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Editorial

Global Burden and Trends of Iron Deficiency with and without Anemia

Prof. Dr. Azhar Masud Bhatti
Editor-in-Chief

Introduction

Iron deficiency (ID) and iron deficiency anemia (IDA) are global health issues frequently encountered in daily clinical practice. Iron deficiency without anaemia is poorly recognised by clinicians despite its high prevalence, probably because of suboptimal screening recommendations. Diagnosing IDWA relies on a combination of tests, including haemoglobin and ferritin levels, as well as transferrin saturation.

Iron deficiency anaemia (IDA) currently affects 1.2 billion people and iron deficiency without anaemia (IDWA) is at least twice as common. ID is the most common nutritional deficiency worldwide, affecting up to 25% of the global population, or nearly 2 billion people[1]. Recent 2024-25 research highlights that iron deficiency remains a critical global health crises with studies projecting the burden persist through 2050.

Children and women of reproductive age are particularly affected by ID due to increased iron requirements. ID arises when the body's iron stores, particularly those in macrophages and hepatocytes, are depleted. Because most iron—approximately 25 mg daily—is used for hemoglobin (Hb) synthesis to support the production of around 200 billion red blood cells each day, IDA is the most evident consequence of ID. This often leads to the mistaken belief that ID and IDA are the same. However, ID is a broader condition that can precede the onset of IDA or impact other tissues beyond those involved in red blood cell production.

ID can be classified into three stages. In the first stage, which is characterized as mild ID, iron stores are depleted but the production of iron-dependent proteins is maintained. It was previously believed that the absence of iron stores had no adverse health effects. However, accumulating evidence suggests that even mild ID can lead to symptoms such as fatigue, cognitive impairment, reduced aerobic performance, compromised immune function, and poor sleep quality. The prevailing body of research strongly supports the need to prevent and manage even mild ID, not only in growing individuals and menstruating and pregnant women, but also in endurance athletes and the elderly to promote optimal health and development. In the second stage, also known as iron-deficient erythropoiesis, the requirements for iron in erythropoiesis are no longer fully met, but Hb synthesis and erythropoiesis are maintained. Also, the production of iron-dependent proteins may be disrupted. The third stage is IDA, characterized by impaired Hb production. In IDA, erythrocytes are typically microcytic (smaller than normal red blood cells, with a mean corpuscular volume (MCV) below 80 fL) and hypochromic (paler due to reduced Hb content). However, in early stages, red blood cells may appear normocytic (normal size, MCV 80–100 fL) and normochromic before becoming microcytic as the deficiency worsens[1].

Prevalence of Iron Deficiency

The prevalence of ID is higher in developing countries compared to developed ones, although it is not limited to economically disadvantaged regions. In developing countries, ID typically arises from inadequate dietary intake of iron and is often associated with parasitic infections that cause bleeding. Additionally, malaria, HIV/AIDS, and tuberculosis contribute to high prevalence rates in some regions[2].

In Pakistan, Iron Deficiency Anemia (IDA) is a severe public health crisis, especially among women and young children. National data indicates that more than half of children under five and over 40% of women of reproductive age suffers from some form of anemia.

Children under Five, approximately 53.7% are anemic, with 28.9% specifically diagnosed with IDA. Women of Reproductive Age (WRA), about 42.7% are anemic, with 18.4% experiencing IDA. Pregnant Women, prevalence is exceptionally high, with some reports estimating that 51% to over 70% are anemic. Iron Deficiency Anemia in Pakistan is a major contributor to high maternal mortality, preterm births, and impaired cognitive and physical development in children.

According to the World Health Organization (WHO), anemia affects 30% of non-pregnant women, 37% of pregnant women, and 40% of children under five worldwide. Despite other causes like malaria, thalassemia, and sickle cell trait, ID remains the leading cause of anemia, making IDA the most common form of the condition. It is estimated that more than 1.2 billion people suffer from IDA worldwide, with prevalence varying significantly between low- and high-income countries[3,4].

In the least developed countries, particularly in sub-Saharan Africa, the prevalence of anemia among children aged 6–59 months often exceeds 60%, with some countries reporting rates as high as 86%. Data show that IDA affects up to 72.8% of children in certain regions (e.g., Ethiopian Somali region), and ID alone may affect over 90% in highly vulnerable subpopulations[4,5]. While national averages for IDA typically range from 12% to 46%, local studies in high-risk groups (e.g., breastfed infants or those exposed to

infections and food insecurity) report extremely high rates, sometimes exceeding 60–70%[5].

In developing countries, anemia affects 20–39.9% of women of reproductive age in many regions, with some countries—such as Papua New Guinea and parts of Indonesia—reporting severe anemia prevalence exceeding 70%. Specific regional data point to anemia prevalence rates as high as 72.9% among women of reproductive age in Indonesia and up to 89.7% in Papua New Guinea, with a significant proportion attributable to ID and compounded by infections such as malaria and helminthiasis[6].

The WHO Global Health Observatory data shows that anemia rates in pregnancy have remained largely unchanged over time, with rates decreasing from 41% in 2000 to only 37% in 2019.

In children, a review of 44 studies conducted across 19 European countries revealed that 2–25% of infants aged 6–12 months were iron deficient, with higher rates among those from lower socioeconomic backgrounds and those who drank cow's milk during their first year. For children aged 12–36 months, ID prevalence ranged from 3% to 48%, while the rate of IDA was as high as 50% in Eastern Europe, but less than 5% in Western Europe[7].

The WHO classifies the public health significance of anemia into four categories based on prevalence estimates in specific populations: "normal" (<5%), "mild" (5–19.9%), "moderate" (20.0–39.9%), and severe (40%) [8]. Given the magnitude of the issue, the WHO has set a target to reduce the prevalence of anemia among women of reproductive age, including adolescent girls, by 50% by the year 2030.

Pathophysiology

Iron is an essential element and is controlled primarily by dietary intake, intestinal absorption and iron recycling.[9] Dietary iron can be found in two forms: haem and non-haem iron. Haem iron is easily absorbable and arises from haemoglobin (Hb) and myoglobin in the form of animal meat, poultry and fish. Non-haem iron is mostly found in plant food but is not as easily absorbable. Compounds such as phytate, oxalate, polyphenols and tannin, which are found in plants, diminish the uptake of non-haem iron, as do some drugs, such as proton pump inhibitors. Ascorbic acid, citrate and gastric acid, conversely, facilitate iron absorption.[10] In a healthy diet, approximately 5–15 mg of elemental iron and 1–5 mg of haem iron are ingested daily although only 1–2 mg is ultimately absorbed into the intestine, predominantly in the duodenum and proximal jejunum.

The two different iron absorption pathways. Non-haem absorption pathway (left): insoluble ferric iron (Fe^{3+}) is reduced to absorbable ferrous iron (Fe^{2+}), which is carried out by the enzyme duodenal cytochrome B (DcytB). The divalent metal transporter 1 (DMT1) imports Fe^{2+} across the apical surface and into the cell, which can then be either stored as ferritin or exported into circulation through ferroportin. Prior to exiting the enterocyte, Fe^{2+} must be oxidised back to Fe^{3+} by hephaestin or ceruloplasmin. Haem absorption pathway (right): the haem carrier protein (HCP1) transports haem iron directly into the enterocyte. Once inside the enterocyte, haem iron can either be released into plasma via the haem exporter FLVCR1 or be converted back into Fe^{2+} via the haem oxidase (HO) enzyme. The ferroportin receptor then releases Fe^{2+} into the plasma. Hepcidin, a hepatic peptide hormone, controls ferroportin, the sole iron exporter, by promoting its endocytosis. Hepcidin production and circulation are regulated by plasma iron concentration and iron stores. Hepcidin is increased in the presence of inflammation.

Causes of Iron Deficiency

Iron has both a storage pool and a functional pool. The storage pool is the reticuloendothelial system which consists of the liver, spleen and lymph nodes. The functional pool consists of red blood cells, bone marrow and cardiac and skeletal muscle. Iron is absorbed in the duodenum via specific transporters and is carried by transferrin molecules to the storage and functional pools. Iron deficiency can be absolute or functional.

Causes of iron deficiency can be grouped into the following categories: inadequate dietary intake, increased body needs, reduced absorption, chronic inflammation and chronic blood loss.

Inadequate intake can result from iron-deficient diets. Athletes and those performing in demanding sports have increased iron needs and are at a higher risk of developing iron deficiency.

Iron absorption occurs mainly in the proximal small intestine.

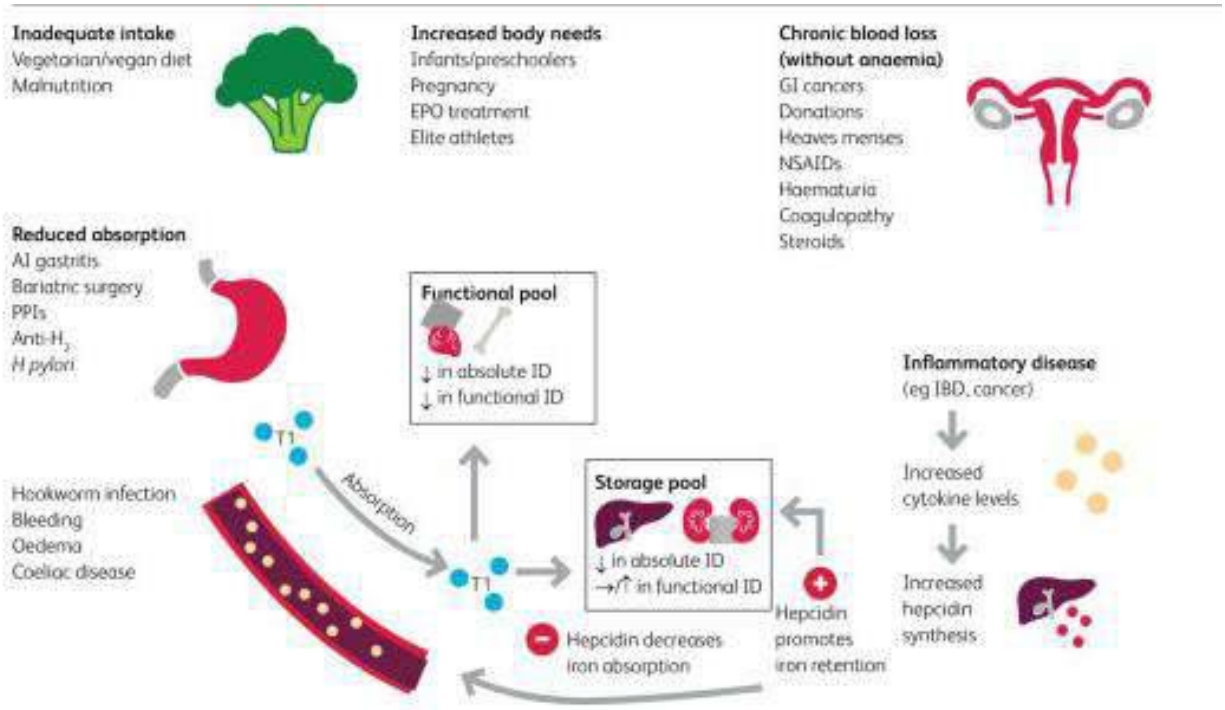
Bariatric surgery patients are highly susceptible to ID due to a decreased absorptive surface area and/or reduced gastric acid secretion.

Less commonly, Helicobacter pylori infection may cause ID due to reduced iron absorption and blood loss.[11]

The consumption of coffee, tea or calcium (in supplements or dairy products) has been reported to reduce iron absorption.

Chronic inflammation, such as in coeliac disease, inflammatory bowel disease (IBD) and HF, increases hepcidin production, blocking iron transporters and reducing absorption, and causes iron entrapment within storage pools.

The main causes of ID and IDA include low dietary iron intake and insufficient iron absorption during periods of life when iron requirements are particularly high, such as during periods of growth in children and adolescents, as well as during the reproductive years in women, especially during pregnancy and postpartum. Chronic GI bleeding, heavy menstrual bleeding, and malabsorption conditions like celiac disease and inflammatory bowel disease (IBD), where the integrity of the cells lining the GI tract is compromised, can also lead to IDA[11]. IDA occurs in 60–80% of patients with IBD.



AI gastritis = autoimmune gastritis; anti H2 = anti histamine-2 receptor (H2 receptor antagonist); EPO = erythropoietin; GI cancers = gastrointestinal cancers; H pylori = Helicobacter pylori; IBD = inflammatory bowel disease; NSAIDs = non-steroidal anti-inflammatory drugs; PPIs = proton pump inhibitors; Tf = transferrin.

Figure No.1: Causes of iron deficiency.[11]

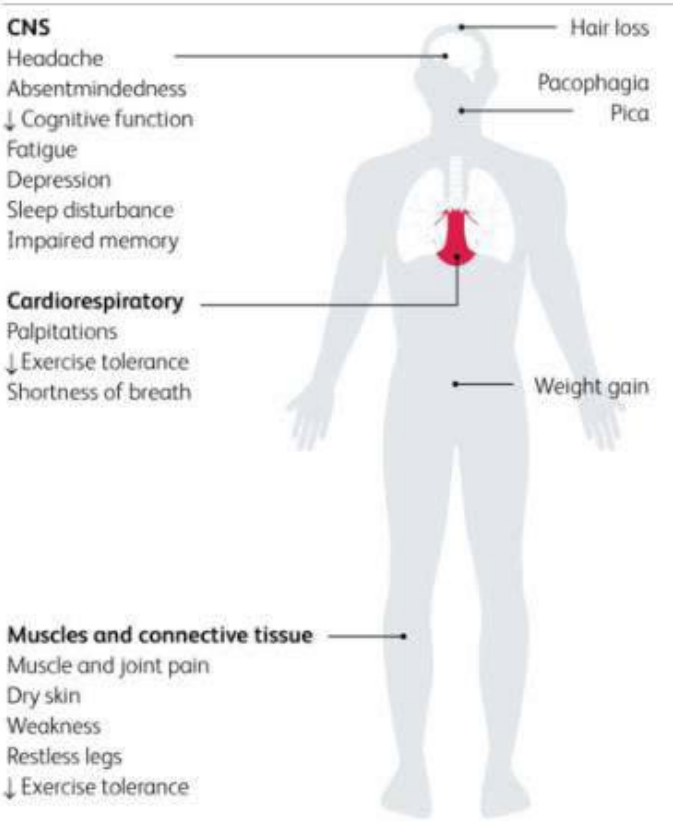


Figure No. 2: Effects of iron deficiency on the human body.[12]

Assessment and diagnosis

The WHO defines anaemia as blood Hb level below 130 g/L in men and 120 g/L in women. In isolated iron deficiency, serum ferritin (the storage molecule for iron) should be less than 30 ug/L. However, ferritin is an acute phase protein and can be increased in the presence of inflammation. Thus, if there is evidence of concomitant inflammation, such as elevated C reactive protein, ferritin less than 100 ug/L is indicative of IDA.[13] Transferrin, the iron transporter, is generally elevated; however, it is a negative acute phase protein and therefore, can be normal or reduced in chronic inflammatory states.[14]

Serum iron and transferrin saturations (TSAT) will be reduced with TSAT less than 20% required for the diagnosis of IDA. See Table 1 for the breakdown of diagnostic criteria for IDA.

Signs and Symptoms of Iron deficiency

There are so many signs and symptoms of iron deficiency, few are describe below:

Pica (Odd Cravings): An intense, strange desire to consume non-food substances such as ice (pagophagia), dirt, paper, or clay.

Spoon-Shaped Nails (Koilonychia): Nails that are thin, brittle, and break easily, or that curve upward in the center, forming a shape like a spoon.

Sore or Swollen Tongue (Glossitis): A tongue that appears unnaturally smooth, inflamed, or swollen, sometimes causing difficulty with swallowing.

Restless Legs Syndrome (RLS): An uncontrollable, uncomfortable urge to move your legs, often accompanied by tingling or itching, which frequently occurs at night.

Angular Cheilitis (Mouth Cracks): Painful, cracked, or ulcerated sores that develop in the corners of the mouth.

Management and Treatment

Iron deficiency anemia (IDA) management involves identifying the root cause (e.g., blood loss, poor absorption) and replenishing iron through oral supplements (ferrous sulfate/fumarate) or IV iron for severe cases. Iron replenishment can occur via three routes: oral iron, parenteral oral and transfusion of packed red cells. Each route has its benefits and limitations mentioned in Table 2.

Table No.1: Diagnostic criteria for iron deficiency anaemia

Serum markers	Diagnosis for IDA
Haemoglobin	<130 g/L males <120 g/L females <110 g/L in pregnancy
Ferritin*	<30 ug/L if no inflammation <100 ug/L if inflammation
Transferrin†	Raised
Total iron binding capacity	Raised
Iron	Reduced
Transferrin saturations	<20%
Mean corpuscular volume	Low

Table No.2: A list of common conditions and patient groups who have an increased risk of developing iron deficiency anaemia

Background	Cause of iron deficiency anaemia	Cause of blood loss	Recommended route of iron replacement
Congestive cardiac ailure	Poor nutrition Decreased GI absorption	Antiplatelet and/or anticoagulant use	Intravenous
Chronic kidney disease		Dialysis and frequent blood sampling	Intravenous
Inflammatory bowel disease		Chronically inflamed and ulcerated bowel	Intravenous
Elderly		Medications (antiplatelet, anticoagulant, anti-inflammatories, anti-depressants)	Oral
Malignancy	Poor nutrition Loss of healthy blood cells Damage to the bone marrow	Bleeding tumour	Intravenous
Surgery	Dependent on cause for surgery requirement	Excessive bleeding either pre and/or post-operatively	Intravenous or oral
Pregnancy	Poor nutrition Increased iron demands to mother and fetus	–	Intravenous or oral

Oral Iron Supplementation: The first-line treatment, often involving daily or alternate-day intake of tablets like ferrous sulfate, fumarate, or gluconate. Taking iron with vitamin C (e.g., orange juice) can enhance absorption, while taking it on an empty stomach is generally recommended, though taking it with food can reduce side effects.

Intravenous (IV) Iron: Used if oral iron is not tolerated, ineffective due to malabsorption, or in cases of severe anemia or chronic blood loss.

Addressing the Underlying Cause: Essential for long-term management, which may include treating heavy menstrual bleeding, gastrointestinal bleeding, or correcting nutritional deficiencies.

Dietary Adjustments: Increasing intake of iron-rich foods such as legumes, lean meat, and fortified cereals.

Monitoring and Duration: Treatment typically continues for 3-6 months to fully replenish iron stores, with monitoring of hemoglobin levels.

References

1. Pasricha SR, Tye-Din J, Muckenthaler MU, Swinkels DW. Iron Deficiency. Lancet 2021;397: 233–248.
2. Abioye AI, Andersen CT, Sudfeld CR, Fawzi WW. Anemia, Iron Status, and HIV: A Systematic Review of the Evidence. Adv Nutr 2020;11: 1334–1363.
3. Kassebaum NJ, Jasrasaria R, Naghavi M, Wulf SK, Johns N, Lozano R, et al. A Systematic Analysis of Global Anemia Burden from 1990 to 2010. Blood 2014;123:615–624.
4. Gardner WM, Razo C, McHugh TA, Hagins H, Vilchis-Tella VM, Hennessy C, et al. Prevalence, Years Lived with Disability, and Trends in Anaemia Burden by Severity and Cause, 1990–2021: Findings from the Global Burden of Disease Study 2021. Lancet Haematol 2023;10:e713–e734.
5. Lemoine A, Tounian P. Childhood Anemia and Iron Deficiency in Sub-Saharan Africa–Risk Factors and Prevention: A Review. Arch Pédiatr 2020;27:490–496.
6. Rakanita Y, Sinuraya RK, Suradji EW, Suwantika AA, Syamsunarno MRA, Abdulah, R. The Challenges in Eradication of Iron Deficiency Anemia in Developing Countries. Syst Rev Pharm 2020;11:383–401.
7. Eussen S, Alles M, Uijterschout L, Brus F, Van Der Horst-Graat J. Iron Intake and Status of Children Aged 6–36 Months in Europe: A Systematic Review. Ann Nutr Metab 2015;66: 80–92.
8. de Benoist B, McLean E, Egli I, Cogswell M, editors. Worldwide Prevalence of Anaemia 1993–2005: WHO Global Database on Anaemia; World Health Organization: Geneva; Switzerland: 2008.p.40.
9. Shah Y, Patel D, Khan N. Iron deficiency anemia in IBD: an overlooked comorbidity. Expert Rev Gastroenterol Hepatol 2021; 15:771–81.
10. Gulec S, Anderson GJ, Collins JF. Mechanistic and regulatory aspects of intestinal iron absorption. Am J Physiol Gastrointest Liver Physiol 2014;307: G397–409.
11. Camaschella C. Iron deficiency. Blood 2018;133:30-39.
12. Soppi E. Iron deficiency without anemia – common, important, neglected. Clin Case Rep 2019;5:2-7.
13. Weiss G. Anemia of chronic disorders: new diagnostic tools and new treatment strategies. Semin Hematol 2015;52:313–20.
14. Jimenez KM, Gasche C. Management of iron deficiency anaemia in inflammatory bowel disease. Acta Haematol 2019;142:30–6.

Original Article

Elevated C-Reactive Protein and In-Hospital Mortality in Patients with Decompensated Liver Cirrhosis at a Tertiary Care Hospital, Karachi

Asma Laeeq[1], Muhammad Tanveer Alam[2], Syed Muhammad Kashif[3], Hari Lal[4], Huda Naim[5] and Arjan Kumar[4]

ABSTRACT

Objective: To determine the frequency of elevated C-reactive protein (CRP) and evaluate its association with in-hospital death in patients with decompensated chronic liver disease who present to a tertiary care hospital in Karachi.

Study Design: Cross-sectional study.

Place and Duration of Study: This study was conducted at the Department of Medicine, Dr. Ruth Pfau Civil Hospital, Karachi, over a period of five months from July 2025 to November 2025.

Methods: Non-probability consecutive sampling was used to select 150 patients with decompensated chronic hepatic illness, ranging in age from 30 to 70 years. The Child-Pugh classification was used to record clinical and demographic characteristics as well as assess the condition's severity. Serum CRP levels were measured when the patient arrived and categorised as mild (6–50 mg/L), moderate (51–100 mg/L), severe (>100 mg/L), or normal (<5 mg/L). Patients were observed throughout their hospital stay, and the results of in-hospital death were recorded. SPSS version 24 was used for data analysis. The chi-square test was used to evaluate associations; a p-value of less than 0.05 was considered statistically significant.

Results: A total of 114 patients had raised CRP (76.0%). Those with moderate and severe CRP elevation had a significantly higher overall in-hospital death rate of 8.0% (12/150) ($p<0.05$) than those with normal or moderately elevated CRP. Furthermore, patients in the advanced Child-Pugh class were more likely to have elevated CRP.

Conclusion: People with decompensated chronic hepatic disease frequently have elevated CRP, which is strongly linked with higher in-hospital mortality. Because of its affordability and ease of use, CRP may be a useful addition to established prognostic methods in the early risk assessment and treatment of hospitalised patients with decompensated cirrhosis.

Key Words: Decompensated chronic liver disease; C-reactive protein; Child–Pugh classification; in-hospital mortality.

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INTRODUCTION

Worldwide morbidity and mortality rates are still rising sharply due to chronic hepatic diseases including cirrhosis, which are major public health issues. Recent global estimates indicate that cirrhosis and its complications kill over a million people annually, and millions of people suffer from chronic hepatic illness[1,2]. Even with significant advancements in supportive treatment and antiviral drugs, patients with decompensated cirrhosis still have poor prognoses, mostly because of infections, sepsis, variceal haemorrhage, and the onset of multiple organ failure. The burden of chronic hepatic disease is particularly apparent in Asia, where viral hepatitis remains a major cause of cirrhosis. Delays in diagnosis, limited access to specialised care, and late disease presentation are still problems in many South Asian countries.

Hepatitis C virus infection continues to be one of the most prevalent causes of chronic hepatic illness in Pakistan, with cirrhosis and eventual decompensation developing in a considerable proportion of individuals affected[3-5].

Bacterial infections and systemic inflammation are common in patients with decompensated hepatic cirrhosis, and both significantly worsen the prognosis. However, because hypersplenism, beta-blocker

[1.] Postgraduate Trainee / Professor[2] / Associate Professor[3] / Assistant Professor[4] / Senior Registrar[5], Department of Medicine, Dr Ruth K.M Pfau Civil Hospital Karachi /Dow University of Health Sciences , Karachi.

Correspondence: Asma Laeeq, Postgraduate Trainee, Department of Medicine, Dr Ruth K.M Pfau Civil Hospital Karachi /Dow University of Health Sciences , Karachi.
Contact No: 03323302613
Email: asma_laeeq@hotmail.com

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medications, or hepato cerebral syndrome can occasionally mask the usual indicators of a systemic inflammatory response, it may be challenging to identify infection in cirrhotic individuals. In this case, readily available inflammatory biomarkers could be crucial in directing medical judgement. Even in advanced stages of liver illness, C-reactive protein (CRP), a widely available and reasonably priced indicator of systemic inflammation, has been shown to retain its therapeutic use[6].

Numerous recent studies have found that individuals with cirrhosis who have high CRP levels are more likely to suffer from adverse outcomes such as in-hospital death and rapid detrioration[7,8]. But there is a dearth of data from Pakistan and the larger South Asian region, especially when it comes to hospitalised patients with decompensated cirrhosis and combining CRP levels with established predictive criteria like the Child-Pugh classification.

Thus, the aim of this study was to determine the frequency of elevated CRP levels and the rate of in-hospital death among patients who arrived at a tertiary care hospital in Karachi with decompensated hepatic illness. The study also sought to assess how CRP categories related to Child-Pugh class and in-hospital outcomes.

METHODS

This cross-sectional study was carried out in the Dr. Ruth Pfau Civil Hospital's Department of Medicine in Karachi with permission from Dow University of Health Sciences' Institutional Review Board (Ref: IRB-3996/DUHS/Approval/2025/255). From July 2025 to November 2025, a five-month period, the study was conducted. All subjects gave their written informed consent before being enrolled, and patient information was kept strictly confidential during the entire study. Using the World Health Organization's (WHO) sample size calculator, the sample size was determined. With a 95% confidence level, a margin of error of 8%, and a 46% prevalence of high CRP, a total sample size of 150 patients was calculated.

Participants in the trial were patients between the ages of 30 and 70 who had been diagnosed with chronic hepatic illness for more than a year and who had experienced acute decompensation that necessitated hospitalisation. Both male and female patients could be included.

Exclusion criteria included a history of hepatocellular cancer, solid or haematological malignancy, recent hospitalisation or sepsis within the last month, or admission for decompensated liver cirrhosis during the last six months.

In order to enlist 150 patients who met the inclusion criteria, a non-probability consecutive sampling procedure was used. Using a pre-made proforma, baseline demographic and clinical data were documented, including age, gender, the length and cause of liver cirrhosis, concomitant diseases (diabetes mellitus, hypertension, and dyslipidaemia), and smoking status. The Child-Pugh score was used to determine the severity of hepatic disease, and patients were assigned to either class A, B, or C based on their results.

Aseptic blood samples were taken at the time of hospital admission in order to assess CRP, and the hospital laboratory performed the analysis. Patients were divided into four groups according to their serum CRP levels: mildly elevated (6–50 mg/L), moderately elevated (51–100 mg/L), severely elevated (>100 mg/L), and normal (<5 mg/L).

The main outcome, in-hospital mortality, which is defined as death that occurs within the same hospital admission, was monitored throughout the duration of the patients' hospital stay.

The statistical software SPSS version 24 was used to enter and analyse the data. Frequencies and percentages were used to represent categorical variables, whereas the mean and standard deviation were used to represent continuous variables. The chi-square test was used to evaluate the relationships between CRP and Child-Pugh class and within-hospital outcomes. The p-value was deemed statistically significant if it was less than 0.05.

RESULTS

The study comprised 150 individuals with chronic hepatic illness that was decompensated. The average age was 50.0 ± 9.6 years, and 62% of the participants were male. With severe liver disease, over half of the patients were in Child-Pugh class C. Hepatitis C was the primary cause of cirrhosis, while diabetes mellitus was the most common comorbidity (Table 1).

Table No. 1: Demographic characteristics, comorbidities, and etiology of liver cirrhosis in patients with decompensated chronic liver disease (n = 150)

Variable	n (%)
Demographics	
Age (years), Mean ± SD	50.0 ± 9.6
Male	93 (62.0)
Female	57 (38.0)
Disease severity	
Child–Pugh class A	29 (19.3)
Child–Pugh class B	51 (34.0)
Child–Pugh class C	67 (44.7)
Comorbidities	
Diabetes mellitus type II	63 (42.0)
Hypertension	31 (20.7)
Dyslipidemia	0 (0.0)
Smoking	3 (2.0)
Etiology of liver cirrhosis	
Hepatitis C	90 (60.0)
Hepatitis B	41 (27.3)
Alcohol-related	9 (6.0)
NAFLD	7 (4.7)

As hepatic function deteriorated, a rising trend of CRP rise was noted. The majority of Child-Pugh class C patients had moderate to severe CRP increase, indicating a substantial correlation between systemic inflammation and advanced hepatic impairment (Table 2).

Table No. 2: Distribution of C-reactive protein (CRP) categories according to Child–Pugh class (n = 150)

CRP category	Child–Pugh A n (%)	Child–Pugh B n (%)	Child–Pugh C n (%)
Normal (<5)	16 (55.2)	16(31.4)	4 (6.0)
Mild (6–50)	9 (31.0)	18(35.3)	18 (26.9)
Moderate (51–100)	4 (13.8)	14(27.5)	39 (58.2)
Severe (>100)	0 (0.0)	3 (5.9)	6 (9.0)

Chi-square test demonstrated a statistically significant association between CRP category and Child–Pugh class (^{2} = 37.73, df = 6, p = 0.0000).Three patients were excluded from this analysis due to missing Child–Pugh classification; therefore, totals in this table sum to 147. As CRP levels rose, in-hospital death gradually climbed as well. Patients with normal CRP readings did not have any deaths. The mortality rate was significantly greater for patients with moderate and severe CRP elevation, suggesting that CRP is a valuable indicator of short-term prognosis in decompensated chronic hepatic illness (Table 3).

Table No. 3: Association of C-reactive protein (CRP) categories with in-hospital outcome in patients with decompensated chronic liver disease (n = 150)

CRP category	Expired during hospital stay n (%)	Survived to discharge n (%)	Total (n)
Normal(<5)	0 (0.0)	36 (100.0)	36
Mild(6–50)	6 (5.9)	96 (94.1)	102
Moderate (51–100)	3 (50.0)	3 (50.0)	6
Severe (>100)	3 (50.0)	3 (50.0)	6

Chi-square test demonstrated a statistically significant association between CRP category and in-hospital outcome ($p < 0.05$).

DISCUSSION

Elevated blood CRP was commonly seen in this cross-sectional research of 150 patients with decompensated liver cirrhosis, and it was clearly linked to the severity of the disease and unfavourable in-hospital outcomes. 36 patients (24.0%) had CRP values < 5 mg/L, whereas 114 patients (76.0%) had elevated CRP levels overall. Patients with higher CRP values were more likely to die, with an overall in-hospital mortality rate of 8.0%. Systemic inflammation was identified as a significant predictor of the short-term prognosis in decompensated cirrhosis, as evidenced by the steady increase in mortality observed throughout rising CRP[9,10].

An important pathophysiological mechanism in the development of serious hepatic disease is becoming more widely acknowledged: systemic inflammation. According to earlier research, inflammatory indicators are closely linked to clinical decompensation and death and increase in tandem with deteriorating hepatic function[11]. These results are corroborated by our study's finding that patients with advanced Child-Pugh class had higher CRP values more frequently, which highlights the strong correlation between increased inflammatory activity and compromised hepatic reserve.

Numerous research have examined the predictive significance of CRP and CRP-based indices in cirrhosis. According to Wang et al., the CRP-to-albumin ratio had a strong correlation with established severity levels and was an independent predictor of short-term death in patients with decompensated cirrhosis associated with hepatitis B[9]. In the same way, Oikonomou et al. showed that higher CRP-based ratios were linked to worse outcomes in decompensated cirrhosis, indicating that inflammation-based indicators might offer more predictive data than traditional scoring methods[12].

Evidence from acutely decompensated cirrhosis cohorts emphasises the significance of systemic inflammation even more. Zanetto et al. found that, independent of conventional liver severity criteria, the degree of inflammatory response, as shown by CRP levels, was the best indicator of acute-on-chronic liver failure and bleeding[6]. These findings align with the notable rise in mortality observed in our group of patients with moderate to severe CRP elevation.

Results in acute-care settings have also been demonstrated to be predicted by CRP. According to a study by Jeong et al., CRP is an independent predictor of in-hospital mortality in patients with alcoholic liver cirrhosis who present to the emergency room[13]. The constant correlation between higher CRP levels and mortality in a variety of clinical contexts underscores the marker's broad clinical importance, despite the fact that their population's etiological profile is different from ours.

Broader inflammatory profiling has shown prognostic usefulness across several stages of liver disease, surpassing single time-point assessments. The idea that inflammation transmits prognostic information throughout the disease spectrum was supported by research demonstration that inflammatory biomarkers were predictive of medium-term survival in patients with recently diagnosed cirrhosis[14]. The current study's findings are further supported by reports that hospitalised patients with decompensated cirrhosis and a larger inflammatory burden have worse short-term outcomes.

These findings have significant clinical ramifications, especially in environments with minimal resources. CRP is an effective technique for early risk

stratification since it is generally accessible, affordable, and quickly measurable. The Child-Pugh classification and CRP interpretation can help physicians identify high-risk patients who need closer monitoring, early infection assessment, and prompt care escalation[15-18]. There are limits to this study. The results may have been impacted by unmeasured factors such concomitant organ dysfunction or occult infection, and its cross-sectional design restricts the ability to draw conclusions about causality. Also, because this was a single-center study, the results might not be as broadly applicable. Notwithstanding, the findings offer significant regional support for the prognostic significance of CRP in individuals with decompensated cirrhosis.

CONCLUSION

Patients with chronic liver illness that was decompensated frequently had elevated C-reactive protein (CRP), which was significantly linked to higher in-hospital mortality, especially for those with moderate to severe CRP heightening. These results highlight how systemic inflammation plays a critical role in determining the short-term course of cirrhosis. In hospitalised patients with decompensated cirrhosis, CRP may be a useful supplement to well-established prognostic tools like the Child-Pugh classification for early risk stratification and well-informed clinical decision-making due to its low cost, broad availability, and simplicity of measurement, particularly in settings with limited resources.

Author's Contribution:

Concept & Design or acquisition of analysis or interpretation of data:	Asma Laeeq, Muhammad Tanveer Alam, Syed Muhammad Kashif
Drafting or Revising Critically:	Hari Lal, Huda Naim, Arjan Kumar
Final Approval of version:	All the above authors
Agreement to accountable for all aspects of work:	All the above authors

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REFERENCES

1. Tham EKJ, et al. Global burden of cirrhosis and other chronic liver diseases, 1990–2021. Lancet Gastroenterol Hepatol 2025;10(2):120–134.
2. Devarbhavi H, Asrani SK, et al. Global burden of liver disease: 2023 update. J Hepatol 2023;79(2): 516–537.
3. Mooneyhan E, Qureshi H, Mahmood H, et al. Hepatitis C prevalence and elimination planning in Pakistan. J Viral Hepat 2023;30(4):345–354.
4. Qureshi H, Alam I, Darijo Z, Mahmood H. Prevalence of hepatitis and HIV in Pakistan. East Mediterr Health J 2024;30(1):45–52.
5. Mansour D. Management of acute decompensated cirrhosis. Clin Med (Lond) 2025;25(1):e12–e18.
6. Zanetto A, Pelizzaro F, Campello E, et al. Systemic inflammation and outcomes in acutely decompensated cirrhosis. J Hepatol 2023;78(2): 301–311.
7. Kwon JH, Jang JW, Kim YW, Lee SW, Nam SW, Jaegal D, et al. The usefulness of C-reactive protein and neutrophil-to-lymphocyte ratio for predicting the outcome in hospitalized patients with liver cirrhosis. BMC Gastroenterol 2015; 15(1):146.
8. State N, et al. C-reactive protein and prognosis in cirrhosis. Maedica (Bucur) 2021;16(3):353–361.
9. Wang CJ, Wu JP, Zhou WQ, Mao WL, Huang HB. The C-reactive protein/albumin ratio as a predictor of mortality in patients with HBV-related decompensated cirrhosis. Clin Lab 2019;65(8).
10. Costa D, Simbrunner B, Jachs M, et al. Systemic inflammation increases across stages of advanced chronic liver disease and correlates with decompensation and mortality. J Hepatol 2021; 74(4):819–828.
11. Sánchez-Aldehuelo R, et al. Progressive systemic inflammation precedes decompensation in compensated cirrhosis. JHEP Rep 2024;7(2): 101231.
12. Oikonomou T, Goulis I, Cholongitas E, et al. Significance of CRP to albumin ratio in decompensated cirrhosis. Ann Gastroenterol 2020;33:667–674.
13. Jeong JH, Lee SB, Sung A, et al. Predictors of mortality in alcoholic cirrhosis. Medicine (Baltimore) 2023;102(8):e33074.
14. Mynster Kronborg T, Webel H, O'Connell MB, Danielsen KV, Hobolth L, Møller S, et al. Markers of inflammation predict survival in newly diagnosed cirrhosis: a prospective registry study. Scientific reports 2023;13(1):20039.
15. Lan Y, Yu Y, Zhang X, et al. Prognostic impact of decompensated events in cirrhosis. BMC Gastroenterol 2024;24:408.
16. Gao N, Yuan P, Tang ZM, et al. Monomeric CRP and prognosis of decompensated cirrhosis. Front Immunol 2024;15:1407768.
17. Kumar B, Kumari B, Kumari P. Inflammatory markers (esr, crp, nlr and ferritin) and their correlation to child pugh scoring in chronic liver disease (cld). Int J Acad Med Pharm 2024; 6(1):1196-202.
18. Di Martino V, Coutris C, Cervoni JP, Dritsas S, Weil D, Richou C, et al. Prognostic value of C-reactive protein levels in patients with cirrhosis. Liver Transplantation 2015;21(6):753-60.

Original Article

Endodontic–Periodontal Lesions: A Cross-Sectional Study Assessing Knowledge and Diagnostic Proficiency among Senior Undergraduate Dental Students at Qassim University

Rakan Almutawa[1], Nubesh Khan Syed[2], Hanan Alharbi[3], Omar AlJasir[3], Saad Obaid Alazmi[2] and Muhammad Zubair Ahmad[3*]

ABSTRACT

Objective: To assess the knowledge and diagnostic proficiency of senior undergraduate dental students regarding endodontic–periodontal lesions (EPLs) at the College of Dentistry, Qassim University.
Study Design: Cross-sectional study
Place and Duration of Study: This study was conducted at the College of Dentistry, Qassim University, Saudi Arabia, September-October 2025.
Methods: A structured 17-item survey was distributed to the 4th- and 5th-year Bachelor of Dental Surgery (BDS) students. Fourteen items assessed knowledge (classification, routes of communication, diagnostic tests, prognosis, microbiology, and treatment principles), and three case-based scenarios assessed diagnostic proficiency. Data were analyzed using SPSS Version 25. Differences between academic years were evaluated using the chi-square test. Binary logistic regression was performed for case-based scenarios to estimate odds ratios (OR) with 95% confidence intervals (CI). A p-value <0.05 was considered statistically significant.
Results: 54 students participated (4th-year: 28 [51.9%]; 5th-year: 26 [48.1%]). 5th-year students achieved higher correct responses than 4th-year students for key knowledge items. Significant differences were observed in recognition of dentinal tubule exposure as a communication pathway (81.3% vs 46.4%; p=0.020) and extraction preference in periodontal-origin combined lesions (87.3% vs 53.2%; p=0.012). Logistic regression showed that 5th-year students had higher odds of correctly diagnosing an endodontic–periodontal lesion (OR=4.05; 95% CI: 1.30–12.62; p=0.016) and a periodontal–endodontic lesion (OR=3.33; 95% CI: 1.03–10.80; p=0.044). No significant difference was observed for the true combined lesion (p=0.530).
Conclusion: Senior undergraduate dental students demonstrated moderate knowledge and variable diagnostic proficiency regarding EPLs, with significantly better performance among 5th-year students in selected domains. Enhanced case-based teaching and structured clinical exposure are recommended.
Key Words: Cross-sectional study, diagnostic proficiency, endodontic–periodontal lesions, knowledge, dental students.

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INTRODUCTION

1. 5th-year student, College of Dentistry, Qassim University, Saudi Arabia
2. Department of Periodontology and Implant Dentistry, College of Dentistry, Qassim University, Saudi Arabia
3. Department of Conservative Dental Sciences, College of Dentistry, Qassim University, Saudi Arabia

Correspondence: Muhammad Zubair Ahmad*, Professor, Department of Conservative Dental Sciences, College of Dentistry, Qassim University, Buraydah 51452, Saudi Arabia.
Contact No: +966582527047
Email: m.muhammad@qu.edu.sa

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Accurate clinical assessment and professional communication in dentistry require standardized diagnostic terminology that links the underlying biological status with clinical and radiographic findings.[1] Simring and Goldberg originally reported the link between pulpal and periodontal disease in 1964. Because the pulp and periodontium share developmental and anatomical connections, disease in one compartment may influence the other, resulting in endodontic–periodontal lesions (EPLs). These lesions remain a therapeutic challenge and require accurate identification of the primary source of infection and the extent of periodontal involvement to plan appropriate treatment.[2]

EPLs are primarily microbial in origin,[3] and cross-infection between the root canal system and periodontium can occur through several pathways: the apical foramen, lateral/accessory canals, dentinal

tubules, developmental grooves, root fractures, and iatrogenic perforations. In general, periodontal destruction progresses from coronal to apical areas, whereas endodontic lesions typically originate at the apex and may extend coronally along the periodontal ligament.[4]

The categorization of EPLs by Simon et al. has provided significant help for making informed clinical decisions.[5] The primary criteria to consider in treatment choices are pulp vitality and the kind and size of the periodontal defect. A multidisciplinary approach is necessitated by the similarities in the pathophysiology of the two diseases and the several routes linking them. The differential findings of endodontic and periodontal diseases can be complex; yet an accurate diagnosis is crucial to ensure the provision of appropriate therapy.

According to previous research, practitioners in academic institutions demonstrate greater understanding and awareness of endodontic–periodontal lesions (EPLs) than those in hospitals and private dental clinics.[6] Evidence suggests that undergraduate dental students exhibit limited knowledge of the microbial etiology underlying EPLs.[6] Which lesions need to be treated initially is unclear.[6-7] These lesions are challenging to treat, and the pulpal and periodontal components must be considered in treatment planning.

Undergraduate students play a crucial role in the diagnosis and management of EPLs, and treatment outcomes and prognosis are directly influenced by their knowledge and attitudes.

Given the limited research in Saudi Arabia, this cross-sectional study aimed to evaluate the knowledge, case-based diagnostic proficiency, and treatment decision-making abilities of senior undergraduate dental students regarding EPLs.

METHODS

After obtaining approval from the Committee of Research Ethics, Deanship of Graduate Studies and Scientific Research, Qassim University, Saudi Arabia (registration no. 25-44-01, dated 22-07-2025) the current cross-sectional study was conducted in College of Dentistry, Qassim University, from September to October 2025. A convenience sample of 4th- and 5th-year Bachelor of Dental Surgery (BDS) students was invited to participate. Students in years 1–3, interns, postgraduate trainees, and those who did not provide electronic informed consent were excluded.

These criteria ensured inclusion of students with appropriate clinical exposure to both endodontics and periodontology for evaluating knowledge and diagnostic decision-making regarding EPLs. The criteria were designed to minimize any potential bias and ensure the relevance of the study results to the target population of dental students.

Data Collection: An online close-ended questionnaire in English containing 17 items was administered. The knowledge section comprised 14 items addressing EPL classification, routes of communication, diagnostic tests, microbiology, prognosis, and basic treatment principles. The diagnostic section included three case-based scenarios (brief history with clinical and radiographic images) requiring selection of the most appropriate diagnosis: Case 1 (endodontic–periodontal lesion), Case 2 (periodontal–endodontic lesion), and Case 3 (true combined lesion). The scenarios were adapted from previously published case reports. The questionnaire link was circulated through official university email.

Statistical Analysis: Statistical analysis was performed using SPSS software version 25 (IBM Corp., Armonk, NY, USA). Frequencies and percentages were calculated. Differences in knowledge items were assessed using the chi-square test. For diagnostic scenarios, binary logistic regression analysis was conducted with correct diagnosis (Yes=1, No=0) as the dependent variable and academic year as the independent variable. Odds ratios (OR) with 95% confidence intervals (CI) were calculated. A p-value <0.05 was considered statistically significant.

RESULTS

Fifty-four students completed the survey (4^{th}-year: n=28 [51.9%]; 5^{th}-year: n=26 [48.1%]). Most participants (n=39 [73.2%]) reported having seen EPLs in their clinics, and among these respondents, (n=25 [63.3%]) were 5^{th}-year students. Overall, (n=31 [57.3%]) reported confidence in diagnosing EPLs. 5^{th}-year students more frequently reported awareness of the 2018 periodontal classification, which includes a distinct category for periodontal-endodontic lesions.

Knowledge about EPLs among 5^{th}- and 4^{th}-year students: 53.1% of 5^{th}-year students and 45.7% of 4^{th}-year students correctly identified the direct communication pathway between periodontal tissues and the pulp. 49.22% of 5^{th}-year students identified Actinomycetem comitans as the most shared bacteria related to EPLs, while 46.54% of 4^{th}-year students marked T. denticola. When asked about the prognosis of a true combined lesion, 63.88% of 5^{th}-year students selected the correct answer, whereas 47.98% of 4^{th}-year students responded correctly. More 5th-year students (78.22%) correctly identified the predisposing risk factors for EPLs than 4th-year students (52.54%). Additionally, 63.55% of 5^{th}-year students have reported that vitality test is the most used type of evaluation for identifying a primary endodontic lesion, on the other hand 57.39% chose percussion test. 81.33% of the 5^{th}-year students correctly indicated that exposure of dentinal tubules allows bacterial byproducts and toxins to enter the pulp. Extraction of teeth with periodontal-

origin combined lesions was preferred by 87.34% of 5th-year students compared with 53.22% of 4th-year students. 76.65% of the 5th-year students correctly marked that persistent infection within the root canal system is the chief reason for treatment failure of periodontal-endodontic combined lesions, while 65.54% of 4th-year students chose recurrence of periodontal inflammation as treatment failure of periodontal-origin combined lesions. Chi-square analysis demonstrated statistically significant differences between academic years for recognition of dentinal tubule exposure as a communication pathway ($p = 0.020$) and extraction preference in periodontal-origin combined lesions ($p = 0.012$). No significant differences were observed for the remaining knowledge items (Table 1).

Table No.1: Comparison of knowledge of EPLs between both groups (Chi-Square test of independence)

Item	4th - Year(%)	5th - Year(%)	p-value
Bacteria most frequently related to EPLs	38.33%	55.65%	0.424
Direct pathway between periodontal tissue and pulp	45.7%	53.1%	0.785
Prognosis of true combined lesion	47.98%	63.88%	0.260
Predisposing risk factors for EPL	52.54%	78.22%	0.131
Most used evaluation for primary endodontic lesion	57.39%	63.55%	0.733
Exposure of dentinal tubules allows pulp entry	46.39%	81.33%	0.020*
Extraction more beneficial in periodontal-origin combined lesions	53.22%	87.34%	0.012*
Primary reason for treatment failure	65.54%	76.65%	0.473

*Statistically significant value

Comparison of case-based diagnostic proficiency between 5th- and 4th-year students: Students were presented with three clinical cases with varying degrees of EPLs accompanied by clinical and radiographic images and were asked to select the correct diagnosis. In the first scenario, most 5th-year students (69.22%) answered correctly, whereas only 35.56% of 4th-year students did. In the case involving a periodontal-endodontic lesion, 76.78% of 5th-year students selected the correct answer compared with only 48.55% of 4th-year students. In the final scenario, 65.43% of 5th-year students correctly diagnosed it, while 58.73% of 4th-year students provided the correct diagnosis. Logistic regression analysis revealed that 5th-year students were significantly more likely to correctly diagnose Case 1 (OR = 4.05; $p = 0.016$) and Case 2 (OR = 3.33; $p = 0.044$) compared with 4th-year students. No statistically significant association was found for Case 3 ($p = 0.530$) (Table 2).

Table No.2: Diagnostic proficiency and logistic regression analysis [Comparison of correct diagnoses between 4th- and 5th-year students. Odds Ratios (OR)represent the likelihood of correct diagnosis among 5th-year students compared with 4th-year students (reference group)].

Clinical Scenario	4th-Year Correct (%)	5th-Year Correct (%)	Odds Ratio (OR)	95% CI	p-value
Case 1. Endodontic–periodontal lesion	35.56	69.22	4.05	1.30 – 12.62	0.016*
Case 2. Periodontal–endodontic lesion	48.55	76.78	3.33	1.03 – 10.80	0.044*
Case 3. Combined lesion	58.73	65.43	1.42	0.47 – 4.27	0.530

*Statistically significant value

Model: Binary logistic regression with correct diagnosis (Yes=1, No=0) as dependent variable and academic year as independent variable. Reference category: 4th-year students.

DISCUSSION

When pulpal and periodontal inflammatory diseases coexist, they can complicate diagnosis and treatment planning and alter the order in which care should be provided.[7] EPLs can be either acute or chronic, affecting both pulp and periodontal tissues. It has been stated that endodontic infections increase the formation of periodontal pockets and are a risk factor for periodontitis, whereas periodontitis, trauma, and iatrogenic conditions are considered the main risk groups for EPLs. The development of mixed periodontal-pulpal diseases might result from the bidirectional nature of infection between both tissues, making diagnosis and treatment more difficult.[8,9]

To effectively diagnose the primary source of infection and assess the extent of periodontal and pulpal involvement, students must have a thorough understanding of the endodontic–periodontal relationship. The decision-making process is further complicated by overlapping clinical symptoms and

inconclusive radiographic findings, leading to inconsistent treatment outcomes.

In this context, an online survey was conducted among senior undergraduate dental students to assess their level of knowledge and diagnostic proficiency regarding EPLs. A total of 54 students participated in the study. Most 5th-year students had encountered EPLs in the clinic, and the majority reported being confident in diagnosing such cases. Predictable prognosis is crucial when EPLs are clinically diagnosed. An appropriate treatment strategy is also necessary for the right prognosis.[10,11] The 2018 revised classification of periodontal disorders includes an additional subsection on EPLs. To facilitate the diagnostic process for medical professionals, the categorization was created based on the symptoms.[12]

When compared to 4th-year students, the majority of 5th-year students had a strong understanding of EPLs. The current results are consistent with those of Almadi et al., [13] who also found that senior undergraduate students had a higher level of knowledge about the relationship between EPLs. In the current survey, the majority of 5th-year students identified the bacteria associated with the EPLs as well as the communication pathway between periodontal and pulpal tissue. This finding may be attributed to the undergraduate curriculum's emphasis on theoretical instruction regarding endodontic-periodontal relationships through lectures and seminars. The etiology and pathophysiology of pulpal and apical periodontitis are well recognized; therefore, students should aim to achieve the highest possible success rate. The course of endodontic treatment and the necessary interventions are largely determined by the pulpal and periodontal diagnosis of a tooth.[14] Using the incorrect diagnostic terms may have clinical ramifications and impact the tooth's prognosis. Accurate characterization and diagnosis require a comprehensive clinical and radiographic examination, along with detailed medical and dental history.

In the present survey, three clinical scenarios were used to evaluate students' diagnostic competence in identifying EPLs. 5th-year students demonstrated a higher rate of correct diagnoses compared with 4th-year students, reflecting superior overall diagnostic performance. The comparatively limited exposure of 4th-year students to endodontic–periodontal cases—often allocated to senior students—may explain their lower level of diagnostic abilities. Effective management of EPLs requires a comprehensive understanding of the interrelationship between pulpal and periodontal pathologies. Therefore, undergraduate dental students should remain updated on current evidence and advancements in endodontic–periodontal disease to enhance both their theoretical knowledge and clinical proficiency.[15] The undergraduate curricula should incorporate targeted teaching modules to overcome these shortcomings. Additionally, interactive, case-based learning may be a useful tactic for closing the knowledge gap between theory and practice.[16,17] Furthermore, improving undergraduate students' diagnostic abilities is essential. The high rate of overlooked or misdiagnosed cases suggests that more thorough instruction on diagnostic criteria is required, perhaps by including decision-making algorithms or standardized diagnostic checklists in the curriculum. The use of simulation-based training, which allows students to practice diagnosing and treating EPLs in a controlled setting, could also greatly improve diagnostic proficiency and treatment outcomes.[18] The implementation of specialist workshops or training sessions focused on endodontic–periodontal disease management is another important recommendation.

The statistically significant differences observed in selected knowledge items and in two of the three diagnostic scenarios indicate that clinical experience may influence both theoretical understanding and applied diagnostic reasoning. The higher odds of correct diagnosis among 5th-year students suggest that increased clinical exposure enhances decision-making skills in complex endodontic–periodontal cases. However, the absence of a significant difference in the true combined lesion scenario reflects the inherent diagnostic complexity of such cases and highlights an area requiring strengthened educational emphasis.

The primary limitation of this study is the lack of comparable prior research, which restricts the ability to contextualize the present findings. Additionally, cross-sectional design limits the capacity to establish causal relationships between knowledge, attitudes, and practices. Finally, the use of a self-administered questionnaire may have introduced response bias, as participants could have overestimated their level of expertise.

CONCLUSION

The findings of this study indicate that senior undergraduate dental students—particularly those in their fourth year—demonstrate a moderate level of knowledge and awareness regarding endodontic–periodontal diseases. These results underscore the importance of a comprehensive understanding of the endodontic–periodontal relationship to ensure accurate diagnosis and appropriate management of such lesions. Greater engagement in clinical case discussions, structured training programs, and focused educational interventions is recommended to enhance students' clinical competence and strengthen their ability to manage endodontic–periodontal cases effectively.

Author's Contribution:

Concept & Design or acquisition of analysis or interpretation of data:	Rakan Almutawa, Nubesh Khan Syed, Hanan Alharbi

Drafting or Revising Critically:	Omar AlJasir, Saad Obaid Alazmi, Muhammad Zubair Ahmad
Final Approval of version:	All the above authors
Agreement to accountable for all aspects of work:	All the above authors

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REFERENCES

1. Gutmann JL, Baumgartner JC, Gluskin AH, Hartwell GR, Walton RE. Identify and define all diagnostic terms for periapical/periradicular health and disease states. J Endod 2009;35(12):1658-74.
2. Herrera D, Retamal-Valdes B, Alonso B, Feres M. Acute periodontal lesions (periodontal abscesses and necrotizing periodontal diseases) and endo-periodontal lesions. J Periodontol 2018;89 Suppl 1:S85-s102.
3. Singh P. Endo-perio dilemma: a brief review. Dent Res J (Isfahan) 2011;8(1):39–47.
4. Zehnder M, Gold SI, Hasselgren G. Pathologic interactions in pulpal and periodontal tissues. J Clin Periodontol 2002;29:663-71.
5. Simon JH, Glick DH, Frank AL. The relationship of endodontic periodontic lesions. J Endod 2013; 39:41-6.
6. Sambandhan V, Kalyani P, Ganapathy D. Awareness about pulpoperiodontal lesions among dental students--A survey. Drug Invention Today 2020;13(3):476-9.
7. Schmidt JC, Walter C, Amato M, Weiger R. Treatment of periodontal-endodontic lesions--a systematic review. J Clin Periodontol 2014;41(8):779-90.
8. Asgary S, Roghanizadeh L, Haeri A. Surgical Endodontics vs Regenerative Periodontal Surgery for Management of a Large Periradicular Lesion. Iran Endod J 2018;13(2):271–6.
9. Qiu CH, Yu YC, Xu PC. [Treatment of combined periodontal-pulpal lesions with periodontal therapy]. Shanghai Kou Qiang Yi Xue 2019; 28(6):636–9.
10. Matuliene G, Studer R, Lang NP, Schmidlin K, Pjetursson BE, Salvi GE, et al. Significance of Periodontal Risk Assessment in the recurrence of periodontitis and tooth loss. J Clin Periodontol 2010;37(2):191–199.
11. Kwok V, Caton JG. Commentary: prognosis revisited: a system for periodontal prognosis. J Periodontol 2007;78(11):2063–2071.
12. Caton JG, Armitage G, Berglundh T, Chapple ILC, Jepsen S, Kornman KS, et al. A new classification scheme for periodontal and peri-implant diseases and conditions - Introduction and key changes from the 1999 classification. J Clin Periodontol 2018;45 Suppl 20:S1-s8.
13. Almadi KH, Akresh AIB, Abushaqqaf HF, Assiry YA, Almefyaz MI, Alghamdi AA, et al. Awareness and knowledge of endo-perio lesions among fifth year students and interns at king saud dental collage: a questionnaire-based study. Int J Community Med Public Health 2023;10(12): 4587-92.
14. Mainkar A, Kim SG. Diagnostic Accuracy of 5 Dental Pulp Tests: A Systematic Review and Meta-analysis. J Endod 2018;44(5):694-702.
15. Alim-Uysal BA, Dincer AN, Yurtgezen B, Guneser MB. Does the Endodontic Education Level Affect Decision-Making for Endodontically Treated Teeth With Apical Periodontitis? A Web-Based Survey. Int Dent J 2021;71(6):477-83.
16. Aboalsaud KM, Foster NL, Yu SH, Sweier DG, Rulli D. Periodontal staging and grading: An international dental hygiene education survey. Int J Dent Hyg 2023;21(2):283-90.
17. Wang P, Gao L, Ning Y, Zheng Y, Zhang C, Tan L, et al. Implementation of Chief Complaint-Based Clinical Reasoning Training in Periodontal Internships. Int Dent J 2025;75(2):1302-10.Evans M. The endodontic-periodontal juncture: Where two worlds meet. An overview of endo-perio lesions. Aust Dent J 2023;68(Suppl 1):S56–65.
18. Evans M. The endodontic-periodontal juncture: Where two worlds meet. An overview of endo-perio lesions. Aust Dent J 2023;68 Suppl 1: S56-s65.

Original Article

Knowledge, Attitude, and Perception regarding the Integration of Artificial Intelligence (AI) for Radiological Diagnosis Among Dental Specialists in Saudi Arabia

1. Mohamed Abdulcader Riyaz 2. Abdulaziz Mansour Alharbi

ABSTRACT

Objective: This study aimed to assess the knowledge, attitudes, and perceptions of dental specialists in Saudi Arabia regarding the use of artificial intelligence **(**AI) programs in radiological diagnosis.
Study Design: Cross sectional observational study
Place and Duration of Study: This Online questionnaire survey were sent from the College of Dentistry-Ar Rass Branch, Qassim university and responses were collected from August 2023 till the end of March 2024.
Methods: The total number of participants in the study were 145 (n=145). Primary data was collected through Questionnaire consisting of a 12-item close ended questions and quantitative methods(Chi-square test) was applied for analysis.
Results: The survey included 145 recent graduates, mostly aged 25–30 years. Most participants already knew about AI (81.4%) and its use in OMFR (72.4%), and many supported using it in clinics (71.7%). Many felt the software cannot exceed a radiologist's skill (62.1%) and would not accept an AI diagnosis that conflicts with their judgement (58.6%). Most believed AI will help new dentists (73.1%) and saw a future for it in oral radiology in Saudi Arabia (80%).
Conclusion: AI applications has become more common in every field and dentistry is no exception. This study reveals that recently graduated dental professionals are more favourable towards the integration of AI applications in Oral Radiology in the Kingdom of Saudi Arabia (KSA)
Key Words: Artificial Intelligence, Machine Learning (ML), Convolutional Neural Networks (CNNs), Clinical Decision Support Systems (CDS)

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INTRODUCTION

Artificial intelligence (AI) is defined as the ability of computers or machines to perform tasks that normally require human intelligence. AI can recognize speech, support decisions, and assist in medical diagnosis accurately and efficiently.

[1.] Assistant Professor of Oral Medicine and Radiology, Department of Oral and Maxillofacial Diagnostic Sciences, College of Dentistry – Ar Rass Branch, Qassim University.
[2.] Intern, College of Dentistry – Ar Rass Branch, Qassim University.

Correspondence: Mohamed Abdulcader Riyaz. Assistant Professor of Oral Medicine and Radiology, Department of Oral and Maxillofacial Diagnostic Sciences, College of Dentistry – Ar Rass Branch, Qassim University.
Contact No: +966-501729597
Email: riyazdental@gmail.com

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Machine Learning (ML) algorithms can be utilized to enable the computers to recognize and analyze data to aid in the preparation of data sets. AI algorithms are used to analyze data in the industrial sector, medical field, for the assessment of trends in Stock market and also for weather analysis in the meteorology department.[1-3]

The trend of using AI programs in the medical field is on the upsurge over the last few years even though the concept of AI has been under research for several years previously. Digital systems are now used more often in dentistry, especially in oral and maxillofacial radiology (OMFR). They help new dentists handle routine work and let experienced clinicians save time. These systems help to trace cephalometric points, detect caries, identify periapical and periodontal changes, with good input data and outline the inferior alveolar nerve, assess facial growth, review cervicofacial nodes, and spot many oral and maxillofacial diseases.[3-5]

METHODS

Online Questionnaires were sent to dental universities in KSA from College of Dentistry in Ar Rass in Qassim

University. A 12-items questionnaire was sent to dental specialists in the KSA through email. Only complete responses were accepted. The criteria for inclusion was recent graduates and with 1-3 years of experience. Quantitative data collection methods were utilized i.e., Questionnaires with close ended questions designed in google forms were sent via email and the responses were collected and analysis was undertaken for the responses. Since this is a questionnaire study, the feasibility of conducting was easier, and it had been conducted in other topics in KSA several times before. The 12-items closed ended online questionnaire was sent to young dentists in KSA and responses were collected. Data were processed in IBM SPSS 28 using the Chi-square test.

RESULTS

The survey included 145 dentists who had graduated within the past three years with 81 men (55.9%) and 64 women (44.1%). The age groups ranged from 25 to 30 years, with a mean of 26.28 ± 1.68 years. A large portion of the participants already knew the concept of AI, with 118 dentists (81.4%) reporting previous knowledge. The awareness of its use in OMFR was reported in 105 dentists (72.4%) and the knowledge of CNNs as a commonly used method in these systems was present in 78 participants.

The support for incorporating these tools into routine radiological practice was observed in 104 dentists (71.7%). Many participants did not believe that the software can exceed the diagnostic skills of a trained radiologist which was shown in 62.1%, while 22.8% agreed to the usage of the software. A total of 58.6% stated that they would not depend upon a software-generated diagnosis when it could conflict with their own judgement, whereas 20% agreed to do so. 73.1% of the participants reported that these tools would help new graduates with diagnosis and treatment planning. The willingness to recommend the use of such tools amongst colleagues and friends and to incorporate them into their routine clinical practices was reported by 73.8% participants. The expectations for future adoption in oral radiology in Saudi Arabia were high, with 116 dentists (80%) anticipating an increased use of AI in dentistry. A smaller proportion (10.3%) did not expect future growth, and 9.7% participants were uncertain. The comparison of responses by gencer showed no statistically significant difference in any of the items.

Table No.1: Correlation between the questionnaire responses with gender and the corresponding statistical significance values (n=145)

		Male	Female	Total	p-value
Have you heard about Artificial intelligence and its application?	Yes	65-44.8%	53-36.5%	118-81.4%	
	No	16-11%	11-7.6%	27-18.6%	0.312
Do you know that artificial intelligence can be utilized in dentistry especially in oral and maxillofacial radiology?	Yes	60-41.4%	45-31%	105-72.4%	
	No	21-14.5%	19-13.1%	40-27.6%	0.212
What according to you are the advantages of AI?	It can aid in oral maxillofacial diagnosis	7-4.8%	6-4.2%	13-9%	
	Dental implant planning	10-6.9%	8-5.5%	18-12.4%	
	It does not have emotional saturation nor physical exhaustion.	2-1.4%	4-2.7%	6-4.1%	0.762
	All the above	62-42.7%	46-31.8%	108-74.5%	
Which among the algorithms are utilized predominantly for AI application in oral and maxillofacial radiology?	Convolutional neural networks (CNNs)	46-31.7%	32-22.1%	78-53.8%	
	Non-convolutional neural networks	8-5.5%	6-4.2%	14-9.7%	
	DICOM-5	6-4.1%	3-2.1%	9-6.2%	
	I don’t know	21-14.4%	23-15.9%	44-30.3%	0.062
Which among the following processes is directly related to OMF radiologists	Proper data set preparation	15-10.3%	13-9%	28-19.3%	
	Operation of surgical robots	6-4.1%	5-3.5%	11-7.6%	0.075
	All the above	60-41.4%	46-31.7%	106-73.1%	

Would you like to incorporate AI software/program for OMF radiology in your clinic?	Yes	57-39.3%	47-32.4%	104-71.7%	0.086
	No	10-6.9%	9-6.2%	19-13.1%	
	May be	14-9.7%	8-5.5%	22-15.2%	
Do you think that AI can surpass the clinical competence of OMF radiologist?	Yes	21-14.4%	12-8.3%	33-22.8%	0.060
	No	50-35.5%	40-27.6%	90-62.1%	
	May be	10-7%	12-8.2%	22-15.2%	
Will you consider accepting the diagnosis given by AI program if it differs from your diagnosis or clinical judgement	Yes	15-10.3%	14-9.7%	29-20%	0.234
	No	46-31.7%	39-26.9%	85-58.6%	
	May be	20-13.8%	11-7.6%	31-21.4%	
Do you think that AI will help a recently graduated dentist in diagnosis and treatment plan?	Yes	59-40.7%	47-32.4%	106-73.1%	0.078
	No	11-7.6%	7-4.8%	18-12.4%	
	May be	11-7.6%	10-6.9%	21-14.5%	
What is the main advantage of using AI in OMF radiology	It reduces time for monotonous tasks	10-6.9%	8-5.5%	18-12.4%	0.913
	It is better for OMF diagnosis	5-3.4%	6-4.2%	11-7.6%	
	It is useful in interventional radiology	4-2.7%	2-1.4%	6-4.1%	
	All the above	62-42.7%	48-33.1%	110-75.9%	
Would you recommend AI program software usage in your friend's /colleague's clinical practice	Yes	61	46	107-73.8%	0.876
	No	9	10	19-13.1%	
	May be	11	8	19-13.1%	
Do you think AI has future in Oral Radiology stations in KSA	Yes	66-45.5%	50-35.5%	116-80%	0.598
	No	9-6.2%	6-4.1%	15-10.3%	
	May be	6-4.1%	8-5.6%	14-9.7%	

DISCUSSION

Artificial intelligence (AI) has been used across many technical fields, and interest in its role continues to grow. Dentistry also follows this direction, with strong use cases in OMFR.[6-8] Most recent work in OMFR has used convolutional neural networks built for image-processing tasks. These networks form the base of deep learning systems that perform well in identifying dental caries on radiographic images.[4] Current systems support radiographic assessment, image interpretation, forensic science, and image quality improvement. Their use is not limited to basic detection, as these models can assist with more detailed diagnostic tasks, including separating subgroups of temporomandibular joint internal derangements with artificial neural networks.[5] Large, well-curated datasets are needed to reach dependable performance, and the input of OMF radiologists remains essential for producing accurate and consistent training data.[9-12]

The inclusion of AI into the dentistry has evolved from innovation to necessity especially for recently graduated dentists who can avail the features provided by the AI applications to aid them in diagnosis and treatment planning. This transition is part of a broader futuristic concept for new dental diagnosis that encompasses artificial intelligence, machine learning, neural networks, and deep learning as interconnected and powerful tools.[6] There are few previous studies which has explored the knowledge, attitude, and perceptions about AI in dentistry and oral radiology. Keser G et al.[13] had conducted a study amongst Turkish dental students to test their knowledge on artificial intelligence applications in oral radiology. The study included 140 participants out of which 55 were male students and 85 were female students. The age range was between 20 to 28. In this study 84 (64%) of the students were already aware of AI applications in dentistry. 111(79.3%) of students agreed that AI has medical uses but only 55 (39.3%) of those were aware about how to incorporate AI in daily practice. 92.9% of

the study participants expressed interest in AI applications in oral diagnosis. 41.1% were unsure that an AI program can make a better diagnosis than a human doctor. A total of 114 (81.4%) participants agreed that they would use AI for diagnosis and treatment planning. 50% of the dental students agrees that the role of AI is to help in interpretation of complicated radiographic scans. 40% (56) students were unsure about the future of AI in Turkey. In our study, 116(80%) of the 145 study participants felt that AI applications have a future in Oral Radiology in the Kingdom of Saudi Arabia and only 9.7% were unsure about the future of AI in Oral radiology in KSA.

Sur J et al.[14] conducted an online survey using google forms with 15 items closed ended questionnaire in India among dental professionals to know about their knowledge towards AI, their attitude and opinion towards AI applications and their perceptions about integration of AI software applications in dental practice. There were 250 study participants and 68% of them were already familiar with the concept of AI. 69% of them were positive for utilising AI applications in dental diagnoses. 51% of them agreed that the main application of AI is to be utilised in interpretation of complicated radiographic scans. 63% of the study population agrees that AI will have a future in India. This positive inclination was also shown by Seram et al.[15] who found that a majority of dental students had positive attitude towards AI and identified its potential to transform dentistry. Singh et al.[16] also reported that while dental professionals perceived AI as a beneficial tool for improving diagnostic accuracy and efficiency, but prominent limitations existed with regards to its adoption with a lack of structured training and high costs. The historical development of artificial neural networks in dentistry provides a foundation for understanding this global optimism, showing a long-standing research interest in automating and enhancing diagnostic processes.[7] AI based clinical decision (CDS) support systems are being increasingly employed nowadays in the dental clinical practices and dental hospital-based radiology practices. These CDS systems can help in correlating clinical features with radiological features to make informed decisions. It can also be helpful in identifying peculiar anatomical features and ambiguous radiology reports creating inconsistencies in diagnosis. This is relevant because AI can support multiple dental fields, including orthodontics, where it helps plan treatment and predict outcomes.[11] The deployment of these systems reflects a broader trend in medicine, where AI in medical imaging is increasingly viewed not as a threat, but as a significant opportunity to place radiologists at the forefront of innovation.[8] Advanced algorithms can extract detailed quantitative information from medical images to improve diagnostic and prognostic accuracy. This approach is directly applicable to oral cancer detection in OMF radiology, where accurate and consistent analysis of imaging features is essential for reliable diagnosis and treatment planning.[10] These CDS algorithms are more developed in the medical field rather than in dentistry and more refined datasets in the coming future may enable the CDS developers to come up with better workflow tailored for specific treatment needs for a given clinical situation.[17-20] A strong dataset is still a basic requirement for reliable algorithm performance in DMF radiology, and ongoing work continues to build the volume and quality needed. A clear need for structured training is also evident, as several surveys show uneven baseline knowledge among students and clinicians. [15,21,22] A related survey reported clear differences between dental and non-dental groups, which supports the need for focused training tailored to clinical practice.[23] Hence, decision-support systems can improve accuracy and reduce errors in radiology, but their safe and effective use requires careful planning and proper implementation.

CONCLUSION

Artificial intelligence applications have become more common in every field and dentistry is no exception. This study reveals that recently graduated dental professionals are more favourable towards the integration of AI applications in Oral Radiology in KSA. They feel that AI applications can reduce time and help in diagnosis and treatment planning. They can be utilised to simplify complex software applications for implant planning and other various clinical situations. More studies with higher sample size are necessary to further enlighten us about this highly interesting and evolving topic. The Hippocratic principle of "First Do No Harm" should be kept in mind during developing AI based programs specific to dentistry for various clinical situations.

Author's Contribution:

Concept & Design or acquisition of analysis or interpretation of data:	Mohamed Abdulcader Riyaz, Abdulaziz Mansour Alharbi
Drafting or Revising Critically:	Mohamed Abdulcader Riyaz, Abdulaziz Mansour Alharbi
Final Approval of version:	All the above authors
Agreement to accountable for all aspects of work:	All the above authors

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REFERENCES

1. Johnston SC. Anticipating and training the physician of the future: the importance of caring in an age of artificial intelligence. Acad Med 2018; 93: 1105-6.

2. Oh S, Kim JH, Choi SW, Lee HJ, Hong J, Kwon SH. Physician confidence in artificial intelligence: an online mobile survey. J Med Internet Res 2019; 21: e12422.
3. Hwang JJ, Jung YH, Cho BH, Heo MS. An overview of deep learning in the field of dentistry. Imaging Sci Dent 2019; 49:1-7.
4. Lee JH, Kim DH, Jeong SN, Choi SH. Detection, and diagnosis of dental caries using a deep learning-based convolutional neural network algorithm. J Dent 2018; 77:106-111.
5. Bas B, Ozgonenel O, Ozden B, Bekcioglu B, Bulut E, Kurt M. Use of artificial neural network in differentiation of subgroups of temporomandibular internal derangements: a preliminary study. J Oral Maxillofac Surg 2012;70:51–59.
6. Mupparapu M, Wu CW, Chen YC. Artificial intelligence, machine learning, neural networks, and deep learning: futuristic concepts for new dental diagnosis. Quintessence Int 2018;49: 687–688.
7. Park WJ, Park JB. History and application of artificial neural networks in dentistry. Eur J Dent 2018;12:594–601.
8. Pesapane F, Codari M, Sardanelli F. Artificial intelligence in medical imaging: threat or opportunity? Radiologists again at the forefront of innovation in medicine. Eur Radiol Exp 2018;24:35.
9. Wong SH, Al-Hasani H, Alam Z, Alam A. Artificial intelligence in radiology: how will we be affected? Eur Radiol 2019;29:141–143.
10. Hosny A, Parmar C, Quackenbush J, Schwartz LH, Aerts HJ. Artificial intelligence in radiology. Nat Rev Cancer 2018;18:500–510.
11. Faber J, Faber C, Faber P. Artificial intelligence in orthodontics. APOS Trends Orthod 2019;9: 201-205.
12. Dreyer KJ, Geis JR. When machines think: radiology's next frontier. Radiol 2017;285:713- 8.
13. Keser G, Namdar Pekiner F. Attitudes, Perceptions and Knowledge Regarding the Future of Artificial Intelligence in Oral Radiology Among a Group of Dental Students in Turkey: A Survey. Clin Exp Health Sci 2021; 11: 637-641.
14. Sur J, Bose S, Khan F, Dewangan D, Sawriya E, Roul A. Knowledge, attitudes, and perceptions regarding the future of artificial intelligence in oral radiology in India: A survey. Imaging Sci Dent 2020;50:193-198.
15. Seram T, Batra M, Gijwani D, Chauhan K, Jaggi M, Kumari N. Attitude and perception of dental students towards artificial intelligence. University J Dent Sci 2021;7(3).
16. Singh N, Pandey A, Tikku AP, Verma P, Singh BP. Attitude, perception and barriers of dental professionals towards artificial intelligence. J Oral Biol Craniofac Res 2023;13(5):584-588.
17. Negrete D, Lopes SLPdC, Barretto MDdA, Moura NBd, Nahás ACR, Costa ALF. Artificial Intelligence and Dentomaxillofacial Radiology Education: Innovations and Perspectives. Dent J 2025; 13(6):245.
18. Hung KF, Ai QYH, Leung YY, Yeung AWK. Potential and impact of artificial intelligence algorithms in dento-maxillofacial radiology. Clin Oral Investig 2022;26:5535–5555.
19. Lee CS, Nagy PG, Weaver SJ, Newman-Toker DE. Cognitive and system factors contributing to diagnostic errors in radiology. AJR Am J Roentgenol 2013;201: 611–617.
20. Sutton RT, Pincock D, Baumgart DC, Sadowski DC, Fedorak RN, Kroeker KI. An overview of clinical decision support systems: benefits, risks, and strategies for success. NPJ Digital Med 2020;3:17.
21. Hasan H, Jayachandran B, Murthy V. A Survey On The Knowledge, Attitude And Perception Of Dental Professionals Regarding The Role Of Artificial Intelligence And Its Applications In Dentistry: A Cross Sectional Study. Frontiers in Health Informatics 2024;13(8).
22. Murali S, Bagewadi A, Kumar L, Fernandes A, Panwar A, Keluskar V. Knowledge, attitude, and perception of dentists regarding the role of artificial intelligence and its applications in oral medicine and radiology: a cross sectional study. J Oral Med Oral Surg 2023;29(2):22.
23. Pringle AJ, Kumaran V, Missier MS, Nadar ASP. Perceptiveness and Attitude on the use of Artificial Intelligence (AI) in Dentistry among Dentists and Non-Dentists - A Regional Survey. J Pharm Bioallied Sci 2024;16(Suppl 2):S1481-S1486. doi: 10.4103/jpbs.jpbs_1019_23.

Original Article

Flexible Ureteroscopy for Renal Stone Fragmentation: Extraction versus No Extraction

Ali Mahmood Shakir[1], Zahraa Ali Kareem[2], Amna Mohammed Hamza[3], Jihad Talib Obead[4] and Noor Mahmood Mahdi[5]

ABSTRACT

Objective: To compare the operative time and stone-free rates between dusting alone and dusting with basket extraction in patients with 15-20 mm renal calculi.

Study Design: Prospective observational study

Place and Duration of Study: This study was conducted at the Department of Urology, Al-Kafeel Hospital, 56001, Karbala, Iraq from 1st January 2024 to 31st December 2024.

Methods: 164 consecutive patients were enrolled. Seventy-three patients underwent dusting with basket extraction, while 91 patients were treated with dusting alone. Stone burden were assessed using non-contrast computed tomography by measuring maximal axial diameter and calculating ellipsoid stone volume. Patients were followed for 4 weeks postoperatively. Primary outcomes were operative time and stone-free fate, while secondary outcomes included perioperative complications.

Results: Mean operative time was significantly longer in the dusting with extraction group compared with the dusting-only group (72±10 vs 59±8 minutes; mean difference 13 minutes, 95% CI 10–16). The stone-free rates at 4 weeks was 91% in the extraction group and 86% in the dusting group, with an absolute difference of 5% (95% CI –4 to 13), which was not statistically significant. Complications were infrequent and minor, with no major adverse events reported.

Conclusions: In patients with 15–20 mm renal calculi, laser dusting alone achieves stone-free rates comparable to dusting with basket extraction while significantly reducing operative time. The use of standardized non-contrast computed tomography-based volumetric assessment enhances the reliability of stone-burden evaluation and should be considered in future clinical trials and routine practice.

Key Words: Flexible ureteroscopy, Renal stone, Fragmentation

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INTRODUCTION

Renal stone disease represents a significant global health burden, with increasing prevalence and recurrence rates, leading to substantial morbidity and healthcare costs.[1,2]

[1.] Department of Urology, Al-Kafeel Hospital, 56001, Karbala, Iraq
[2.] College of Education for Pure Sciences, University of Kerbala, 56001, Karbala, Iraq
[3.] College of Nursing, University of Karbala, Karbala, Iraq.
[4.] Department of Microbiology & Parasitology, University of Kerbala, Iraq
[5.] Department of Basic Sciences, College of Dentistry, University of Kerbala, Karbala, 56001, Iraq

Correspondence: Ali Mahmood Shakir, Department of Urology, Al-Kafeel Hospital, 56001, Karbala, Iraq.
Contact No: +9647516639169
Email: nooralshahmani@gmail.com

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Advances in endourological techniques have revolutionized the management of nephrolithiasis, positioning flexible ureteroscopy (fURS) as a cornerstone modality for the treatment of renal calculi, particularly those of small to moderate size.[3,4] The widespread adoption of fURS is attributed to its high efficacy, minimally invasive nature, and favorable safety profile when compared with open or percutaneous surgical approaches.[5]

Flexible ureteroscopy has become a standard treatment for renal calculi 20 mm, offering high success rates with minimal morbidity. Advances in laser technology and flexible scopes have widened its role in modern endourology. Although basket extraction ensures immediate removal of fragments, it increases operative time and costs. Dusting is quicker and avoids basket use, but residual fragments may persist. Accurate stone measurement is critical: volumetry is superior to diameter alone. Therefore, we conducted a prospective study to compare dusting and dusting with extraction in 15–20 mm renal stones, employing standardized CT volumetry. Laser lithotripsy, most commonly utilizing the holmium:yttrium-aluminum-garnet (Ho:YAG) laser,

is the standard method for stone fragmentation during fURS.[6] However, optimal management of the resulting stone fragments remains a subject of ongoing debate. Two principal strategies are currently employed: active extraction of fragments using retrieval devices, and fragmentation without extraction (dusting), wherein fine particles are left in situ to pass spontaneously through the urinary tract.[7,8]

Proponents of fragment extraction argue that it maximizes stone-free rates and reduces the likelihood of residual fragments, which are associated with recurrent stone formation, persistent symptoms, and the need for secondary interventions.[9,10] Conversely, advocates of the no-extraction approach emphasize reduced operative time, lower intrarenal pressure, decreased risk of ureteral trauma, and potential cost effectiveness, particularly when residual fragments are sufficiently small to permit spontaneous clearance.[11-13] Despite numerous studies evaluating both techniques, there remains no clear consensus regarding the superiority of one approach over the other.[14,15] Variability in stone characteristics, patient factors, surgical expertise, and definitions of stone-free status further complicate direct comparisons.[16] Therefore, a comprehensive evaluation of extraction versus no-extraction strategies during flexible ureteroscopy is warranted. This study aims to critically compare the clinical outcomes of stone fragment extraction versus no extraction following laser lithotripsy during flexible ureteroscopy for renal stones, focusing on stone-free rates, operative time, perioperative complications, need for auxiliary procedures, and overall patient outcomes.[17]

METHODS

This prospective, single-center observational study at Al-Kafeel Hospital from 1st January 2024 to 31st December 2024 vide letter No. 4545/QM/Approval/3839JFHF dated 21.12.2023 Written informed consent obtained. Adults 18, renal stones 15–20 mm confirmed by NCCT were included. Prior PCNL, abnormal renal anatomy, strictures, or anesthesia contraindications were excluded. Group A (dusting with basket extraction, n=73) vs Group B (dusting only, n=91). Performed under GA with flexible ureter scopes and Ho:YAG laser. Double-J stent placed in all patients. Stone measurement: NCCT with maximal diameter and ellipsoid formula (/6 × length × width × depth). Cumulative volume reported for multiple stones. 3 mm slice thickn ess, standardized settings, blinded radiologists. Follow-up: NCCT at 4 weeks. SFR defined as no fragments >2 mm. Complications graded by Clavien-Dindo. Statistics: t-test and ². Effect sizes and 95% CI reported. Sample size determined a priori for 10% SF R difference with 80% power.

RESULTS

Groups similar in demographics and stone size (17.1±1.1 mm vs 16.4±1.3 mm, p=0.09) [Table 1]. Mean operative time was 72±10 min (extraction) vs 59±8 min (dusting) [p<0.001]. Mean difference 13 min (95% CI 10–16). Operative time differences are demonstrating significantly (P<0.001) longer duration for extraction group as compared with dusting group (Table 2, Fig. 1). 91% vs 86% (p=0.28), absolute difference 5% (95% CI –4 to 13), the 4-week stone-free rates showing a modest but non-significant advantage of basket extraction (Fig. 2).

Table No. 1: Baseline characteristics

Variable	Extraction (n=73)	Dusting (n=91)	p-value
Age (years)	46.8±11.4	47.2±12.0	0.82
Male	61%	63%	0.74
Stone size (mm)	17.1±1.1	16.4±1.3	0.09

Table No. 2: Operative outcomes

Variable	Extraction (n=73)	Dusting (n=91)	p-value
Operative time (min)	72±10	59±8	<0.001
SFR at 4 weeks	91%	86%	0.28
Complications (major)	-	-	–

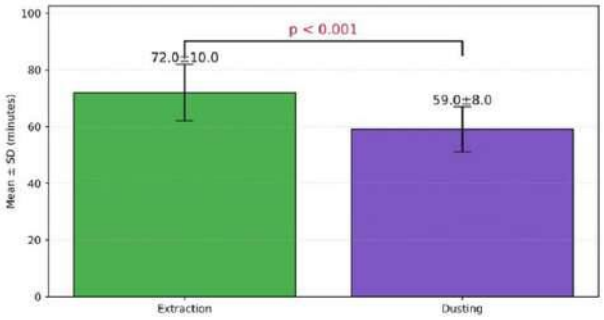

Figure No. 1: Operative time by treatment modality

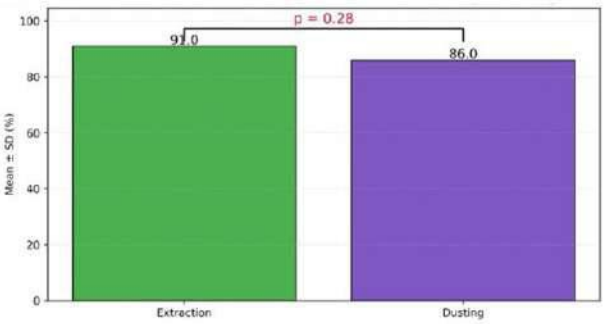

Figure No. 2: Stone-free rate at 4 weeks by treatment modality

DISCUSSION

This study shows that laser dusting alone during fURS for 15-20 mm renal stones gets stone-free rates similar to dusting with basket extraction, while cutting down operative time a lot. Though the extraction group had a bit higher stone-free rate (91% vs 86%), this difference is not statistically significant and probably not clinically meaningful. These results are in line with previous studies which reported equal effectiveness between dusting and extraction techniques for renal stones 20 mm.[18] The significantly shorter operative time observed with dusting alone represents a key advantage; mean reduction of 13 minutes is clinically relevant as it reduces anesthesia exposure, operating room utilization, and procedural costs. Similar reductions in operative time with dusting strategies have been consistently reported in the literature.[19] The prolonged duration associated with basket extraction is likely attributable to repeated instrument exchanges and fragment retrieval maneuvers. This prospective study shows dusting provides comparable SFR to extraction while significantly reducing operative time. The small SFR difference was not statistically or clinically significant, consistent with prior reports. The 13-minute reduction in operative time is clinically meaningful. The use of CT volumetry strengthens methodological rigor. Basket extraction may remain valuable in dense stones or lower pole locations. In the present study, the non-significant SFR difference and the clear operative-time reduction confirm that dusting achieves equivalent clearance with shorter procedures.

Both techniques were very safe and had no major complications at all. This matches earlier reports that said there are few complications when fURS are done by skilled surgeons.[19] Even though basket extraction could theoretically raise the risk of ureteral injury, no such injuries happened in this group. The clinical importance of leftover pieces after dusting is still up for debate. Some proof indicates that pieces smaller than or equal to 2 mm usually pass without help and could be thought of as clinically unimportant.[20] In this research, the slightly lower rate of being stone-free in the dusting group did not lead to more complications or reinterventions within the short follow-up period. A major strength of this study is standardized NCCT-based volumetric stone assessment which improves accuracy compared with diameter-only measurements.[17] Limitations include single-center design, modest sample size, and short follow-up duration. Longer-term outcomes such as stone recurrence were not assessed. In general, these results back up laser dusting alone as an efficient and effective strategy for handling 15-20 mm renal stones during fURS, keeping basket extraction reserved for particular cases based on stone characteristics and anatomy.

In this study, stone-free rates at 4 weeks were high in both groups and did not differ statistically between dusting with extraction and dusting alone. These results are consistent with previous studies that have shown comparable clearance rates for the two techniques for renal stones 20 mm. [3,11,13] The use of NCCT and a strict fragment threshold (>2 mm) enhances the robustness of these findings.

Operative time was significantly shorter in the dusting-only group, with a mean reduction of 13 minutes. This finding echoes prior reports that omission of basket extraction improves procedural efficiency.[3,6,11] Reduced operative time is clinically relevant as it reduces anesthesia exposure and optimizes operating room utilization.

The techniques were safe with no major complications observed. Minor complications were infrequent and comparable between groups. Although basket extraction has been associated with increased ureteral manipulation, no ureteral injuries occurred in this study consistent with existing literatures.[19,20] Clinical Impact of Residual Fragments The slightly lower stone-free rate observed with dusting alone did not result in increased morbidity or need for secondary interventions since small residual fragments following dusting are often clinically insignificant and may pass spontaneously.[11,18] These findings support a more pragmatic interpretation of stone-free status in the context of dusting techniques.

CONCLUSION

It was effective as extraction for 15‑20 mm renal stones while significantly reducing operative time. CT volumetry should be integrated into clinical research and practice to improve outcome accuracy. Flexible ureteroscopy with laser dusting alone results in comparable stone-free rates to that of dusting followed by basket extraction in patients with renal stones of size 15–20 mm, but offers the added significant advantage of decreased operative time. The major complications are absent in both arms, thus confirming the safety of either intervention performed by a competent surgeon. Although there is a slight enhancement in the stone-free rate with basket extraction, this does not seem to be clinically relevant during the short-term follow-up period. Standardized non-contrast computed tomography with volumetric stone assessment improves outcome evaluation accuracy and increases findings reliability.

Author's Contribution:

Concept & Design or acquisition of analysis or interpretation of data:	Ali Mahmood Shakir, Zahraa Ali Kareem, Amna Mohammed Hamza
Drafting or Revising Critically:	Jihad Talib Obead, Noor Mahmood Mahdi

Final Approval of version:	All the above authors
Agreement to accountable for all aspects of work:	All the above authors

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REFERENCES

1. Türk C, Petík A, Sarica K, Seitz C, Skolarikos A, Straub M, Knoll T. EAU guidelines on diagnosis and conservative management of urolithiasis. Eur Urol 2016;69(3):468-74.
2. Smith A. Flexible ureteroscopy: techniques and outcomes. J Endourol 2021;35(5):653-60.
3. Wen Z, Wang L, Liu Y. Outcomes between dusting and fragmentation in RIRS. BMC Urol 2023;23:113.
4. Zeinelabden KM, Abdelhalim E, Galal M, Abdelbaky T, Nabeeh H. Flexible ureteroscopy, extracorporeal shock wave lithotripsy and mini percutaneous nephrolithotomy for management of lower pole renal hard stones 2 cm: a prospective randomized study. BMC Urol 2024;24(1):288.
5. Wu W, Wan W, Yang J. Flexible vs semirigid ureteroscopy. BMC Urol 2024;24:261.
6. Elshazly M, Assi M. Laser settings in dusting vs fragmentation. J Endourol 2024;38(7):925-33.
7. Yu S. Flexible ureteroscopic management of kidney stones: review. Asian J Urol 2024;11(2): 122-30.
8. Rammah AM. Flexible ureteroscopy for renal stones <20 mm. Arab J Urol 2025;23(1):51-7.
9. Kuo RL. Stone volume vs diameter for URS outcomes. Urology 2018;115:45-50.
10. Cao D. CT slice thickness and stone measurement variability. Radiology 2015;277(3):874-81.
11. Doizi S, Traxer O. Dusting vs fragmentation: considerations. Curr Opin Urol 2019;29(2): 120-26.
12. Fulgham PF. AUA guideline on imaging for urolithiasis. J Urol 2020;203(1):20-28.
13. Breda A. Flexible ureteroscopy outcomes review. Eur Urol Focus 2017;3(2):175-82.
14. Zeng G. Standardized reporting in endourology. World J Urol 2019;37(1):7-13.
15. Aldoukhi A. Advances in laser lithotripsy. J Endourol 2020;34(6):567-74.
16. Schuster TG. Radiation and low-dose CT in urolithiasis. AJR Am J Roentgenol 2012;198(1): W90-95.
17. Assimos D, Krambeck A, Miller NL, Monga M, Murad MH, Nelson CP, et al. Surgical Management of Stones: American Urological Association/ Endourological Society Guideline, PART I. J Urol 2016;196(4):1153-60.
18. Ghani KR, Wolf JS. What is the stone-free rate? World J Urol 2015;33(2):213-5.
19. Traxer O. Complications of ureteroscopy. World J Urol 2017;35(5):675-82.
20. Ibrahim A. Outcomes of flexible ureteroscopy in different populations. Urolithiasis 2021;49(3): 231-8.

Original Article

In-Vitro Fertilization Protocols: Agonist versus Antagonist in Relation to Ovarian Response, Embryological Performance, and Treatment Characteristics

Aveen Munib Mahmoud[1] and Melad Alias Yalda[2]

ABSTRACT

Objective: To compare the characteristics of ovarian stimulation, oocyte maturation, embryo development, and transfer-related parameters between the gonadotropin-releasing hormone agonist long protocol and the gonadotropin-releasing hormone antagonist protocol in infertile couples having intracytoplasmic sperm injection.

Study Design: Retrospective comparison analysis

Place and Duration of Study: This study was conducted at the Department of Gynecology & Obstetrics, Collage of Pharmacy, University of Duhok from 20th August 2024 to 28th February 2025.

Methods: This retrospective comparison analysis was performed on 200 Intracytoplasmic sperm injection cycles utilising either a gonadotropin-releasing hormone agonist or gonadotropin-releasing hormone antagonist regimen. We looked at the length of stimulation, the amount of gonadotropin used, the reaction of the ovaries, the age of the oocytes, the success of fertilisation, the quality of the embryos, the thickness of the endometrium, and the day of embryo transfer.

Results: The gonadotropin-releasing hormone antagonist protocol correlated with markedly reduced stimulation days ($p=0.003$) and diminished gonadotropin requirements ($p<0.001$). The ovarian response was more effective in antagonist cycles, with increased quantities of metaphase II oocytes ($p=0.001$) and fertilised oocytes ($p=0.010$). The quality of embryos varied considerably among procedures ($p < 0.001$), with antagonist cycles yielding a greater percentage of high-grade blastocysts and more frequent day-5 embryo transfers ($p<0.001$). The endometrial thickness on the day of embryo transfer was considerably higher in antagonist cycles ($p=0.032$).

Conclusion: Gonadotropin-releasing hormone antagonist programs exhibit enhanced stimulation efficacy and embryological outcomes relative to gonadotropin-releasing hormone agonist protocols. These data indicate that biological and treatment-related benefits linked to antagonist regimens may enhance reproductive outcomes.

Key Words: In-vitro fertilization protocols, Gonadotropin-releasing hormone, Ovarian stimulation, Embryo quality, Oocyte maturation, Intracytoplasmic sperm injection

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INTRODUCTION

Successful in vitro fertilisation (IVF) relies not only on achieving pregnancy but also on the quality of ovarian response, embryo development, and endometrial receptivity, all of which are influenced by the chosen ovarian stimulation protocol.[1,2]

[1.] Department of Clinical Pharmacy, Collage of Pharmacy, University of Duhok.
[2.] Department of Gynecology & Obstetrics, Collage of Pharmacy, University of Duhok.

Correspondence: Aveen Munib Mahmoud, Lecturer, Department of Clinical Pharmacy, Collage of Pharmacy, University of Duhok.
Contact No: +9647504586974
Email: aveen.mahmoud@uod.ac

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Although pregnancy and live birth represent the ultimate outcomes of assisted reproductive technology (ART), these endpoints result from a complex sequence of biological and clinical events initiated by controlled ovarian stimulation (COS).[3]

The two principal protocols used for ovarian stimulation in IVF are the gonadotropin-releasing hormone (GnRH) agonist long protocol and the GnRH antagonist protocol. The GnRH agonist protocol induces pituitary desensitisation through prolonged stimulation of GnRH receptors, leading to suppression of endogenous luteinizing hormone (LH) secretion.[4] In contrast, the GnRH antagonist protocol rapidly suppresses LH release by competitively blocking GnRH receptors, allowing more immediate control over the hypothalamic–pituitary–ovarian axis.[5] These mechanistic differences significantly influence follicular recruitment, endocrine environment, oocyte maturation, and embryo developmental potential.[6]

The numerous studies have compared clinical pregnancy and live birth rates between agonist and antagonist regimens, fewer investigations have focused on the underlying biological and treatment-related factors that contribute to these outcomes.[7,8] Understanding how stimulation protocols affect ovarian response, oocyte maturity, fertilisation efficiency, embryo quality, and embryo transfer conditions is essential for optimising IVF strategies and individualising patient care.[9]

In addition, the choice of stimulation protocol may influence treatment burden, including the duration of stimulation and total gonadotropin consumption-factors that directly affect patient comfort, treatment cost, and safety.[10] The GnRH antagonist protocol has gained increasing popularity due to its shorter stimulation period, lower gonadotropin requirements, and reduced risk of ovarian hyperstimulation syndrome (OHSS).[11]

Accordingly, this study aims to evaluate and compare stimulation characteristics, ovarian response, embryological outcomes, and embryo transfer parameters between GnRH agonist and GnRH antagonist protocols in infertile couples undergoing intracytoplasmic sperm injection (ICSI). By focusing on these mechanistic determinants, this research seeks to clarify how protocol selection influences the biological processes that ultimately govern IVF success.

METHODS

This retrospective comparison analysis was performed at Department of Gynecology & Obstetrics, Collage of Pharmacy, University of Duhok from 20th August 2024 to 28th February 2025 vide letter No. 4545/QM/Approval/9389JFDNF dated August 11, 2024. There were 200 ICSI cycles done on infertile couples in the study group. The cycles were divided into two groups depending on the controlled ovarian stimulation regimen that was used Long protocol group for GnRH agonist: 100 cycles and GnRH antagonist protocol group: 100 cycles. The analysis only included cycles that had both full stimulation and embryological data. In the lengthy protocol for GnRH agonists, the pituitary gland was down regulated before ovarian stimulation. Then, gonadotropins were given to start follicular development.

In the GnRH antagonist protocol, gonadotropins were used to start ovarian stimulation. A GnRH antagonist was then added during the follicular phase to stop the luteinizing hormone (LH) surge from happening too soon.Final oocyte maturation was conducted in accordance with established clinical protocols, succeeded by transvaginal oocyte retrieval. All retrieved oocytes were fertilised using intracytoplasmic sperm injection, and embryos were cultivated under standardised laboratory conditions.

The main results looked at in this study were biological and treatment-related factors, such as:

Stimulation Traits

- Days of ovarian stimulation
- Number of gonadotropin vials given

Response of the Ovaries

- How many oocytes were taken out
- Count of metaphase II (MII) oocytes

Results of Embryology

- Count of fertilised oocytes
- Quality of embryos based on morphological grade

Parameters for Embryo Transfer

- The thickness of the endometrium on the day of embryo transfer
- Day of embryo transfer (cleavage stage compared to blastocyst stage)

We didn't include clinical pregnancy and live birth outcomes in our analysis on purpose because they are covered in a separate study. We got clinical, stimulation, and embryological data from standard patient records and embryology lab records. All factors were classified based on established clinical thresholds employed in normal IVF therapy.

The chi-square test was used to compare categorical variables between the two procedure groups. The results were shown as percentages and frequencies. A p-value of less than 0.05 was seen as statistically significant.

RESULTS

There was a big difference in the length of ovarian stimulation between procedures ($p = 0.003$). Cycles stimulated with the GnRH antagonist treatment necessitated fewer stimulation days than those employing the agonist long regimen. This finding indicates greater stimulation efficiency with the antagonist protocol (Table 1). There was a very big variation in the need for gonadotropins ($p < 0.001$). The GnRH antagonist protocol correlated with reduced gonadotropin use (Table 2).

While the overall oocyte output was similar, the distribution of recovered oocytes varied between procedures, with antagonist cycles more often attaining an optimum response (Table 3). There were a lot more mature (MII) oocytes in antagonist cycles ($p = 0.001$), which means that oocyte maturation got better (Table 4).

The quantity of fertilised oocytes exhibited a significant variation among protocols ($p = 0.010$), with a preference for the GnRH antagonist regimen (Table 5). Embryo grading showed a very big difference between treatments ($p < 0.001$). Antagonist cycles yielded a higher percentage of high-quality embryos (Table 6).

On the day of embryo transfer, the thickness of the endometrium was considerably higher in antagonist cycles ($p = 0.032$) [Table 7]. The date of embryo

transfer varied considerably among protocols ($p < 0.001$), with antagonist cycles more often achieving the blastocyst stage (Table 8).

Table No. 1: Duration of ovarian stimulation

Stimulation days	GnRH agonist	GnRH antagonist
9 days	Lower proportion	Higher proportion
> 9 days	Higher proportion	Lower proportion

Table No. 2: Gonadotropin vials used

Gonadotropin vials	GnRH agonist	GnRH antagonist
20 vials	Lower proportion	Higher proportion
> 20 vials	Higher proportion	Lower proportion

Table No. 3: Number of oocytes retrieved

Oocytes retrieved	GnRH agonist	GnRH antagonist
5	Higher proportion	Lower proportion
6–10	Moderate	Higher proportion
> 10	Comparable	Comparable

Table No. 4: Number of MII oocytes

MII oocytes	GnRH agonist	GnRH antagonist
3	Higher proportion	Lower proportion
4–8	Moderate	Higher proportion
> 8	Lower proportion	Higher proportion

Table No. 5: Number of fertilized oocytes

Fertilized oocytes	GnRH agonist	GnRH antagonist
3	Higher proportion	Lower proportion
4–6	Moderate	Higher proportion
> 6	Lower proportion	Higher proportion

Table No. 6: Embryo grade

Embryo grade	GnRH agonist	GnRH antagonist
Grade A–B	Lower proportion	Higher proportion
Grade C–D	Higher proportion	Lower proportion

Table No. 7: Endometrial thickness

Endometrial thickness	GnRH agonist	GnRH antagonist
< 8 mm	Higher proportion	Lower proportion
8 mm	Lower proportion	Higher proportion

Table No. 8: Day of embryo transfer

Day of transfer	GnRH agonist	GnRH antagonist
Day 3	Higher proportion	Lower proportion
Day 5	Lower proportion	Higher proportion

DISCUSSION

The current study demonstrates that the GnRH antagonist protocol offers distinct biological and therapeutic advantages over the GnRH agonist long regimen in infertile couples undergoing intracytoplasmic sperm injection (ICSI). By examining stimulation efficiency, ovarian response, embryological performance, and embryo transfer parameters, this investigation provides mechanistic insight into how protocol selection may influence reproductive success. These findings support a growing body of evidence suggesting that antagonist-based stimulation aligns more closely with physiological ovarian dynamics.[12]

One of the most significant findings of this study is that the GnRH antagonist protocol results in a shorter duration of ovarian stimulation and reduced gonadotropin consumption. Decreased stimulation length and medication exposure are clinically meaningful, as they reduce patient burden, treatment cost, and the risk of adverse effects. Previous studies have similarly reported that antagonist cycles require fewer injections and allow greater scheduling flexibility without compromising follicular recruitment or cycle outcomes.[13,14] These advantages have contributed to the widespread adoption of antagonist regimens in routine clinical practice.

Although the total number of retrieved oocytes did not differ significantly between protocols, antagonist cycles were associated with a more favorable distribution of oocytes and a significantly higher proportion of mature metaphase II (MII) oocytes. Oocyte maturity is a critical determinant of fertilisation competence and subsequent embryonic development. The increased proportion of MII oocytes observed in antagonist cycles may reflect improved synchronisation of follicular growth and a more physiologic hormonal environment during stimulation.[15,16] These findings suggest that antagonist protocols may optimise oocyte developmental readiness rather than merely increasing oocyte yield.

Embryological outcomes further favored the GnRH antagonist protocol, with significantly higher fertilisation rates and a greater proportion of high-quality embryos. These results indicate superior oocyte

competence and early embryonic development under antagonist stimulation. Prolonged pituitary suppression in agonist cycles has been associated with altered intrafollicular steroid concentrations and impaired oocyte cytoplasmic maturation, which may negatively affect embryo quality.[17,18] In contrast, antagonist protocols allow rapid and reversible suppression of LH surges, potentially preserving a more balanced endocrine milieu conducive to optimal embryo development.

On the day of embryo transfer, endometrial thickness was significantly greater in antagonist cycles, with a higher proportion of patients achieving parameters considered optimal for implantation. Adequate endometrial thickness and synchrony between embryo development and endometrial receptivity are key determinants of implantation success.[19] Moreover, antagonist cycles demonstrated a higher likelihood of progressing to blastocyst-stage (day-5) embryo transfer, reflecting improved embryo growth kinetics. Together, these findings suggest enhanced embryo-endometrium synchronisation in antagonist cycles, a factor that has been closely linked to improved implantation potential.[20]

Although this study did not directly assess pregnancy or live birth outcomes, the observed improvements in stimulation efficiency, oocyte maturity, embryo quality, and transfer conditions provide a strong biological rationale for the favorable clinical outcomes associated with antagonist protocols reported with Toftager et al.[21] These mechanistic advantages support the increasing preference for GnRH antagonist regimens in contemporary IVF and ICSI practice, particularly in strategies aimed at individualised ovarian stimulation.

The principal strength of this study lies in its comprehensive evaluation of mechanistic and embryological parameters influencing IVF success within a real-world clinical setting. However, the retrospective design limits causal interpretation, and residual confounding factors cannot be entirely excluded. Additionally, embryo grading and stimulation categorisation were based on routine clinical assessments, which may introduce inter-observer variability. Prospective randomised studies incorporating cumulative live birth outcomes would further clarify the clinical implications of these findings.

CONCLUSION

The GnRH antagonist protocol exhibits greater stimulation efficiency, enhanced oocyte maturation, improved embryological performance, and more advantageous embryo transfer characteristics in comparison to the GnRH agonist long protocol. These biological and treatment-related benefits indicate that antagonist procedures foster a more conducive environment for IVF success and may explain the enhanced clinical outcomes observed in antagonist-based cycles. Using GnRH antagonist protocols could make assisted reproductive therapies more effective and better overall.

Author's Contribution:

Concept & Design or acquisition of analysis or interpretation of data:	Aveen Munib Mahmoud, Melad Alias Yalda
Drafting or Revising Critically:	Aveen Munib Mahmoud, Melad Alias Yalda
Final Approval of version:	All the above authors
Agreement to accountable for all aspects of work:	All the above authors

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REFERENCES

1. Macklon NS, Stouffer, RL, Giudice, LC, Fauser BC. The science behind 25 years of ovarian stimulation for in vitro fertilization. Endocrine Rev 2006;27(2):170-207.
2. Bosch E, Ezcurra D. Individualised controlled ovarian stimulation (iCOS): Maximising success rates for assisted reproductive technologies. Reprod Biol Endocrinol 2011;9:82.
3. Fauser BCJM, de Jong D, Olivennes F, Wramsby H, Tay C, Itskovitz-Eldor J, van Hoorenbeeck K. Endocrine profiles in GnRH antagonist versus agonist cycles. Human Reproduction Update 2005; 11(4):303-12.
4. Mahmood A, Tan L. Improves pregnancy outcomes during in vitro fertilization (IVF) and intracytoplasmic sperm injection (ICSI) treatment in young infertile women: a retrospective study. Cureus 2024;16(6):e61554.
5. Al-Inany HG, Youssef MA, Ayeleke RO, Brown J, Lam W, Broekmans FJ. Gonadotropin-releasing hormone antagonists for assisted reproductive technology. Cochrane Database Sys Rev 2016; 2016(4):CD001750.
6. Devroey P, Polyzos NP, Blockeel C. An OHSS-free clinic by segmentation of IVF treatment. Human Reproduction 2009;24(11):2783-9.
7. Kolibianakis EM, Collins J, Tarlatzis BC, Papanikolaou EG, Devroey P, Fauser BC. Among patients treated for IVF with GnRH antagonists, is the probability of pregnancy dependent on the timing of initiation of the antagonist? Hum Reprod 2006;21(1):193-9.
8. Griesinger G, Kolibianakis EM, Venetis C, Diedrich K. Oral contraceptive pretreatment in

ovarian stimulation with GnRH antagonists for IVF: a systematic review and meta-analysis. Fertil Steril 2010;94(5):1792-8.
9. Bosch E, Labarta E, Crespo J, Simón C, Remohí J. Impact of ovarian stimulation on oocyte and embryo quality. Fertil Steril 2015; 95(6): 1880-85.
10. Al-Inany HG, Aboulghar M. GnRH antagonist in assisted reproduction: A review. Human Reproduction 2002;17(4): 874-85.
11. Papanikolaou EG, Polyzos NP, Humaidan P, Devroey P. GnRH agonist versus GnRH antagonist IVF cycles: Is the reproductive outcome different? Curr Opinion Obstet Gynecol 2010;22(4): 283-9.
12. Humaidan P, Polyzos NP, Alsbjerg B, Erb K, Mikkelsen AL, Elbaek HO, et al. GnRH agonist for triggering final oocyte maturation: Time for a change of practice? Hum Reprod Update 2011; 17(4): 510-24.
13. Ludwig M, Katalinic A, Diedrich K, Weiss JM. Use of GnRH antagonists in ovarian stimulation for IVF: A meta-analysis. Hum Reprod 2002;17(10): 2719-27.
14. Orvieto R, Patrizio P. GnRH antagonists in assisted reproduction: A review of clinical efficacy and safety. Fertil Steril 2013;100(3): 629-38.
15. Andersen CY, Fischer R, Giorgione V. GnRH antagonists in ovarian stimulation: A review of clinical outcomes and ovarian physiology. Reprod Biomed Online 2006;13(3):350-57.
16. Haas J, Ophir E, Barzilay E, Machtinger R, Orvieto R, Hourvitz A. GnRH antagonist versus long GnRH agonist protocols: Effects on oocyte maturity and embryo development. J Assisted Reprod Genetics 2015;32(5):733-8.
17. Jiang S, Kuang Y. The effects of low-dose human chorionic gonadotropin combined with human menopausal gonadotropin protocol on women with hypogonadotropic hypogonadism undergoing ovarian stimulation for in vitro fertilization. Clin Endocrinol (Oxf) 2018;88(1):77-87.
18. Sunkara SK, Rittenberg V, Raine-Fenning N, Bhattacharya S, Zamora J, Coomarasamy A. Association between the number of eggs and live birth in IVF treatment: An analysis of 400,135 treatment cycles. Human Reproduction 2010; 26(7): 1768-74.
19. Kasius A, Smit JG, Torrance HL, Eijkemans MJ, Mol BW, Opmeer BC, et al. Endometrial thickness and pregnancy rates after IVF: A systematic review and meta-analysis. Hum Reprod Update 2014; 20(4):530-41.
20. Shapiro BS, Daneshmand ST, Garner FC, Aguirre M, Hudson C. Evidence of impaired endometrial receptivity after ovarian stimulation for IVF: A prospective randomized trial comparing fresh and frozen embryo transfer. Fertil Steril 2011;96(2): 344-8.
21. Toftager M, Bogstad J, Løssl K, Prætorius L, Zedeler A, Bryndorf T, et al. Cumulative live birth rates after one ART cycle including all fresh and frozen transfers: GnRH antagonist versus GnRH agonist protocols. Hum Reprod 2017;32(8): 1620-27.

Original Article

Simulation Cataract Surgery, an Analysis on its Impact on the Training of Post Graduate Trainees

Simulation Cataract Surgery - Analysis

Nargis Nizam Ashraf and Tarique Saleem

ABSTRACT

Objective: To assess impact of simulation of eye surgery skills on training of post graduate trainees at Dow University of Health Sciences.

Study Design: Cross-sectional study

Place and Duration of Study: This study was conducted at the Simulation Laboratory of Dow University Health Sciences for a period of 3 months from 1st March 2025 to 30th May 2025.

Methods: This study of 3 months duration after approval from institutional review board. Data regarding capsular rhexis and intracapsular maneuvers was taken from the Eyesi simulator system. Average score, minimum score, maximum score and total time taken were analyzed. They were then documented on and analyzed on SPSS version 25.

Results: The data of 11 trainees was analyzed over a period of three months. The mean average score for Capsular rhexis was 86.13 with a standard deviation of 8.655. The mean of total time taken was 46.45 minutes with standard deviation of 14.955. Regarding intracapsular navigation the mean of total time was 19.90 minutes with a standard deviation of 6.53 The mean of average score was 75.7 with a standard deviation of 9.44.

Conclusion: The individual scores of simulations showed that learning on it was a variable curve with improvement in the end.

Key Words: Simulation, Intracapsular maneuvers, phacoemulsification, capsular rhexis

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INTRODUCTION

This is a cross sectional regarding simulation system for eye cataract surgery and how the skills of the post graduate trainees at Dow University of health sciences improved with it. The Eye Si simulation system was used by the trainees. It provides a better setup than wet lab as it conforms to the human eye. There are other simulators such as MicroVis Touch and Phaco Vision but Eysesi was the one available in our institution[1]. Verbal instructions are in the program and at the end scoring is done so the candidate gets to know where he/she needs to improve. It is available in very few universities in our country as its expensive.

In studies done internationally it was seen that the trainees` surgery time shortened and there were less complications as compared to those who didn't undergo simulation training[2].

Assistant Professor Eye Unit 2, Dow University of Health Sciences, Karachi.

Correspondence: Nargis Nizam Ashraf, Assistant Professor Eye Unit 2, Dow University of Health Sciences, Karachi.
1 A/2 West street phase 1 DHA Karachi Pakistan.
Contact No: 03002712875
Email: nargis.ashraf99@hotmail.com

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Amongst the surgeries done in ophthalmology, phacoemulsification is more popular. Therefore, trainees need to master the procedure and it's better that they practice on simulation systems and wet lab rather than human eye initially[3].

Amongst the more frequently seen problems encountered during cataract surgery are posterior capsular rent and vitreous prolapse. These are more frequent in surgeries done by trainee doctors[4].

During Covid times patient interaction had to be limited. Various alternatives were utilized such as online clinics and simulation were particularly helpful[5]. When we train on patients there are more complications and results are not that good either. These parameters were significantly improved when the residents initially trained on simulation[6].

In the developing countries there are much more cataract patients than in the developed world. This is because of lack of access of medical facilities to the population living in the peripheries. Economic problems also enhance this issue. Therefore, all the more reason that ophthalmologists are properly trained for cataract surgery to reduce the bulk of patients[7].

Another positive aspect of simulation training is the fact that patient exposure to trauma is minimized. Therefore, the popularity of this training system has increased in trainee ophthalmologists (8).

METHODS

This study was conducted at the simulation laboratory at Dow university of Health Sciences. Eleven Third year and fourth year post graduate trainees of fellowship of Ophthalmology were included in this study. Initially approval was taken from the Institutional review board of Dow University of Health Sciences to conduct this study. Data regarding capsular rhexis and intracapsular maneuvers were taken from the Eyesi simulation system.

The Eyesi simulation system was installed at Dow University in 2023. Training of ophthalmic trainees started around October of the same year. We analyzed the simulation data of the fellowship trainees for a period of approximately three months from 1st March 2025 to 30th May 2025. Each step was practiced by the trainees till a score of 70% was obtained three times consecutively. Then only could they proceed to the next step of training on simulation. They continued practice till their scores improved.

The data was then typed in and analyzed on SPSS version 25.

Inclusion criteria: Third- and fourth-year fellowship trainees of ophthalmology. Capsular rhexis and intracapsular maneuvers on simulation.

Exclusion criteria: Brunescent cataracts, errant capsular rhexis, capsular rent management were not included.

Operational Definition:

Capsular rhexis and intracapsular maneuvers were analyzed on the basis of:

Precision

Time taken

Complication avoidance.

These were observed for a period of 3 months.

RESULTS

It was observed that the score of simulation training were variable, that is they didn't necessarily have an upward spike but dipped in between and then finally improvement was seen.

The data of 11 trainees was analyzed. The mean average score for Capsular rhexis was 86.13 percent with a standard deviation of 8.655. The minimum score was 70 percent and maximum 97 percent. The mean of total time taken was 46.45 minutes with standard deviation of 14.955.

Regarding intracapsular navigation the mean of total time was 19.90 minutes with a standard deviation of 6.53. The mean of average score was 75.7 with a standard deviation of 9.44. The minimum score was 63 percent and maximum was 90 percent.

Table No.1: Capsular Rhexis.

Avgscore					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	70.00	1	9.1	9.1	9.1
	76.57	1	9.1	9.1	18.2
	78.50	1	9.1	9.1	27.3
	81.33	1	9.1	9.1	36.4
	85.30	1	9.1	9.1	45.5
	87.60	1	9.1	9.1	54.5
	90.00	1	9.1	9.1	63.6
	92.60	1	9.1	9.1	72.7
	93.00	1	9.1	9.1	81.8
	95.30	1	9.1	9.1	90.9
	97.33	1	9.1	9.1	100.0
	Total	11	100.0	100.0	

Statistics of intracapsular navigation.		
Avgscore		
N	Valid	11
	Missing	0
Mean		75.7455
Median		75.3000
Std. Deviation		9.44440
Range		26.70
Minimum		63.30
Maximum		90.00

Table No.2: Intracapsular Navigation.

Avgscore					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	63.30	1	9.1	9.1	9.1
	65.30	1	9.1	9.1	18.2
	68.00	1	9.1	9.1	27.3
	70.00	1	9.1	9.1	36.4
	70.40	1	9.1	9.1	45.5
	75.30	2	18.2	18.2	63.6
	82.60	1	9.1	9.1	72.7
	83.00	1	9.1	9.1	81.8
	90.00	2	18.2	18.2	100.0
	Total	11	100.0	100.0	

DISCUSSION

Simulation surgery training is available in very few institutes in Pakistan because of its high cost. Dow University has procured it since a few years especially since training was getting affected in the Covid era. Therefore, research is also limited in this regard, thus the rationale for this study. In the Eyesi simulation system there is a model eye with openings at different positions to allow for entry of probes that take on the role of instruments[3].

In a study by Momin SN, Memon AS, et al conducted at the Agha Khan University in 2022, which included 8 trainees and consultants, capsular rhexis was analyzed

exclusively on simulation for a period of 1 month[9]. They saw eventual improvement in scores of capsular rhexis. In our study we have analyzed data for Intracapsular maneuvers and capsular rhexis for a period of 3 months. We also observed an irregular graph with dips in between and eventual success in mastering the step.

Another study by Zubair Z and Zubair U in 2020 highlighted the lack of wet lab and simulation training facilities in Pakistan[10]. They were of the view that such facilities would decrease the brain drain from our country as training would improve.

As reported in a study done at Kerala in 2022, because of lack of training opportunities, 30 to 50% trainees in the developed countries and about 70% trainees in the developing world have difficulty in operating without supervision (3). In a study at UK there was 40% decrease in the rate of posterior capsular rent even after a few days of training on simulation[11].

There was 70% decrease in posterior capsular rent by the trainees after simulation training, as observed by Dean[12]. In a study at UK by Ferris et al this was reported to decline by 38%[13]. Studies by Bergqvist et al and McCannel are similar to ours as they also observed decreased complications in surgery but didn't compare with surgery on patients[14].

It would greatly enhance performance of trainees if simulation for surgery were included in their curriculum. As not only do they have near to life scenarios for surgery steps practice but they also get evaluation for their performance and get scores out of 100[15]. This has been implemented by International council of Ophthalmology of East Africa. They have a program for development of surgical skills of trainees before doing surgery on patients[16]. According to the (OLIMPICS) Improvement initiative in cataract surgery and (GLASS) The glaucoma simulated surgery trial, skills and confidence both are enhanced with simulation training[17].

In the French pedagogic multicentric study it was tried to fathom how much teaching time is required on simulation for trainees. They assigned two, four-hour simulation trainings to all 16 trainees and an assessment cataract surgery also on simulation at the end of these sessions. The lowest scores were on emulsification[18].

Another study assessed trainees for Manual Small Incision Cataract Surgery according to steps in the Help MeSee MSICS standard procedure for testing. They found that even the expert phacosurgeons didn't achieve the required results for MSICS, this being a different type of cataract surgery[19].

There are some negative aspects of simulation training according to some studies such as the one by Puri et al. They deemed interaction and advice by the teachers to be more effective than simulation training[14]. Overall it is the preferred system of teaching for beginner trainees as also discussed in a recent workshop at College of Physicians and surgeons Pakistan. This workshop was conducted by Dr. James Innes who is lead of simulation skill lab of Royal College of ophthalmology UK.

Some review studies have also been done regarding simulation one such being by Rothschild et al in 2020 which shows simulation improvement of posterior capsular rhexis and less of the other steps involved in cataract surgery. Another study by Ahmed T M, et al was a review of 165 articles regarding simulation training and how training can be improved with this tool[20].

CONCLUSION

Simulation training helps improve the cataract surgery learning curve in ophthalmology trainees. It should be incorporated in the teaching curriculum of post-graduation. The limitation of our study is that simulation data wasn't compared with surgical data on humans by the trainees. The study needs to be followed up with that.

Author's Contribution:

Concept & Design or acquisition of analysis or interpretation of data:	Nargis Nizam Ashraf, Tarique Saleem
Drafting or Revising Critically:	Nargis Nizam Ashraf, Tarique Saleem
Final Approval of version:	All the above authors
Agreement to accountable for all aspects of work:	All the above authors

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REFERENCES

1. Winebrake JP, McMahon JF, Sun G. The Utility of Virtual Reality simulation in Cataract surgery training: A Systematic Review. J Acad Ophthalmol 2020;12:e221-e233.
2. Beauchamp CL, Singh GA, Shin SY, Magone MT. Surgical simulator training reduces operative times in resident surgeons learning phacoemulsification cataract surgery. Am J Ophthalmol Case Reports 2020;17:100576.
3. Oflaz AB, Koktekir BE, Okudan S. Does cataract surgery simulation corelate with real- life experience? Turk J Ophthalmol 2018;48:122-126.
4. Staropoli PC, Gregori NZ, Junk AK, et al. Surgical simulation Training reduces intraoperative cataract surgery complications among residents. Simul Healthc 2018;13(10: 11-15. doi:10.1097/SIH.0000000000000255.

5. Narayanan S. Ophthalmic simulation: The need of the times. Kerala J Ophthalmol 2022:34:89-91.
6. Nair AK, Ahiwalay C, Bacchav AE, Sheth T, et.al. Effectiveness of simulation- based training for manual small incision cataract surgery among novice surgeons: a randomized controlled trial. Scientific Reports 2021;11:10945.
7. Nair AG, Ahiwalay C, Bacchav AE, Sheth T, Lansingh VC. Assessment of a high -fidelity, virtual reality-based, manual small-incision cataract surgery simulator. A face and content validity study. Ind J Ophthalmol 2022;70:4010-5.
8. Beylea DA, Brown SE, Rajjoub LZ. Influence of surgery simulator training on ophthalmology resident phacoemulsification performance. J Cataract Refract Surg 2011;37(11).
9. Momin SN, Memon AS, Malik MB, et.al. Surgical training in ophthalmology: Role of Eyesi in the era of simulation -based learning. JPMA 2022;72(Suppl 1):S127-S129.
10. Zubair U, Zubair Z. Surgical resident training in Pakistan and benefits of simulation-based training. J Pak Med Assoc 2020;70(5).
11. Swampillai AJ, Nowak VA, Maubon L, Neffendorf JE, et al. Confidence of UK ophthalmology registrars in managing posterior capsular rupture: Results from a national trainee survey. Ophthalmol Ther 2022;11;225-37.
12. Dean WH, et al. Intense simulation -based surgical education for manual small-incision cataract surgery: The ophthalmic learning and improvement initiative in cataract surgery randomized clinical trial in Kenya, Tanzania, Uganda and Zimbabwe. JAMA Ophthalmol 2020 https://doi.org/10.1001/jamaophthalmol.2020.4718.
13. Ferris JD, Donachie PH, Johnston RL, Barnes B, et al. Royal College of ophthalmologists` National Ophthalmology Database study of cataract surgery: Report the impact of Eyesi virtual reality training on complication rates of cataract surgery performed by first- and second-year trainees. Br J Ophthalmol 2020;104:324-9.
14. Kiew SY, Yeo IYS, Golnik KC, Muriel-Herrero MA, et al. The ophthalmology surgical competency assessment rubric for intravitreal injections (ICO-OSCAR: [V]). J Clin Med 2021;10: 1476.doi:10.3390/jcml10071476.
15. International Council of Ophthalmology (ICO). ICO residency curriculum. Available from: http://www.icoph.org/refocusingeducation/curricul ahtml. Accessed August 20, 2020.
16. Dean WH, Buchan J, Gichuhi S, Philippin H et al. Simulation-based surgical education for glaucoma versus conventional training alone: The Glaucoma Simulated surgery (GLASS) trial. A multicenter, multicountry, randomized controlled, investigator-masked educational intervention efficacy trial in Kenya, South Africa, Tanzania, Uganda and Zimbabwe. Br J Ophthalmol 2021: bjophthalmol-2020-318049.doi;10.1136/bjophthalmol-2020-318049.
17. Rothschild P, Richardson A, Beltz J, Chakrabarti R. Does virtual reality simulation training result in fewer real-life cataract surgery complications? A systematic literature review. J Cataract Refract Surg 2020. doi:10.1097/j.jcrs.0000000000000323
18. Ducloyer JB, Poinas A, Duchesne L, Caillet P, et al. Learning curves of novice residents on cataract surgery simulator: the E3CAPS pedagogic study. BMC Med Educ 2024;24(1):1078. doi:10.1186/s12909-024-1078
19. Hutter DE, Wingsted L, Cejvanovic S, et al. A validated test has been developed for assessment of manual small incision cataract surgery skills using virtual reality simulation. Sci Rep 2023;13:10655. doi:10.1038/s41598-023-32845-5
20. Ahmed TM, Hussain B, Siddiqui MAR. Can simulators be applied to improve cataract surgery training: a systematic review. BMJ Open Ophthalmol 2020;5(1): e000488.doi:10.1136/ bmjophth-2020-00048

Original Article

Morphometric Analysis of Foremen Magnum and Occipital Condyles Using CT Scan and its Relation to Gender

Zumirah Atiq[1], Amna Javaid[2], Ayesha Sanaullah[2], Athar Maqbool[3], Saman Ali[1] and Humna Akhtar Ali[2]

ABSTRACT

Objective: This study focuses on the morphometric features of the foramen magnum and occipital condyles to assist in surgical procedures and forensic identification, with an emphasis on their correlation with gender.

Study Design: Retrospective study, analysing 3D-CT images of the skull base from 111 Pakistani individuals.

Place and Duration of Study: This study was conducted at the Radiology department of M. Islam Teaching Hospital, Gujranwala from March 2024 to February 2025.

Methods: Head CT scans of 111 individuals (58 males, 53 females) were analyzed using a Toshiba Aquillion 64-slice CT scanner (1 mm slice thickness, non-contrast). Measurements included foramen magnum length, width, area; right and left occipital condyle length and width; and minimum and maximum intercondylar distances. Data were analyzed using SPSS Version 23.

Results: A total of 111 CT scans were analyzed. The mean foramen magnum length was 36.68 ± 3.93 mm and width 29.76 ± 3.08 mm. Length, width, and intercondylar distances showed statistically significant differences between males and females. The mean right and left occipital condyle lengths were 23.75 mm and 23.47 mm, respectively. Left condyle width averaged 11.73 mm in males and 11.69 mm in females. The mean foramen magnum area was significantly larger in males (893.77 ± 164.82 mm^2) than in females (828.17 ± 158.85 mm^2, $p < 0.05$).

Conclusion: Morphometric measurements of the foramen magnum and occipital condyles serve as vital anatomical landmarks that enhance the safety and precision of surgical planning in the craniovertebral region. They also provide CT-based, region-specific anatomical data for the Pakistani population and contribute to forensic identification by highlighting gender-based differences.

Key Words: Computerized tomography, Foramen magnum, Morphometry, Occipital condyles, Skull

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INTRODUCTION

The human skull, a complex structure housing the brain and sensory organs, serves as the foundation for understanding cranial anatomy. Within this intricate framework, the foramen magnum and occipital condyles play pivotal roles in both forensic identification and surgical interventions. The foramen magnum, the largest foramen in the human skeleton, is a vital anatomical landmark at the base of the cranium.[1] The tectorial membrane and apical ligament extend through the foramen magnum to anchor at its margins.[2]

[1.] Senior Demonstrator / Demonstrator[2] / Professor[3], Department of Anatomy, M. Islam Medical College, Gujranwala.

Correspondence: Dr. Zumirah Atiq, Senior Demonstrator of Anatomy, M. Islam Medical College, Gujranwala.
Contact No: 0322-5557161
Email: zumirahatiq@gmail.com

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Anterolateral to the foramen magnum, the occipital condyles are two distinct bony projections located on the inferior surface of the occipital bone.[3] The craniovertebral junction (CVJ), comprising the foramen magnum, occipital condyles, and the first two cervical vertebrae (atlas and axis), relies on the occipital condyles as pivotal structures that connect the cranium to the spinal axis while maintaining the stability and structural integrity of this complex region.[4,5]

The foramen magnum's shape and dimensions are key determinants in the development and progression of numerous craniovertebral junction disorders.[2] The analysis of foramen shapes using CT scans has become increasingly important in clinical practice. Research states that surgical access to the skull base is more efficient when the foramen magnum is round, oval, or hexagonal, as these shapes offer increased working space.[6] While classical anatomy and neurosurgery texts traditionally describe the foramen magnum as oval, being wider posteriorly, and with its longest diameter in the anteroposterior direction. Studies such as those by Ilhan Bahsi[2] reveal that it can also appear as tetragonal, round, egg-shaped, hexagonal, pentagonal, or irregular.

Morphometric analysis of the occipital condyles is vital for determining the safe extent and direction of condylar drilling, preventing occipito-cervical destabilization, avoiding injury to the neurovascular structures of the hypoglossal canal, and improving surgical techniques for addressing pathologies in this complex anatomical region.[3,4]

The sensitivity of the craniovertebral junction to surgical manipulation has led to considerable debate regarding the most effective surgical approach, often described as the "surgical corridor," which refers to the space through which a surgeon accesses a lesion.[7] This concept emphasizes the necessity of selecting an appropriate pathway to ensure safe and efficient intervention. Additionally, morphometric analysis offers an affordable approach for determining sex with reasonable accuracy, particularly when dealing with incomplete skeletal remains from mass disasters or extensively decomposed bodies.[8] Studies have shown that sex can be accurately determined from cranial remains, with accuracy levels ranging between 65% to 88%.[1] In transcondylar surgical approaches to the foramen magnum, such as those employed in tumor resections, a thorough understanding of the anatomical features and variations of the foramen magnum and occipital condyles is essential for enhancing surgical exposure and minimizing the risk of neurovascular injury. Several studies have highlighted these variations, stressing the importance of tailoring surgical techniques to the specific anatomical characteristics of this region.[9]

METHODS

This study employed a retrospective study-based design, analysing three-dimensional computed tomography (3D-CT) images of the skull base from 111 Pakistani individuals with documented age and sex. Study was conducted at the Radiology department of M. Islam Teaching Hospital, Gujranwala from March 2024 to February 2025 after taking ethical approval from Institute's Review Board. The requirement of consent form was waived as it was conducted retrospectively.

Sampling Method: Simple convenience sampling.

Sample Size: Sample size of 111 participants is calculated with 90% confidence level, 7.1% absolute precision, and by taking the expected percentage of accuracy of foramen magnum in sex estimation as 71%. Following formula is used for sample size calculation:

$$n = \frac{z^2_{1-\alpha/k} P(1-P)}{d^2}$$

Inclusion Criteria: The study analyzed normal human skulls from patients over 18 years old of both sexes, who underwent CT scans for various medical or surgical diagnostic purposes. Only high-quality reconstructed CT images were considered.

Exclusion Criteria: Our exclusion criteria included CT images from patients under 18 years of age, low-quality images with artifacts or patient rotation, or images that did not fully capture the foramen magnum region and showed evidence of congenital anomalies, fractures, or previous surgeries involving the skull base region.

CT Machine: Head CT scans without contrast were conducted on a Toshiba Aquillion 64-slice CT machine with a slice thickness of 1 mm and analyzed using the software.

Measurements: In this study, 3D-CT images were evaluated, and several parameters were measured directly on the scanner's console using a millimeter scale. Observers were permitted to modify contrast, brightness, and zoom settings for enhanced visualization. One radiologist and one researcher took the readings independently to reduce the inter observer bias. The measured parameters were:

Foramen magnum length (FML): To measure the anteroposterior length of the foramen magnum in the mid-sagittal section, the distance between the basion (anterior margin) and the opisthion (posterior margin) was recorded.

Foramen magnum width (FMW): The transverse diameter of the foramen magnum was taken as the widest distance between its sides, measured at the points of greatest outward curve and perpendicular to the mid-sagittal section.

Right occipital condyle length (ROCL): The length of the right occipital condyle was determined by measuring the span between its most anterior and most posterior margins along the longitudinal axis.

Left occipital condyle length (LOCL): The length of the left occipital condyle was determined by measuring the span between its most anterior and most posterior margins along the longitudinal axis.

Right occipital condyle width (ROCW): The distance from the outer side to the inner side of the right occipital condyle was measured as its width, at a right angle to its length.

Left occipital condyle width (LOCW): The distance from the outer side to the inner side of the left occipital condyle was measured as its width, at a right angle to its length.

Intercondylar distance minimum (ICDMn): The measurement between the innermost edges of the right and left occipital condyles was taken.

Intercondylar distance maximum (ICDMx): The measurement between the outermost edges of the right and left occipital condyles was taken.

Foramen magnum area (FMA): The area of the foramen magnum (FMA) was determined by applying the formula proposed by Ihsanullah et al.,[10] which is: Area = 1/4 × × length × width .

Foramen magnum shape: The foramen magnum (FM) shapes were grouped into oval, round, egg, hexagonal, pentagonal, tetragonal, and irregular categories. A three-member team identified these shapes to reduce observational bias.

Data Analysis: Data was analyzed in SPSS version 23. For continuous data, the mean and standard deviation (SD) were calculated. Percentages were used for categorical data. All the parameters of the foramen magnum were compared between males and females using the Mann-Whitney U test and the independent samples t-test, with a significance level of $p < 0.05$.

RESULTS

A total of 111 CT scans were analyzed which showed much variation in the measurements. The mean of foramen magnum length was 36.68 mm ± 3.93 and the mean of foramen magnum width was 29.76 mm ± 3.08. The difference of mean of foramen magnum length and width for males and females was statistically significant with p values .008 and 0.053, respectively. The right occipital condylar length mean was 23.75 mm and for left it was 23.47 mm. The mean width of right occipital condyle was 11.64 mm in males and 11.39 mm in females. The mean width of left occipital condyle was 11.73 mm for males and 11.69 mm for females. The difference of mean of minimum and maximum intercondylar distance for males and females was statistically significant with p values of 0.024 and 0.008, respectively. The mean of area of foramen magnum for males was 893.77 mm ± 164.82 and for females 828.17 mm ± 158.85 with the difference being significant (p-value < 0.05). The comparison of all variables is shown in Table-1. Figure-3 bar charts show percentages of various shapes of foramen magnum in males and females.

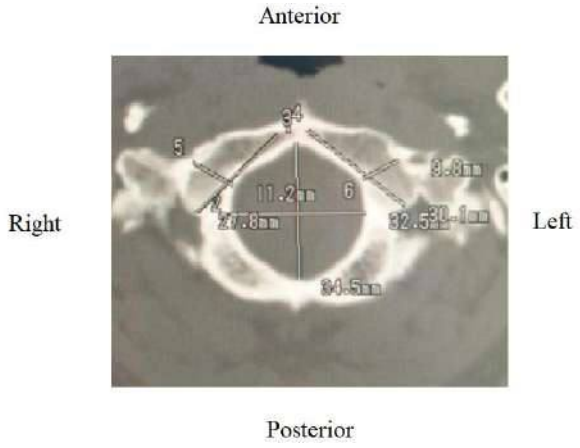

Figure No. 1A: Transverse section of the skull showing measurements of foramen magnum and occipital condyles. **1:** Foramen magnum length (34.5mm), **2:** Foramen magnum width (32.5mm), **3:** Right occipital condyle length (27.8mm), **4:** Left occipital condyle length (30.1mm), **5:** Right occipital condyle width (11.2mm), **6:** Left occipital condyle width (9.8mm).

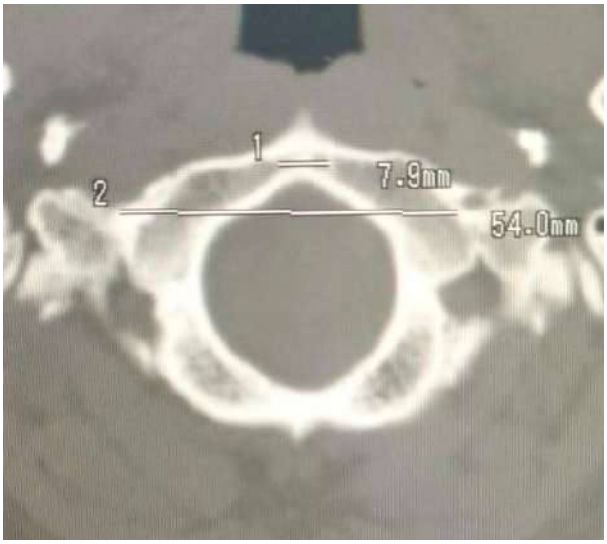

Figure No. 1B: Transverse section of the skull showing measurements of Intercondylar distance. **1:** Intercondylar distance minimum (7.9mm), **2:** Intercondylar distance maximum (54mm).

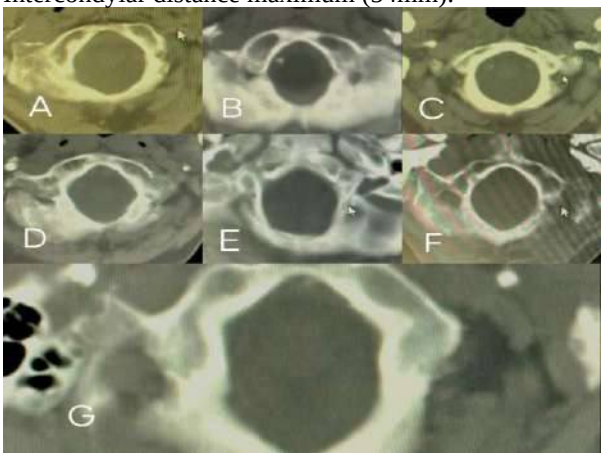

Figure No. 2: Pictures from CT scan showing various shapes of foramen magnum (A- Egg, B-Tetragonal, C-Round, D-Irregular, E-Pentagonal, F-Oval, G-Hexagonal).

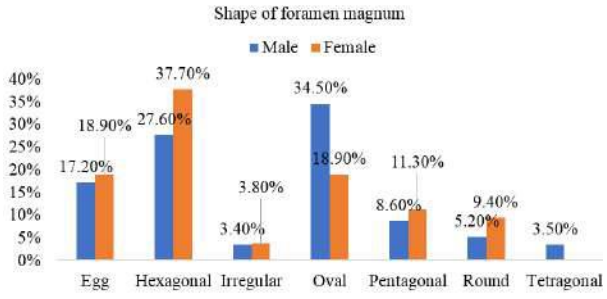

Figure No.3: Shape of Foramen Magnum

The comparative analysis of foramen magnum shapes between males and females reveals distinct morphological differences that align with the dimensional variations observed in the study. In males, the foramen magnum typically exhibits a more elongated oval shape, characterized by a pronounced anteroposterior elongation. Female foramen magnum

shapes tend to display a more hexagonal configuration, with more symmetrical proportions between length and width dimensions.

Table No.1: Comparison of variables in the foramen magnum region

	Male	Female	Total	p-value
FML (mm)	37.5±4.1	35.8±3.5	36.68±3.93	**0.008*** (M)
FMW (mm)	30.2±2.9	29.3±3.2	29.76±3.08	**0.053*** (M)
ROCL (mm)	24.2±2.9	23.3±2.0	23.75±2.52	**0.060** (t)
ROCW (mm)	11.64±1.70	11.39±1.77	11.52±1.72	**0.435** (t)
LOCL (mm)	23.9±2.9	23.1±1.9	23.47±2.48	**0.091** (t)
LOCW (mm)	11.73±1.58	11.69±2.03	11.70±1.80	**0.902** (t)
ICDMx (mm)	48.9±3.9	46.5±6.9	47.77±5.66	**0.008*** (M)
ICDMn (mm)	11.73±2.88	10.47±2.62	11.12±2.81	**0.024*** (M)
FMA (mm^2)	893.77±164.82	828.17±158.85	862.44±164.58	**0.013*** (M)

Note: (M) Mann Whitney U test, (t) Independent sample t-test, (*) Statistically significant (p-value<0.05)

DISCUSSION

The average values of foramen magnum length and width were 36.68 mm and 29.76 mm, respectively. In males the average length was 37.5 mm and average width was 30.2 mm while in females it was 35.8 mm and 29.3 mm, respectively. Our findings are similar to another study by Degno[11] where mean values of length and width of foramen magnum were 35.19 mm and 30.17 mm, respectively. Another study by Ominde[8] on 336 Nigerian patients also showed similar results with average length of foramen magnum being 34.70 mm and average value of width being 30.80 mm. When values for both parameters were separately compared for males and females, the Nigerian population results were almost similar to ours with average length of males 34.72 mm and for females 33.68 mm. This study also shows that the mean of foramen width for males was 30.87 mm and 30.76 mm for females. Atreya[1] study on Nepalese population showed similar results to ours when width of FM was considered being 28.9 mm while results were different for FM length being 33.5 mm. Our findings are closely aligned with two studies from Peshawar by Shahabuddin[12] and Ihsanullah[10] which reported similar foramen magnum dimensions, mean FM length: 35.5 mm and 35.69 mm; mean width: 31.9 mm and 31.58 mm, respectively. This consistency supports the possibility of developing population-specific morphometric baselines within Pakistan. However, a study from Lahore by Majid[13] on dry human skulls recorded significantly smaller values, mean FM length: 32 mm; mean width: 26 mm, highlighting notable variation. Despite being from the same national context, such differences may reflect regional, ethnic, or methodological influences. Although, all of these studies consistently reported FM length being greater than its width, affirming a general anatomical pattern across populations, Gruber[14] reported no sexual dimorphism between male and female gender with respect to the occipital condylar length and width.

A thorough understanding of the foramen magnum area is critical, given its association with conditions like atlas occipitalization and skull base hypoplasia.[8] The area of FM in our study was 862.44 mm^2. These results were quite similar to a study conducted by Ihsanullah[10] where mean area was 885.22 mm^2. Another study by Murshed[9] also had similar findings while considering FM area being 863.35 mm^2.

The occipital bone, due to its structural robustness and protected anatomical location, is highly suitable for sex estimation, particularly when the pelvis is absent. This makes it especially valuable in forensic analysis.[15,16] Morphometric assessment of the foramen magnum is an objective, non-destructive method and should be prioritized before invasive procedures.

Detailed knowledge of occipital condyle anatomy, including their size and shape variations, provides valuable insights for safe and effective surgical intervention.[4] Our study revealed the mean condylar length to be 23.61 mm and the mean condylar width 11.61mm which is higher than the observations made by Gumussoy[5] where the mean length and width were found to be 19.6 mm and 10.3 mm respectively. Similar observation to our study was reported by Rizvi[3] where the mean length and mean width was found to be 23.32 mm and 11.99 mm, respectively.

The average right occipital condyle length and width in males were 24.2 mm and 11.64 mm, respectively, whereas in females these values were 23.3 mm and 11.39 mm. On the left side, the mean occipital condyle length and width were 23.9 mm and 11.73 mm in males, and 23.1 mm and 11.69 mm in females. Thus, on both sides, male skulls exhibited larger measurements than female skulls. In contrast, Sholapurkar[17] in a study on dry adult human skulls, reported no significant sex-based difference in the transverse diameter of the right and left occipital condyles. While our study did not classify condyles into predefined morphological types, the measured lengths are comparable to the shorter

Type I condyles predominantly reported by Ominde et al.[18] This similarity should be kept in mind while dealing our population as limited condylar length can increase the likelihood of joint instability following condylectomy. Thus, occipital condyle morphometry holds clinical importance, as condylar dimensions influence the extent of safe bone removal in transcondylar approaches and play a key role in maintaining occipitocervical stability during skull base surgeries. [19,20]

The morphology and shape of the foramen magnum play a significant role in neurological assessment. In our study, the most commonly observed shape of the foramen magnum in males was oval (34.5%), which is lower than the 40% reported by Anjum.[4] In females, the hexagonal shape was predominant, observed in 37.7% of cases. In another CT based study conducted by Murshed[9] on 110 subjects, the maximum shape observed was round (21.8%). Degno[11] research on adult Ethiopian skulls states that the maximum number of skulls had round shape and accounted 25.9% of the total sample. This was contrary to our study where only 5.20% males and 9.40% females had round shape.

Research by Aljarrah[21] on the Saudi Arabian population, which examined the same parameters of the foramen magnum and occipital condyles, also reported higher values in males compared to females, consistent with our findings.

CONCLUSION

This study highlights the significance of foramen magnum morphometry in two key areas: first, in providing CT-based region-specific anatomical data for the Pakistani population; and second, in its surgical relevance, particularly for craniovertebral procedures, where accurate measurements help define surgical corridors and reduce operative risk. These findings provide essential anatomical reference points that can enhance the safety and precision of surgical planning in the craniovertebral region.

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Author's Contribution:

Concept & Design or acquisition of analysis or interpretation of data:	Zumirah Atiq, Amna Javaid, Ayesha Sanaullah
Drafting or Revising Critically:	Athar Maqbool, Saman Ali, Humna Akhtar Ali
Final Approval of version:	All the above authors
Agreement to accountable for all aspects of work:	All the above authors

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REFERENCES

1. Atreya A, Shrestha R, Bhandari K, Malla SK, Acharya S, Menezes RG. Morphometric analysis of the foramen magnum in sex estimation: An additional 3DCT study from Nepal on a larger sample. Health Sci Rep 2023;6(1):e999. DOI: 10.1002/hsr2.999
2. Bahi , Adanr SS, Orhan M, Kervancolu P, Büyükbee ZS, Yalçn ED. Anatomical evaluation of the foramen magnum on cone-beam computed tomography images and review of literature. Cureus 2021;13(11):e19385. DOI 10.7759/cureus. 19385
3. Rizvi SS, Sawant SP. Morphometric Analysis of human occipital condyle and its clinical significance. GAIMS J Med Sci 2025;5(1):101-108. https://doi.org/10.5281/zenodo.14498881
4. Anjum A, Pandurangam G, Garapati S, Bandarupalli N, Rabbani H, Divya P. Morphology and morphometric study of occipital condyles. Int J Anat Res 2021;9(1.3):7905-7911. DOI: 10.16965/ ijar.2021.107
5. Gumussoy I, Duman SB. Morphometric analysis of occipital condyles using alternative imaging technique. Surg Radiol Anat 2020;42:161-169. https://doi.org/10.1007/s00276-019-02344-2
6. Abdullayev A. The correlation between the foramen magnum dimensions and the main craniometric data of the skull. Traumatology and Orthopedics of Kazakhstan 2024;72(2):25-32. DOI: https://doi.org/10.52889/1684-9280-2024-2-72-25-32
7. Chethan P, Prakash KG, Murlimanju BV, Prashanth KU, Prabhu LV, Saralaya VV, et al. Morphological analysis and morphometry of the foramen magnum: an anatomical investigation. Turk Neurosurg 2012;22(4):416-419. DOI: 10.5137/1019-5149.JTN.4297-11.1
8. Ominde BS, Igbigbi PS. A retrospective study to evaluate the morphometry of the foramen magnum and its role in forensic science in a Nigerian population of Delta State. J Forensic Sci Med 2022;8(2):46-51. DOI: 10.4103/jfsm.jfsm_41_21
9. Murshed KA, Çiçekcibai AE, Tuncer I. Morphometric evaluation of the foramen magnum and variations in its shape: a study on computerized tomographic images of normal adults. Turk J Med Sci 2003;33(5): 301-306.
10. Ullah I, Khursheed H, Aziz I, Bangish NN. Sex identification from foramen magnum using

computed tomography scanning in a sample of Peshawar population. JRMI 2023;9(1): 8-10.
11. Degno S, Abrha M, Asmare Y, Muche A. Anatomical variation in morphometry and morphology of the foramen magnum and occipital condyle in dried adult skulls. J Craniofac Surg 2019; 30(1): 256-259. DOI: 10.1097/SCS. 0000000000004925
12. Shahabuddin MJ, Shabnum M, Mumtaz S, Ihsanullah MN. Morphological and morphometric study of foramen magnum in cadaveric skulls and its clinical implications in northern Pakistani population. KJMS 2018;11(3):331-335.
13. Majid H, Shahid S, Shahzeb M. Morphometric study of foramen magnum in human skulls. APMC 2021;15(3):164-167. DOI: 10.29054/APMC/ 2021.1140
14. Gruber P, Henneberg M, Böni T, Rühli FJ. Variability of human foramen magnum size. Anat Rec 2009;292(11):1713-1719. DOI 10.1002/ar. 21005
15. Edwards K, Viner MD, Schweitzer W, Thali MJ. Sex determination from the foramen magnum. J Forens Radiol Imaging 2013;1(4):186-92. http://dx.doi.org/10.1016/j.jofri.2013.06.004
16. Babu YR, Kanchan T, Attiku Y, Dixit PN, Kotian MS. Sex estimation from foramen magnum dimensions in an Indian population. J Forensic Leg Med 2012;19(3):162-167. DOI:10.1016/j.jflm. 2011.12.019
17. Sholapurkar VT, Virupaxi RD, Desai SP. Morphometric analysis of human occipital condyles for sex determination in dry adult skulls. Int J Anat Res 2017;5(1):3318-3323. DOI: https://dx.doi.org/10.16965/ijar.2016.457
18. Ominde BS, Igbigbi PS. Morphometry of the Occipital Condyles in Adult Nigerians. Online J Health Allied Scs. 2021;20(4):1-7
19. Yataco-Wilcas CA, Salazar-Ascurra A, Diaz-Llanes BE, Coasaca-Tito YS, Lengua-Vega LA, Salazar-Campos CE. Morphometric analysis of the foramen magnum in the Peruvian population. Surg Neurol Int 2024;15(9):1-8. DOI 10.25259/ SNI_936_2023
20. Boulton MR, Cusimano MD. Foramen magnum meningiomas: concepts, classifications, and nuances. Neurosurg focus 2003;14(6):1-8.
21. Aljarrah K, Packirisamy V, Al Anazi N, Nayak SB. Morphometric analysis of foramen magnum and occipital condyle using CT images for sex determination in a Saudi Arabian population. Morphologie 2022;106(355):260-270. DOI:10. 1016/j.morpho.2021.07.006

Original Article

Impact of Adjuvant Oral Care on Clinical Outcomes in Mechanically Ventilated ICU Patients: A Randomized Controlled Trial

Akash Samuel[1], Saira Khalid[3], Samina Kausar[2] and Farzana Kausar[1]

ABSTRACT

Objective: This was a prospective study to determine the impact of structured adjuvant oral care on clinical outcomes, such as duration of mechanical ventilation, ICU length of stay and mortality among mechanically ventilated ICU patients.

Study Design: Randomized, controlled, trial study

Place and Duration of Study: This study was conducted at the Intensive Care Unit of a Tertiary Care Hospital from 30 July 2024 and 3 January 2025.

Methods: Mechanically ventilated patients (n = 100) were randomly put under intervention (n = 50) and control (n = 50) groups. The control group was provided with the standard care of the ICU in terms of oral care, whereas the intervention group went through the structured adjuvant oral care on top of the standard care. Clinical outcomes that were determined were the duration of mechanical ventilation, length of stay in ICU, and mortality. Independent sample t-tests and chi-square tests were used to analyze data with the statistical significance of $p < 0.05$.

Results: The intervention group showed better clinical outcomes when compared to the control group. The average ICU stay was also significantly lower in the intervention arm (12.28; 7.15 days) than the control arm (16.57; 8.75 days; p= 0.009). On the same note, the average length of the mechanical ventilation duration was also significantly lower in the intervention group (11.19 ± 6.97 days) in comparison with the control group (15.46 ± 8.67 days; p = 0.008). The intervention group also had a lower mortality rate (44% vs. 66%).

Conclusion: Organized oral care was linked with better clinical outcome among the patients who were put on mechanical ventilation in ICU. The intervention greatly decreased the mechanical ventilation duration and the length of stay in the ICU and was linked with a decreased mortality rate. The integration of systematic oral care procedures into the standard ICU nursing care could help to achieve better patient outcomes and less healthcare waste.

Key Words: Ventilator Associated Pneumonia, Intensive care unit, Adjuvant oral care, Chlorohexidine, Ventilator duration.

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INTRODUCTION

Mechanical ventilation refers to a vital supportive treatment applied in an intensive care unit (ICU) to address critically-ill patients, with respiratory failure, and other life-threatening diagnoses[1,2].

Regardless of its clinical advantages, there are numerous complications that are related to prolonged mechanical ventilation and may adversely impact patient outcomes, such as infection, prolonged hospitalization, and even mortality[3]. These complications pose a significant burden on the healthcare systems and seriously raise treatment costs.

Oral hygiene is an important aspect of nursing care in the case of mechanically ventilated patients[4]. The mouth acts as a reservoir of pathogenic microorganisms that can colonize the respiratory tract especially in patients under intubation[5]. The existence of an endotracheal tube interferes with the micro-aspiration of oral secretions and the natural defense mechanisms, which leads to the fact that respiratory complications and prolonged ventilation using mechanical ventilation are under the threat of development[6].

The focus on preventive nursing interventions to enhance the outcomes of the mechanically ventilated patients has become an object of growing interest in recent years[7]. They have proposed oral care interventions (brushing teeth, antiseptic mouth rinsing,

[1.] Department of MS Nursing Scholar / Head of Department[2], Institute of Nursing / Professor[3], University of Health Sciences, Lahore.

Correspondence: Akash Samuel, MS Nursing Scholar, Institute of Nursing, University of Health Sciences, Lahore.
Contact No: 03421532346
Email: akashsamuel20@gmail.com

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oral moisturization, etc.) as the possible methods of the elimination of the bacterial colonization and enhancement of patient recovery[8]. Formulated oral hygiene guidelines can help improve respiratory, as well as help diminish the complications linked to prolonged ventilation[9].

Although a number of studies have investigated the contribution of oral care to prevention of ventilator-associated pneumonia (VAP), not much literature has explored the overall clinical outcomes of these measures[10,11]. The length of time on mechanical ventilation, length of stay in ICU, and patient mortality are the key parameters of patient recovery and medical effectiveness[12].

Thus, the objective of the given randomized controlled trial was to assess the effect of organized adjuvant oral care on clinical outcomes in mechanically ventilated ICU patients. The research question was particularly whether the use of a structured oral care protocol would be able to decrease the time on mechanical ventilation, decrease the length of stay on ICU and improve survival.

METHODS

To assess the effectiveness of structured oral care on clinical outcome of mechanically ventilated patients in the ICU, a randomized controlled trial with a parallel group design was used to compare the effects of structured oral care on outcomes in this group. A total of 30 July 2024 to 3 January 2025 were the 6 months that data were gathered at the Services Hospital Lahore, Pakistan, after ethical consent was granted by the University of Health Sciences, Lahore. The smallest sample size was estimated 50 participants per group, with 80 percent power of study, 95 percent confidence interval, and 37.8 percent ventilator-associated pneumonia (VAP) incidence in the study group and 62.2 percent in the control group using the WHO Sample Size 2.0 formula with the standardized Z-values of 1.96 and 0.842. One-hundred participants were sampled with the help of non-probability consecutive, and randomly assigned to either intervention or control group with the help of computer-generated random numbers, which led to 50 patients in each group. The criteria used to select patients included being 18 years and above, invasive mechanical ventilated, and admitted to the ICU within the study period. Patients that were not at ICU at the time of pneumonia onset, were inherently unable to undergo oral care procedures and those who were anticipated to be on mechanical ventilation less than 24 hours were excluded. The intervention group members were provided with oral adjuvant care together with routine ICU care that included brushing of teeth with soft toothbrush that was moistened with chlorhexidine solution, application of 0.2%chlorhexidine oral rinse, cleaning of the oral cavity using wet swabs and oral moisturization, which was administered twice daily during a period of about five days. The control group was provided with regular oral attention according to the normal ICU practice including suctioning of the oral secretions, regular mouth cleaning, and antiseptic mouth rinsing as needed. The major outcomes measured were the length of mechanical ventilation, length of ICU stay and ICU mortality. Age, gender, smoking history and comorbid conditions were gathered as baseline demographic and clinical outcomes were monitored during the ICU stay. Analysis of data was done using Statistical Package of Social Sciences (SPSS) whereby the continuous variables were measured in terms of mean and standard deviation and the categorical variables measured in terms of frequencies and percentages. The comparisons of continuous variables between groups were done with the help of independent sample t-tests, whereas the comparisons of categorical variables were carried out and chi-square tests were utilized with a statistical significance level of $p < 0.05$.

RESULTS

One hundred patients were involved in the study, half of them were in the intervention group and the other half in the control group. The average age of the people who participated in the intervention population was 48.71 + 10.54, and the average age of the population who participated in the control group was 48.83 + 11.60. Base line demographic characteristics were not significantly different between the groups, which means that the randomization was successful (Table 1).

Table No. 1: Baseline Characteristics of Study Participants

Variable	Intervention Group (n=50)	Control Group (n=50)
Age (years) Mean ± SD	48.71 ± 10.54	48.83 ± 11.60
Male n (%)	30 (60%)	32 (64%)
Female n (%)	20 (40%)	18 (36%)
Smoking History n (%)	16 (32%)	18 (36%)
Comorbidities n (%)	21 (42%)	23 (46%)

The average ICU length of stay was much low in the intervention group than in the control group. Mean ICU stay among patients who were given structured oral care was 12.28 ± 7.15 days compared with the patients in the control group who faced an average stay of 16.57 ± 8.75 days ($p = 0.009$). Equally, the intervention group had a considerable shortening of the mechanical ventilation time. The mean hospitalization of the patients under the oral care intervention of 11.19 +/- 6.97 days versus 15.46 +/- 8.67 days in the control group ($p = 0.008$). (Table 2)

Table No. 2: Comparison of Clinical Outcomes Between Groups

Outcome	Inter-vention Group Mean±SD	Control Group Mean ± SD	t-value	p-value
ICU Length of Stay (days)	12.28 ± 7.15	16.57 ± 8.75	2.682	0.009
Mechanical Ventilation Duration (days)	11.19 ± 6.97	15.46 ± 8.67	2.710	0.008

The intervention group also was better in terms of mortality outcomes. The death rate among the interventional group was 44/66 respectively. Such results imply that systematic oral care can help to achieve better outcomes among mechanically ventilated ICU patients. (Table 3)

Table No. 3: Patient Outcomes During ICU Stay

Outcome	Intervention Group (n=50)	Control Group (n=50)	p-value
Discharged	28 (56%)	17 (34%)	0.028
Expired	22 (44%)	33 (66%)	

DISCUSSION

Results of the present randomized controlled study indicate that among mechanically ventilated patients in an ICU, structured oral care is linked to better clinical outcomes. The patients who were subjected to the oral care intervention had much shorter mechanical ventilation and ICU stay periods than those who were provided with regular care.

The decrease in the mechanical ventilation time that has been observed in this paper could be explained by an increase in oral hygiene and a decrease in bacterial colonization of the oral mouth. Oral cleanliness of intubated patients can contribute to the prevention of the buildup of pathogenic microorganisms that can potentially disrupt the respiratory system and slow down the recovery rate[13].

Equally, the intervention group had the shorter length of stay at ICU, which implies positive clinical outcomes and reduced complications in the treatment process. The improvement of ICU stay is especially crucial, since the long-term ICU admission can be linked with high cost of healthcare delivery and predisposition to hospital-acquired infection[14].

The intervention group also performed better as far as mortality results are concerned. Even though baseline mortality of critically ill ICU patients is high, the reduced mortality rate of the intervention group indicates that structured oral care could be a part of the overall improved patient outcomes[15].

The results agree with the earlier studies that show the significance of oral hygiene interventions in acutely ill patients[16]. Some studies have also stated that oral care protocols conducted in a structured manner may minimize respiratory complications and enhance recovery in the patients who are under mechanical ventilation[7,17].

Clinically, these findings demonstrate the significance of integrating the structured oral care protocols in the routine ICU nursing practice[18]. Oral hygiene interventions are quite easy, inexpensive and can be undertaken by the nursing staff without the need to have complicated equipment and a lot of resources[9].

But this work also has a number of drawbacks. The research was also based in one health facility and this might affect the external validity of the research results to other clinical environments. Moreover, the sample size was also rather small, and multi-centre trials can be needed to verify the findings.

CONCLUSION

This study proves that structured oral care is linked to better clinical outcomes in the cases of mechanically ventilated ICU patients. Intervention markedly decreased length of mechanical ventilation and length of stay in the ICU and had a lower mortality than usual care. The findings are relevant to the suggestion that structured oral hygiene regimes should be integrated into the routine ICU nursing practice to enhance patient recovery and reduce complications related to mechanical ventilation.

Author's Contribution:

Concept & Design or acquisition of analysis or interpretation of data:	Akash Samuel, Saira Khalid
Drafting or Revising Critically:	Samina Kausar, Farzana Kausar
Final Approval of version:	All the above authors
Agreement to accountable for all aspects of work:	All the above authors

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REFERENCES

1. Rubulotta F, Torra LB, Naidoo KD, Aboumarie HS, Mathivha LR, Asiri AY, et al. Mechanical ventilation, past, present, and future. Anesthesia Analgesia 2024;138(2):308-25.
2. Frat J-P, Grieco DL, De Jong A, Gibbs K, Carteaux G, Roca O, et al. Noninvasive

respiratory supports in ICU. Intensive Care Med 2025;51(8):1476-89.
3. Huang HY, Huang CY, Li LF. Prolonged mechanical ventilation: outcomes and management. J Clin Med 2022;11(9):2451.
4. SuWen L, YuYang H, Wei B. Understanding oral care in the intensive care unit: a qualitative study of nurse experiences and practices with mechanically ventilated patients. Nursing Critical Care 2025;30(2):e13296.
5. Dong J, Li W, Wang Q, Chen J, Zu Y, Zhou X, et al. Relationships between oral microecosystem and respiratory diseases. Frontiers Molecular Biosci 2022;8:718222.
6. Charan A, Thomas LS, Bambal V, Kenchappa V, Jose A. Nosocomial Infections-An Overview of Prophylactic Approaches to Control VAP. Int J Pharmaceutical Investigation 2025;15(4).
7. Lei S, Liu Y, Zhang E, Liu C, Wang J, Yang L, et al. Influence of oral comprehensive nursing intervention on mechanically ventilated patients in ICU: a randimized controlled study. BMC Nursing 2023;22(1):293.
8. Quinn B. Best practices in oral care. Critical Care Nurse 2023;43(3):64-7.
9. Marusiak MJ, Paulden M, Ohinmaa A. Professional oral health care prevents mouth-lung infection in long-term care homes: a systematic review. Canadian J Dental Hygiene 2023;57(3):180.
10. Mastrogianni M, Katsoulas T, Galanis P, Korompeli A, Myrianthefs P. The impact of care bundles on ventilator-associated pneumonia (VAP) prevention in adult ICUs: a systematic review. Antibiotics 2023;12(2):227.
11. Sadeghigolafshani M, Papi S, Maghsoodloo E, Rostamvand M. The role of oral care in reducing hospital-acquired infections and improving the health of critically ill patients: A narrative review. J Dental Advances Clin Sci 2025; 1(1):38-42.
12. Tilahun L, Molla A, Ayele FY, Nega A, Dagnaw K. Time to recovery and its predictors among critically ill patients on mechanical ventilation from intensive care unit in Ethiopia: a retrospective follow up study. BMC Emergency Med 2022;22(1):125.
13. Gupta A, Saleena LM, Kannan P, Shivachandran A. The impact of oral diseases on respiratory health and the influence of respiratory infections on the oral microbiome. J Dent 2024; 148:105213.
14. Abban MK, Ayerakwa EA, Mosi L, Isawumi A. The burden of hospital acquired infections and antimicrobial resistance. Heliyon 2023;9(10).
15. Janto M, Iurcov R, Daina CM, Neculoiu DC, Venter AC, Badau D, et al. Oral health among elderly, impact on life quality, access of elderly patients to oral health services and methods to improve oral health: a narrative review. J Personalized Med 2022;12(3):372.
16. Lombardo L, Ferguson C, George A, Villarosa AR, Villarosa BJ, Kong AC, et al. Interventions to promote oral care regimen adherence in the critical care setting: A systematic review. Australian Critical Care 2022;35(5):583-94.
17. Singh P, Arshad Z, Srivastava VK, Singh GP, Gangwar RS, SINGH Sr P, et al. Efficacy of oral care protocols in the prevention of ventilator-associated pneumonia in mechanically ventilated patients. Cureus 2022;14(4).
18. Barzoki ER, Fallah S, Marofi S, Talebi M. Evolving aspects of oral care in modern nursing: a systematic review. BMC Oral Health 2025; 25(1):1585.

Original Article

Impact of Intermittent Self-Catheterization (ISC) with 12 FR Catheter as A Nursing Intervention in Reducing Recurrence of Female Urethral Stricture Disease following Urethral Dilatation

Farah Naz[1], Samina Kausar[2], Shazia Taj[1] and Maria Sharif[1]

ABSTRACT

Objective: To study the impact of intermittent self-catheterization (ISC), performed by the patient after trained by a specialist nurse, on reducing the recurrence of female urethral stricture disease after their urethral dilation.
Study Design: Randomized controlled trial (RCT) study
Place and Duration of Study: This study was conducted at the Urology Department of Shaikh Zayed Hospital, Lahore, Pakistan from December 2024 to May 2025.
Methods: A total of 132 female patients (aged 31-60 years) were recruited and randomized into two groups. Intervention group (n=66) performed intermittent self-catheterization (ISC) twice a week at home, whereas the control group (n=66) did not perform ISC at home at all. Both the groups were followed up by the researcher after every 15 days of recruitment for 12 consecutive weeks. Urethral stricture recurrence was assessed on every follow up visit by passing a 12Fr Nelton and catheterization failure was labelled as urethral stricture recurrence.
Results: Intervention group showed statistically significant (p=0.005) reduction in the recurrence 07/27 (25.93%) in comparison with 20/27 (70.07 %) recurrence in control group. The main bulk of recurrences 18/27 (66.67%) were reported on the very first follow up within first 15 days, irrespective of their group allocation.
Conclusion: After urethral dilatation intermittent self-catheterization (ISC) performed by patients themselves after adequate training by a specialist nurse significantly reduces the stricture recurrence.
Key Words: Female urethral stricture disease, Urethral dilatation, Intermittent self-catheterization, Specialist nurse, Stricture recurrence.

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INTRODUCTION

When a female urethra is narrowed in a such a way that it does not allow insertion of any instrument through it without injuring its mucosa, it is said to have stricture disease (Lumen et al., 2021)[1]. A urethral stricture is always suspected whenever there is a failure to pass a 12Fr catheter per urethra in a patient with urinary retention which may be confirmed by urethroscopy (Aldamanhori and Inman, 2018)[2].

[1.] MSN Scholar / Supervisor & Head of Department[2], Institute of Nursing University of Health Science Lahore.

Correspondence: Farah Naz, MSN Scholar Institute of Nursing University of Health Science Lahore.
Contact No: 03000846863
Email: mrsfarahubaid@gmail.com

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4%–13% of the women having obstructive urinary symptoms like straining, weak flow, stop–start pattern, poor bladder emptying have urethral stricture disease (Chua et al., 2021)[3]. In North America, about 5000 new patients with urethral stricture are added per year in the registry with the total expenses of around $200 million every year (Xu et al., 2022)[4].

Absence of any definitive diagnostic parameters, low index of suspicion for urethral stricture in a women and possible delays in the disease management all are possible reasons for fewer (0.1 to 1%) reported diagnosed cases of urethral stricture and thus contributing data scarcity on the disease prevalence and its management (Sarin et al., 2021)[5]. This is even worse on the national level where only 2.7 -8% are actually reported to have urethral stricture (Hassan et al., 2022)[6]. Urethral dilatation alone provides promising short term relief in voiding symptoms, however it has rather higher recurrence rates in the long run. That is why intermittent self-catheterization (ISC) is practically an acceptable adjunct in order to minimize urethral

stricture recurrence (Campos-Juanatey et al., 2021)[7]. Intermittent catheterization (IC) helps maintaining bladder capacities and volumes as well as prevents renal function abnormalities and urinary infections in contrast to permanent bladder catheter (Blanc et al., 2021)[8]. Intermittent self-catheterization (ISC) is safe, easy-to-perform repeatedly and delays the need for reconstructive urethral surgery. (Hussein et al., 2024)[9].

We enrolled only those female who had already been treated with urethral dilatation by the urologist and were subsequently advised intermittent self-catheterization (ISC) which in our study was performed by the patients themselves at home after they were trained by the specialist nurse, to analyze the effect of Intermittent Catheterization (IC) in minimizing the recurrence rates.

METHODS

Following approvals from relevant review boards and ethical committees and registration at clinicaltrials.gov via ID NCT06064968, this Randomized Controlled Trial (RCT) was carried out as a collaborative research work between Institute of Nursing, University of health Sciences, Lahore and Department of Urology, Shaikh Zayed Hospital, Lahore, Punjab, Pakistan from December 2024 to May 2025.

Already diagnosed cases of urethral strictures after their urethral dilatation were referred by the Urologist to the specialist nurse researchers for training for intermittent self-catheterization (ISC). All the participants were females having age range of 31 to 60 years, body mass index (BMI) lower than 30, abbreviated mental test score (AMTS) of at least 7 and/or above, American Urological Association (AUA) score for evaluating lower urinary tract symptoms severity ranged from 8 to 35 in order to exclude obese, physically and/or mentally challenged patients and to gauge the overall improvement in symptoms.

A convenience sampling was used to include participants (n=132) who were then randomly allocated through lottery method in two equal groups each having (n=66) recruits. The control arm (n= 66) participants was offered catheterization with 12Fr nelton catheter only on their follow up visits with the specialist nurse. In contrast, however, in the intervention group (n=66), self-catheterization was performed by the patients themselves at home twice a week for a period of 12 consecutive weeks. For performing self-catheterization, all the patients in the intervention group first received proper training by the specialist nurse. This self-catheterization was advised in a full urinary bladder in morning at the time of first void in to minimize any unnecessary bladder discomfort.

Proper one–to-one counselling of the participants, their detailed briefing about the procedure as well as practical demonstration of catheterization procedure on mannequin followed by real-time self-catheterization by the patients on their own selves; every step was taught and supervised by the specialist nurse. Preferred positions for catheterization were lying supine with frog leg position (Fig-1) and/or in crouching position just like using an Indian toilet seat. After detailed practical demonstrations, patients were also handed over written instructions and provided procedural videos for their guidance for the successful catheterization at home.

For catheterization, under clean and aseptic conditions, a topical jelly (lignocaine gel 2%) is to be is instilled in the urethra followed by insertion of a size 12Fr (3French= 1mm) Nelton tube (Fig-2) after applying jelly at its tip also. Tube is to be advanced into the filled urinary bladder until urine starts pouring out through Nelton, which confirmed that catheter has fully traversed the urethra and entered the bladder. After the bladder is completely drained, Nelton is removed gently.

Every participant from each group was followed fortnightly for a period of 12 weeks. On each follow up a 12Fr Nelton catheter is passed per urethra by the researcher nurse. Successful passage of catheter confirmed patency of urethra and such patients were booked for the next follow up visit. However, failure to pass Nelton tube confirmed narrowing of urethra and the patients were labelled as having stricture recurrence and were referred back to the urologist.

RESULTS

Intervention group showed statistically significant (p=0.005) reduction in the recurrence 07/27 (25.93%) in comparison with 20/27 (70.07 %) recurrence in control group. The main bulk of recurrences 18/27 (66.67%) were reported on the very first follow up within first 15 days, irrespective of their group allocation.

In the control group (n=66) where no intermittent catheterization was being performed at home, 20 participants (30.30 %) experienced urethral recurrence. However, only 07 patients (10.60%) reported to have recurrence of disease in the intervention group because they were performing intermittent catheterization twice weekly at home taught by the researcher nurse. Chi-square test applied and the difference of the recurrence rates between the two groups was statistically significant (p-value 0.005).

Table No.1: Descriptive statistics of intervention and control groups:

Parameters	Groups	N	Minimum	Maximum	Mean	Standard Deviation
Age	Intervention	66	31 years	59 years	48.36 years	7.13
	Control	66	33 years	56 years	46.79 years	4.28
Weight	Intervention	66	64 Kg	88 Kg	79 Kg	2.76
	Control	66	66 Kg	92 Kg	81 Kg	3.01
Height	Intervention	66	1.56 m	1.78 m	1.65 m	0.10
	Control	66	1.57 m	1.79 m	1.66 m	0.11
Body Mass Index (BMI)	Intervention	66	26.3 Kg/m^2	27.8 Kg/m^2	29 Kg/m^2	0.95
	Control	66	26.8 Kg/m^2	28.7 Kg/m^2	29.4 Kg/m^2	1.16

Table No.2: Comparison of "Urethral Strictures Recurrence" between intervention and control groups

Groups	Recurrence		Total	Significance
	No	Yes		
Control	46 (69.70 %)	20 (30.30 %)	66	p = 0.005
Intervention	59 (89.40 %)	07 (10.60 %)	66	
Total	**105 (79.55%)**	**27 (20.45%)**	**132**	

Figure No.1: Frog leg position for performing IC

Figure No.2: Nelton catheters of various sizes

DISCUSSION

Current study included treated cases of urethral strictures with females with between 31 years to 60 years with a mean of 48.36 ± 7.13 in intervention group and 46.79 ± 4.28 in control group. These figures correspond to a study on female population with urethral stricture disease with a mean age of 48 years with age range of 26-76years (Hassan et al., 2022)[6]. In the females of this age range there was high likelihood of finding definite cases of urethral stricture disease where cognition and functional capacity (assessed via AMTS score in our study) is preserved along with dexterity needed to perform ISC of the recruits which is possible with this BMI range. All the above factors reportedly have been associated with the success of the study (Engberg et al., 2020)[10]. A total of 136 female patients with a diagnosis urethral stricture were randomized into intervention and control groups having 68 patients in each group. In published data worldwide , however, rather lower numbers of female participants in different studies have been reported i.e. from only 7 patients to as much as 82 patients with variety of diagnoses ranging from metal stenosis to bladder neck contractures to functional urethral syndrome (Kore and Martins, 2022)[11]. None of these studies focused on the female urethral stricture exclusively in contrast to our study. However, some researchers did recruit only the confirmed cases despite the low prevalence (2.7 to 23 %) and controversies in the standardizing the diagnosing criteria for female urethral stricture disease (Nagabhairava et al., 2024)[12]. Male urethral stricture disease , in contrast to female urethral stricture, has been reported to have more definite diagnostic criteria, hence a much higher incidence (0.6% - 0.9%) has been presented in various studies (Pang et al., 2021)[13], (Madec et al., 2024)[14].

The size of the urethral catheter which was used for intermittent catheterization (IC) in our research was 12Fr in order to maintain the patency of urethra. This catheter size selection corresponds to the data available in a study where they have recommended the use of urethral catheters as small as 5 Fr catheter to as large as 22 Fr catheter for intermittent catheter (IC) and maintaining the minimal normal urethral patency (Newman, 2021)[15].

All the patients were followed up by the trained nurse (researcher herself) after every two weeks for a period of three months (i.e.12 weeks) and a Nelton catheter of 14Fr was used for catheterization by the participants twice a week for 3 months in intervention group after acquiring proper training by the researcher. Likewise, researches have also reported successful intermittent self-catheterization (ISC) performed by the patient after their training by the registered nurse (Gray et al., 2019)[16]. However, traditionally in our health care system, doctors have been reported to teach the patient how to perform intermittent catheterization using Nelton catheters of varying sizes to be used for a variable period of follow up spanning from 02 to 12 months post procedure (Ullah et al., 2023, Khan et al., 2011)[17,18].

Out of all the recurrences in both groups combined (n=10) in our study, the timing of every individual case in each group was also analyzed. It was noticed that majority (7 /10) of these recurrences appear on first follow up after two weeks' time with 05 cases in 'control group' and 02 cases in 'intervention group'. Rest of the 03 cases with urethral stricture recurrence were reported in 'control group' only with 02 cases at the 3rd follow-up and 01 participants at the 4th follow-up. Although similar recurrence rates have been mentioned within a certain follow up time ranging from 08 weeks to 01 year, however, none of these show specifically the time of recurrence of individual case (Ullah et al., 2023)[17] (Kumar et al., 2019)[19], (Khan et al., 2011)[18].

CONCLUSION

A well planned and scheduled intermittent self-catheterization (ISC) when performed by a properly trained patient on her own, does reduce the recurrence of female urethral stricture. Moreover, in our conventional health care system a trained nurse can may be a reliable alternative to a specialized doctor for training and supervising patients undergoing self-catheterization breaking through the stereotype. However, further studies are required focusing mainly on documenting true incidence of female urethral stricture disease in local population and role of intermittent self-catheterization after urethral dilation with much longer duration of follow up than that of 3 months as in this study.

Author's Contribution:

Concept & Design or acquisition of analysis or interpretation of data:	Farah Naz, Samina Kausar
Drafting or Revising Critically:	Shazia Taj, Maria sharif
Final Approval of version:	All the above authors
Agreement to accountable for all aspects of work:	All the above authors

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REFERENCES

1. Lumen N, Campos-Juanatey F, Greenwell T, Martins FE, Osman NI, Riechardt S, et al. European Association of Urology guidelines on urethral stricture disease (part 1): management of male urethral stricture disease. Eur Urol 2021; 80(2):190-200.
2. Aldamanhori R, Inman R.The treatment of complex female urethral pathology. Asian J Urol 2018;5(3):160-163.
3. Chua KJ, Mikhail M, Patel HV, Tabakin AL, Doppalapudi SK, Sterling J, et al. Treatment of urethral stricture disease in women: nonsystematic review of surgical techniques and intraoperative considerations. Research and Reports Urol 2021;381-406.
4. Xu K, Han Y, Huang Y, Wei P, Yin J,Jiang J. The application of 3D bioprinting in urological diseases. Materials Today Bio 2022;16100388.
5. Sarin I, Narain TA, Panwar VK, Bhadoria AS, Goldman HB, Mittal A. Deciphering the enigma of female urethral strictures: A systematic review and meta-analysis of management modalities. Neurourol Urodynamics 2021;40(1):65-79.
6. Hassan RU, Siraj S, Khan A, Saleem A, Ahmad I, Naeem R. Dorsal Onlay Urethroplasty Using Buccal Mucosal Graft and Vaginal Wall Graft for Female Urethral Stricture; Outcome of a Tertiary Care Hospital. Pak J Med Health Sci 2022;16(05): 1519-1519.
7. Campos-Juanatey F, Osman NI, Greenwell T, Martins FE, Riechardt S, Waterloos M, et al. European Association of Urology guidelines on urethral stricture disease (part 2): diagnosis, perioperative management, and follow-up in males. Eur Urol 2021;80(2):201-212.
8. Blanc BFL, Rodríguez-Almagro J, Lorenzo-García C, Alcaraz-Zomeño E, Fernandez-Llorente G, Baixauli-Puig M, et al. Quality of life and autonomy in patients with intermittent bladder

catheterization trained by specialized nurses. J Clin Med 2021;10(17):3909.
9. Hussein AM, Jameel KA, Rahman FA. The Role of Topical Steroid Application During Intermittent Self Urethral Dilatation in Reducing the Recurrence Rate of Anterior Urethral Stricture Following Direct Visualized Internal Urethrotomy-A Cohort Study. J Natural Sci Biol Med 2024; 15(2):283.
10. Engberg S, Clapper J, Mcnichol L, Thompson D, Welch VW, Gray M. Current evidence related to intermittent catheterization: a scoping review. J Wound Ostomy Continence Nursing 2020;47(2): 140-165.
11. Kore RN, Martins FE. Dorsal onlay urethroplasty using buccal mucosal graft and vaginal wall graft for female urethral stricture–Outcome of two-institution study. Ind J Urol 2022;38(2):140-145.
12. Nagabhairava MK, Khattar N, Tripathi MC, Manasa T. Defining the "Cutoff" on the Urethral Caliber in Diagnosing a Female Urethral Stricture. Cureus 2024;16(4).
13. Pang KH, Chapple CR, Chatters R, Downey AP, Harding CK, Hind D, et al. A systematic review and meta-analysis of adjuncts to minimally invasive treatment of urethral stricture in men. Eur Urol 2021;80(4):467-479.
14. Madec FX, Marcelli F, Neuville P, Fourel M, Baudry A, Morel-Journel N, et al. Urethral strictures–General aspects: Definition, anatomy of the urethra and its clinical application in stenosis, epidemiology, etiology, and principles of urethral reconstruction. The French J Urol 2024;34(11): 102720.
15. Newman DK. Intermittent Self-Catheterization Patient Education Checklist. Urologic Nursing 2021;41(2).
16. Gray M, Wasner M, Nichols T. Nursing practice related to intermittent catheterization: A cross-sectional survey. J Wound Ostomy Continence Nursing 2019;46(5):418-423.
17. Ullah N, Nawaz J, Shoaib M, Khan A, Ud Din N. Fareed T. Effectiveness of clean intermittent self-catheterization in patients with recurrent urethral stricture post visual internal urethrotomy. J Rawalpindi Med Coll 2023;27(1).
18. Khan RA, Ullah A, Haq F, Rahman A, Durrani SN, Khan MK. Role of clean intermittent self catheterisation (CISC) in the prevention of recurrent urethral strictures after internal optical urethrotomy. J Ayub Med Coll Abbottabad 2011;23(2):22-25.
19. Kumar V, Dharwadkar S, Doshi C, Batta A. Role of intermittent self-catheterization in prevention of recurrence of stricture urethra following visual internal urethrotomy: a prospective single centre study. Int Surg J 2019;6(4):1093-1096.

Original Article

Effect of Narguile Smoking on Male Reproductive Health

The Knowledge and Awareness about the Effect of Narguile Smoking on Male Reproductive Health and Fertility among College Students at University of Karbala

Ali Ibrahim Rahim Al-Dulaimi[1], Muhjah Falah Hassan[2] and Ali M. Kadim Al-Tuma[3]

ABSTRACT

Objective: This study evaluates medical students' knowledge and awareness about narguile (hooka or shisha) smoking effects on male reproductive health.

Study Design: Descriptive cross-sectional study

Place and Duration of Study: This study was conducted at the General Medicine, Dentistry, and Pharmacy Colleges at University of Kerbala from 1st March 2025 to 1st November 2025.

Methods: A descriptive cross-sectional survey and included 102 male students. The smoking behaviors, knowledge of fertility risks and perceptions of awareness campaigns were assessed.

Results: 56.9% of included students were smokers and 27.5% were cigarette smokers. 76.5% of students were aware of hookah effect on male fertility. Only 52% were aware of its' effect on reproductive hormones, and 57.8% knew that it would affect sperm quality. The peer factor had influenced 40.2% of the smokers, and 87.3% recommended awareness campaigns more; only 17.6% had consulted health care professionals.

Conclusion: As a sizeable number of students knew that hookah smoking reduces male fertility, however, the knowledge gap is considerably high with respect to its' specific effect on male hormones and sperm quality. The high number of smokers among students and the peer pressure, as well as the belief that smoking hookah is safe, show the necessity of health education programs and smoking cessation programs at universities.

Key Wards: Awareness, Knowledge, Male fertility, Semen parameters, Reproductive function

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INTRODUCTION

Unlike cigarette smoking, that provides direct tobacco combustion, narguile smoking provides an indirect tobacco heating by burning charcoal and smoke filtration by the water before inhalation by the smoker.[1] Despite the widespread, but incorrect idea that water filtration eliminates the emitted toxic components within smoke, evidences suggest that it does very little to remove some toxic chemicals; nicotine, carbon monoxide (CO) in addition to carcinogenous compounds.[2]

As well as, charcoal itself provides other toxicants; heavy metals and polycyclic aromatic hydrocarbons (PAHs).[3] Narguile smoking was firstly performed in groups, using a single pipe with family members, friends or guests, as a measure of social connectedness.[4] Over the years, the narguile culture and practice changed to be popular outside its' original places. In the past few decades, narguile smoking becomes a global revival and being used in particular among young adults and university students. The increasing popularity among them is largely attributed to the peer influence and social nature.[5,6] Several studies exhibit that the prevalent use of narguile among university students is usually for recreational purposes.[7,8]

A common misunderstanding about narguile among university students is that the waterpipe smoking is less harmful in comparison to cigarette smoking.[9,10] Flavored tobacco products such as fruity varieties and mint-based mixes minimize the smoke intensity and suggesting the illusion that it is less harm to health.[11] An important factor in both initiation and maintenance of narguile smoking is peer pressure especially first time nargulie smokers who are encouraged by friends due to social acceptability within peer groups.[12]

[1.] Department of Anatomy, Faculty of Medicine, University of Kufa, Najaf, Iraq
[2.] Department of Anatomy, Histology & Embryology, University of Kerbala/College of Medicine, Karbala, Iraq
[3.] Rheumatology & Medical Rehabilitation, University of Kerbala, College of Medicine, Karbala, Iraq

Correspondence: Ali Ibrahim Rahim Al-Dulaimi, Department of Anatomy, Faculty of Medicine/University of Kufa, Najaf, Iraq.
Contact No: +964 780 128 2226
Email: aliir.abbas@uokufa.edu.iq

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Moreover, the wide spread pictures and videos of narguile smoking in social media sites made it more popular, young people's trendy hookah lounges and clouds of flavored smoke, give the impression of sophistication and relaxation which made it more attractive to students.[13] The prevalence and habits of narguile smoking differ markedly between the sexes. Research indicates it is more common among male students than females. Smoking among males is more acceptable socially in several Middle Eastern societies, while female smoking in public is more likely to be stigmatized. However, recent studies indicate that narguile smoking is started to be also popular among young age females, especially those who live in urban areas at which social restrictions become laxer.[14]

Emerging researches exhibited that narguile smoking has a significant impact on male reproductive health. Multiple mechanisms have been involved; increased oxidative stress, hormonal imbalances and impaired semen parameters.[15] A study showed that narguile smokers exhibited a 30% reduction in total sperm number with a significant decrease in the number of progressively motile sperm.[16] Together, they exhibit higher levels of sperms with fragmented DNA and damaged chromatin, which is usually leads to decrease male fertility and increasing the risk of miscarriage among their female partners.[17]

This cumulative effect (oxidative stress, hormonal imbalances, and impaired semen parameters) put narguile smokers at a higher risk of long term sub-fertility problems. Additionally, heavy metals exposure (lead and cadmium) may lead to genetic mutations in sperm which potentially affects their future offsprings.[18]

Together, chronic exposure to carcinogenous compounds within smoke among nargiule smokers are linked with increased rates of prostatic carcinoma and penile cancers. In addition to their toxic effects, nicotine and carbon monoxide also increase the susceptibility to male genital tract and accessory glands infections (urethritis, epididymitis and prostitis). As well as to sub-fertility, the reduced serum testosterone levels, changes in seminal fluid parameters and poor sperm quality (sperm viability and fertilizing potential) as a result of smoking can predispose to chronic inflammatory diseases of reproductive system.[19,20] So, due to the wide spread use of narguile in university students and the recognizable adverse effects on male reproductive function and fertility potentials, this study is designed to assess male students in some medical colleges' knowledge and awareness about its' possible adverse effects on male reproductive function.

METHODS

A descriptive cross-sectional survey was conducted at General Medicine, Dentistry, and Pharmacy Colleges at University of Karbala from 1st March 2025 to 1st November 2025 vide letter No. 24-90 dated 5-2-2025. A total of 102 male students from some colleges in Karbala University, from different grades from 1st year to 5th/6th year were included. These faculties were selected because of that their students receive exposure to health-related education that may affect their knowledge and awareness of smoking-related risks. The primary data collection tool was a structured questionnaire, which was carefully designed to assess different dimensions of students' awareness regarding the effects of narguile smoking on male fertility. Demographic information; age, academic level, marital status, and residence; Smoking status, preferred smoking method (cigarettes, hookah, electronic hookah), frequency of smoking, duration of smoking, and experience with peer pressure. Knowledge of how smoking affects male hormones, fertility, and reproductive health and opinions on whether smoking influences fertility, increases the risk of fetal miscarriage, or contributes to birth defects. Awareness of studies on the topic and whether participants had ever consulted a healthcare professional regarding smoking's reproductive health effects were recorded. The data was entered and analyzed through SPSS-25.

RESULTS

The majority of participants were from college of general medicine (60.8%), with the largest academic representation from sixth-year students (30.4%). A significant proportion (91.2%) was single, and 57.8% resided outside Karbala (Table 1). About 56.9% were smokers, while 43.1% were non-smokers. Among those who smoked, the preferred smoking methods were cigarettes (27.5%), followed by hookah (16.7%) and electronic hookah (12.7%), about peer pressure to smoke hookah, 40.2% of respondents admitted they had felt pressured, while 59.8% reported no such experience. Regarding the duration of smoking, most respondents had been smoking for more than five years (17.6%), while 43.1% were non-smokers (Table 2).

A total of 67.6% (n=69) of participants reported that they had previously tried smoking hookah, whereas 32.4% (n=33) indicated that they had never tried it. About 52.0% (n=53) indicated they do not smoke hookah at all. The remaining 48.0% engage in hookah smoking with varying frequency: 13.7% (n=14) smoke sometimes, another 13.7% (n=14) randomly, and 9.8% (n=10) reported daily use (once a day). Other less frequent patterns included once a week (5.9%), three times a day (5.9%), and twice a day (2.9%) [Table 3]. When asked whether they knew that hookah smoking could affect male fertility, 76.5% answered yes, while 23.5% were unaware of this risk. While most students acknowledged the fertility risks, a significant minority (23.5%) lacked awareness of this issue (Table 4).

About 60.8% of participants believed that smoking increases the risk of having children with birth defects,

while 39.2% did not recognize this risk. 70.6% acknowledged that smoking affects male sexual function, but 29.4% remained unaware, 52.0% understood that smoking affects male hormone levels, yet 48.0% were unaware (Table 5).

Table No. 1: Demographic characteristics of participants

Variable	No.	%
Academic level		
First Year	1	1.0
Second Year	10	9.8
Third Year	15	14.7
Fourth Year	19	18.6
Fifth Year	26	25.5
Sixth Year	31	30.4
Department		
General Medicine	62	60.8
Dentistry	27	26.5
Pharmacy	13	12.7
Residence		
Karbala	43	42.2
Other Cities	59	57.8
Marital Status		
Single	93	91.2
Married	9	8.8
Age group (years)		
19-20	19	
22-23	47	
24-26	36	

Table No. 2: Smoking status, methods, peer pressure and smoking duration

Smoking variables	No.	%
Are you smoker?		
Yes	58	56.9
No	44	43.1
Smoking methods		
Cigarettes	28	27.5
Hookah	17	16.7
Electronic Hookah	13	12.7
Felt Peer Pressure to Smoke?		
Yes	41	40.2%
No	61	59.8%
Duration of Smoking (years)		
< 1	7	6.9
1	3	2.9
2	3	2.9
3	10	9.8
4	4	3.9
5	13	12.7
> 5	18	17.6

About 87.3% of participants agreed that more public awareness campaigns are needed to highlight the health risks of hookah smoking. Only 17.6% had ever discussed hookah smoking's effects on fertility with a healthcare professional, while the students' awareness of the presence of chemicals and toxins in hookah smoke and their potential effects on reproductive health. Among the 102 respondents, 70.6% (n=72) answered Yes, indicating awareness of the harmful substances in hookah smoke, while 29.4% (n=30) reported no awareness (Table 6).

Table No. 3: History, experience and frequency of hookah smoking

Variable	No.	%
Did you ever try smoking hookah before?		
Yes	69	67.6
No	33	32.4
How often do you smoke hookah? Sometimes		
I do not smoke	53	52.0
Sometimes	14	13.7
Randomly	14	13.7
Once a day	10	9.8
Once a week	6	5.9
Three times a day	6	5.9
Twice a day	3	2.9

Table No. 4: Knowledge and awareness of hookah smoking's effect on male fertility

Variable	No.	%
Does hookah smoking affect male fertility?		
Yes	78	76.5
No	24	23.5
Do you know that hookah smoking may cause infertility (difficulty conceiving) after marriage?		
Yes	65	63.7
No	37	36.3
Do you know that hookah smoking can reduce semen parameters and sperm quality?		
Yes	59	57.8
No	43	42.2

Table No. 5: Perceptions of health risks

Variable	No.	%
Do you think smoking increases the risk of having children with birth defects?		
Yes	62	60.8
No	40	39.2
Do you think smoking affects male sexual function?		
Yes	72	70.6
No	30	29.4
Do you think smoking impacts male hormones?		
Yes	53	52.0
No	49	48.0

Table No. 6: Public awareness and healthcare discussions

Variable	No.	%
Do you think more public awareness campaigns are needed?		
Yes	89	87.3
No	13	12.7
Have you discussed hookah smoking's effects on fertility with a healthcare professional?		
Yes	18	17.6
No	84	82.4
Are you aware of the chemicals and toxins present in hookah smoke and their potential impact on reproductive health?		
Yes	72	70.6
No	30	29.4

DISCUSSION

This study showed that 56.9% of students were smokers and 43.1% were non-smokers. Among them, the predominant smoking method was cigarette smoking (27.5%), followed by hookah (16.7%) and electronic hookah (12.7%) These indicators imply that, despite not being their first option to consume tobacco, university students still favor hookah smoking as a huge component of consumption. This finding is consistent with prior research which suggests young adult use of hookah is common due to its perceived social acceptability and perceived lower health risk in comparison to cigarettes.[21] In contrast, scientific evidence suggests that hookah smoke also contains nicotine, carbon monoxide, heavy metals, and carcinogenic substances, which may have severe long-term health effects, including reproductive impairment.[22]

Another critical finding was the influence of peer pressure on smoking habits. A substantial 40.2% of students reported experiencing peer pressure to smoke hookah, which highlights the social nature of hookah smoking. Previous studies have confirmed that social gatherings and cultural acceptance contribute to the increasing prevalence of hookah smoking among university students.[23] This underscores the need for targeted awareness campaigns addressing peer influence and educating students on the actual risks associated with hookah smoking.

One challenge identified in this analysis is the lack of information on the impact of hookah smoking on reproductive health. The vast majority (76.5%) of students felt that hookah smoking has an impact on male fertility, yet a concerning 23.5% of students were unaware of that risk. 48.0% of students were unaware that smoking affects the male hormones, while 42.2% were unaware of its potential to reduce sperm quality. This is alarming since scientific studies prove that hookah smoking is associated with reduced testosterone levels, reduced sperm motility, increased DNA fragmentation, and oxidative stress, all of which contribute to male infertility.[24]

Such a knowledge gap in current study is alarming, especially in light of the expected higher level of awareness of medical and health sciences students. Studies conducted among university students in Saudi Arabia, Iran and Iraq has shown similar observations[25], where the low levels of awareness were due to misconceptions among participants that hookah smoking is less harmful than cigarettes. Overall, these results reveal an urgent need for educational interventions at the university level to correct misconceptions and provide accurate information to students regarding risks related to smoking and reproductive health.

Most of the participants (87.3%) agreed that there is a need for the public awareness about the health hazards of hookah smoking. The high level of agreement suggests students acknowledge the importance of health education but may not be receiving adequate information via existing university offerings. The absence of awareness workshops may suggest why only 17.6% of students ever discussed the effects of hookah smoking on fertility with a healthcare provider. I believe that the lack of engagement with medical professionals indicates either that student's underestimate the risks or that they are not proactively trying to learn about the long-term consequences of smoking. Based on research, public health professionals have been able to demonstrate through university-based awareness campaigns and smoking cessation programs that these guided programs can lessen indices of smoking prevalence, while improving general knowledge as to detrimental effects of smoking.[26] Based on the findings of this study, universities should conduct educational workshops, invite health professionals to give guest lectures, and host social media campaigns to offer sex education and encourage healthier lifestyle choices.

This study has important public health implications. Prevalence of smoking among students in Moldova is high and awareness about its reproductive risks is low; therefore, stronger tobacco control policies and targeted education initiatives are needed. Our solution is for universities to offer compulsory health education classes targeted at smoking reproductive repercussions. We also need to provide counselling services for students willing to quit smoking, while correcting myths related with hookah smoking.

More representation of students from other universities and majors should be included in future studies to better understand smoking behavior and awareness and level of interest in quitting. A longitudinal study would also be helpful in assessing knowledge and smoking practices over time, specifically after awareness programs are provided. Furthermore, qualitative

research methods, including focus group discussions and in-depth interviews, could give in-depth understanding of the social and psychological determinants that influence students' smoking practices.

CONCLUSION

As a sizeable number of students knew that hookah smoking reduces male fertility, however, the knowledge gap is considerably high with respect to its' specific effect on male hormones and sperm quality. The high number of smokers among students and the peer pressure, as well as the belief that smoking hookah is safe, show the necessity of health education programs and smoking cessation programs at universities. The public health agenda should be addressing misconceptions, increasing the engagement of students with healthcare professionals and the need for tobacco control measures. Long-term trends in awareness and smoking behaviours should be explored in future studies to provide insight into the impact of interventions in reducing the health risks associated with hookah smoking.

Author's Contribution:

Concept & Design or acquisition of analysis or interpretation of data:	Ali Ibrahim Rahim Al-Dulaimi, Muhjah Falah Hassan
Drafting or Revising Critically:	Ali Ibrahim Rahim Al-Dulaimi, Ali M. Kadim Al-Tuma
Final Approval of version:	All the above authors
Agreement to accountable for all aspects of work:	All the above authors

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REFERENCES

1. Sepidarkish M, Rezazadeh S, Ghaffari Hamedani H, Lohrasbi F, et al. The waterpipe smoking and human health: a systematic review and meta-analysis of 191 observational studies. Sys Rev 2025;14(1):74.
2. Guedes Pinto T, Magalhães FA, Renno AC, Ribeiro DA. Does waterpipe smoke induce genotoxicity (DNA damage) in mammalian cells in vivo? A systematic review. Toxicol Mech Methods 2025;35(3):240-9.
3. Yadav S. Decoding waterpipe tobacco smoking: a comprehensive narrative review exploring mechanics, health risks, regulatory challenges, and public health imperatives. Cureus 2024;16(1).
4. Bani Hani A, Mansour S, Al Smady MM, Bani Hani F, et al. Waterpipe tobacco smoking in healthcare students in the University of Jordan. Frontiers Public Health 2025;13:1576868.
5. Kopa-Stojak PN, Pawliczak R. Disposable electronic cigarettes–Chemical composition and health effects of their use. A systematic review. Toxicol Mech Methods 2025;35(3):250-61.
6. Shaukat N, Chowdhury S, Roy S, Asfar T, et al. Waterpipe-specific pictorial health warning labels are effective in reducing subjective measures, behavioral responses and toxicant exposure among young adults: A crossover study. PloS one 2025;20(8):e0327730.
7. Eshghjoo S, Ghafarinezhad S. Impact of Cigarette and Hookah Smoke on Sex Hormone Regulation in Animal Model: a comparative analysis. IJBLS 2025;4(1):32-41.
8. Al-Hadithi T, Shabila N. Characteristics of waterpipe tobacco smoking among youth in Nasiriya, Iraq. BMC Public Health 2022; 22(1):765.
9. Nasser AM, Geng Y, Al-Wesabi SA. The prevalence of smoking (cigarette and waterpipe) among university students in some Arab countries: a systematic review. Asian Pacific journal of cancer prevention: APJCP 2020; 21(3):583.
10. Mandil A, Hussein A, Omer H, Turki G, Gaber I. Smoking habits of university students in Saudi Arabia: Prevalence and associated factors. East Mediterr Health J 2020;26(3):316-25.
11. Hamadneh J, Al-Zenati AA, Banihani SA. Semen Quality Measures in Hookah and Cigarette Smokers Compared to Nonsmokers. Sci World J 2025;2025(1):3380445.
12. Mishra A, Khan SA, Jadhav K, Mehrotra N. Inhaling Risk: Smoking Impact on Male and Female Reproductive Health. Biosci Biotechnol Res Asia 2025;22(1):23-35.
13. Alanazi FS, Alrawaili YS. Impact of Smoking on Reproductive Health: A Systematic Review. Saudi J Med Pharmaceut Sci 2023;9(12):821-7.
14. Al-Jayyousi GF, Kurdi R, Islam N, Alhussaini NW, et al. Factors affecting waterpipe tobacco smoking among university students in Qatar. Substance Use Misuse 2022;57(3):392-401.
15. Afifi R, Khalil J, Fouad FM, Hammal F, et al. Social norms and attitudes linked to waterpipe use in the Middle East. Tob Control 2013; 22(5):276-80.
16. Alzyoud S, Weglicki LS, Kheirallah KA, et al. Waterpipe smoking among university students in Jordan: Prevalence and associated factors. East Mediterr Health J 2014;20(9):529-37.
17. Ghafouri N, Hirsch JD, Heydari G, et al. Waterpipe smoking among health sciences

university students in Iran: perceptions, practices and patterns of use. BMC Res Notes 2011; 4(1):496.

18. Sengupta P, Hassan MF, Dutta S, et al. Orexins: the â€˜ multitaskingâ€™ neuropeptides in the energy metabolism and immune regulation of male reproduction. Chem Biol Letters 2021; 8(4):202-12.
19. Dutta S, Sengupta P, Hassan MF, Biswas A. Role of toll-like receptors in the reproductive tract inflammation and male infertility. Chem Biol Letters 2020;7(2):113-23.
20. Flor LS, Reitsma MB, Gupta V, Ng M, Gakidou E. The effects of tobacco control policies on global smoking prevalence. Nat Med 2021; 27(2):239-43.
21. Akl EA, Jawad M, Lam WY, Co CN, Obeid R, Irani J. Motives, beliefs and attitudes towards waterpipe tobacco smoking: a systematic review. Harm Reduc J 2013;10:1.
22. El-Zaatari ZM, Chami HA, Zaatari GS. Health effects associated with waterpipe smoking. Tobacco Control 2015;24(Suppl 1):i31-43.
23. Arshad A, Matharoo J, Arshad E, et al. Knowledge, attitudes, and perceptions towards waterpipe tobacco smoking amongst college or university students: a systematic review. BMC Public Health 2019;19:1.
24. Suleiman I, Mohammed A, Kawu MU, et al. Maleficent effects of chronic tobacco Shisha smoke exposure on sperm DNA fragmentation, count, motility and morphology in adult male wistar rats. J Afr Assoc Physiol Sci 2021; 9(1):48-57.
25. Asiedua C, Abah E, Asare M. Theoretical Perspectives on Hookah Smoking Behavior: A Scoping Review of Studies Among Young Adults in Low-and Middle-Income Countries. J Comm Health 2025:1-20.
26. Htet H, Saw YM, Saw TN, et al. Prevalence of alcohol consumption and its risk factors among university students: A cross-sectional study across six universities in Myanmar. PLoS One 2020;15(2):e0229329.

Original Article

Psychosocial Burden across Rheumatoid Arthritis, Osteoarthritis, and Psoriatic Arthritis: A Comparative Study

Muhammad Ammar Khan[1], Mahpara Munir[2], Syed Kamal Husnain Shah[3], Muhammad Maroof[3], Salman Azhar[4] and Ayesha Shahab[5]

ABSTRACT

Objective: To compare the perceived social support and psychosocial burden of patients with psoriatic arthritis, osteoarthritis, and rheumatoid arthritis.

Study Design: Comparative Cross-Sectional Study

Place and Duration of Study: This study was conducted at the Department of Medicine, Madinah Teaching Hospital / University Medical and Dental College, Faisalabad from January to June 2025.

Methods: Based on estimations from the World Health Organization calculator and corrected for non-response, 500 persons with psoriatic arthritis, osteoarthritis, or rheumatoid arthritis were included in the sample. Stratified random sampling was used to choose the eligible participants. A standardized questionnaire that included sociodemographic information, the Multidimensional Scale of Perceived Social Support, and the Depression Anxiety Stress Scale-21 was used to gather data in person. Tukey post-hoc tests, one-way analysis of variance, and descriptive statistics were used in the Statistical Package for the Social Sciences version 26 analysis; $p < 0.05$ was deemed significant.

Results: PsA patients showed significantly higher levels of depression, anxiety, and stress ($p<0.05$) than RA and OA patients, as well as the lowest scores of MSPSS.

Conclusion: The findings highlight the significant psychological burden experienced by PsA patients as well as the significance of patient education, mental health screening, and a multidisciplinary approach in rheumatology therapy.

Key Words: Rheumatoid-Arthritis, Osteo-arthritis, Psoriatic-Arthritis, Psycho-social Burden

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INTRODUCTION

Chronic rheumatic disorders can affect every part of the body and have a major financial and emotional impact on patients as well as healthcare systems worldwide. Rheumatoid arthritis, osteoarthritis, and psoriatic arthritis are among the most prevalent of them, affecting a significant portion of the world's population. The Global Burden of Disease 2021 report states that rheumatoid arthritis alone accounts for 18.1 million disability-adjusted life years, making bone and joint illnesses one of the main causes of disability. Over 528 million people worldwide suffer with osteoarthritis, which is a major cause of pain, limited mobility, and a lower quality of life, especially for older persons[1-4].

Although psoriatic arthritis affects only 0.1% to 1% of the world's population, its burden is increased by the fact that it is often ignored or detected too late[5-6].

Due to population growth, longer life expectancies, and changes in lifestyle brought on by urbanization, arthritis-related illnesses are becoming increasingly prevalent in nations like Pakistan. As per local estimates, 0.5% to 1% of people have rheumatoid-arthritis, 12% to 20% of people more than 40 years of age have osteoarthritis, and 20- 30% of persons with psoriasis may develop psoriatic-arthritis[7-8]. Although these diseases cause stiffness, pain and incapacity, they have far-reaching outcomes. In addition to, having difficulty with social interactions and reducing independence in daily activities, arthritis can cause chronic stress in many patients. Anxiety and depression are more common in people with arthritis than in the general population, according to research, and up to 40% of rheumatoid arthritis patients may have clinically severe depressive symptoms[9]. While psoriatic arthritis can be particularly challenging as it affects the joints as well as skin, commonly resulting in stigma,

[1.] Registrar / Assistant Professor[2] / Fellow[3], Department of Rheumatology, University Medical and Dental College Faisalabad.

[4.] Associate Professor of Medicine / Senior Registrar[5], University Medical and Dental College Faisalabad.

Correspondence: Muhammad Ammar Khan, Registrar Rheumatology, University Medical and Dental College Faisalabad.
Contact No: 03453204431
Email: dowite2015@yahoo.com

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and emotional disturbances, osteo-arthritis may contribute to social seperation as pain limits daily life activities.

Support from friends, family, and the larger community can be crucial in helping people manage the emotional challenges that frequently accompany chronic disease, adhere to treatment, and deal more successfully. It is challenging to comprehend the similarities and differences between rheumatoid arthritis, osteoarthritis, and psoriatic arthritis because many prior research have only looked at mental health in one type of arthritis at a time. This emphasises the necessity of directly comparing these illnesses in order to have a better understanding of their emotional impact and the patients' demands for social assistance[10-11].

The study evaluated patients with psoriatic arthritis, osteoarthritis, and rheumatoid arthritis in terms of social support, depression, anxiety, and stress.

METHODS

After being approved by the Institutional Review Board of University Medical and Dental College, Faisalabad (Approval No. TUF/UMDC/DME/37/25), this study was carried out at the rheumatology clinic of a tertiary care hospital from January to June 2025. Using a 95% confidence level, 80% power, and a medium effect size (Cohen's f = 0.25), the sample size was calculated using the World Health Organization sample size calculator to compare mean scores among three groups. In order to consider for probable non-response, the estimated sample size of 450 patients was increased to 500.

Following informed consent, adults more than 18 years of age who met the American College of Rheumatology/EULAR criteria for rheumatoid arthritis, osteo-arthritis, or psoriatic-arthritis were added. Patients with severe mental illness, other serious autoimmune or systemic diseases, or factors that could make it difficult for them to comprehend or respond to the questionnaire were not included. A sampling technique that guaranteed appropriate representation of each disease group was used to choose the participants. A standardised questionnaire comprising sociodemographic data, the Depression Anxiety Stress Scale-21, and the Multidimensional Scale of Perceived Social Support was used to gather the data.

Face-to-face interviews were done by qualified research personnel in the participant's preferred language. 62.2% participants were women, with mean age of 57.5 ± 15.1 years. Using descriptive statistics, comparisons among groups, and post-hoc testing, the SPSS version 26 was used for data analysis. A p-value of < 0.05 was deemed statistically significant.

RESULTS

The final results had 500 persons in total. Most of the patients were between 45 & 65 years old, having mean age of 57.5 ± 15.1 years, and the majority of them were women (62.2%). RA was the most common condition identified, followed by osteo and psoriatic-arthritis, which demonstrates what is commonly seen in routine clinical settings (see Table I).

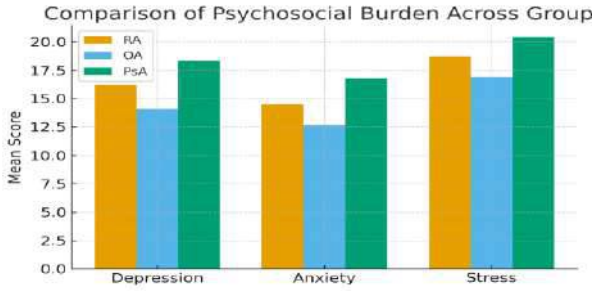
When the 3 groups were evaluated, marked differences were observed in emotional burden. Persons with rheumatoid-arthritis and psoriatic-arthritis had the highest mean ratings for stress and depression, whereas those patients with osteo-arthritis had generally lower values.

The differences among the 3 groups were statistically significant, and further testing revealed PsA had significantly higher emotional burden than both RA and OA patients ($p < 0.05$ for all comparisons). This indicates that patients with psoriatic-arthritis may face more mental distress, perhaps as a result of the condition's combination of both joint and skin involvement.

Table No.1: Participant's Demographic features

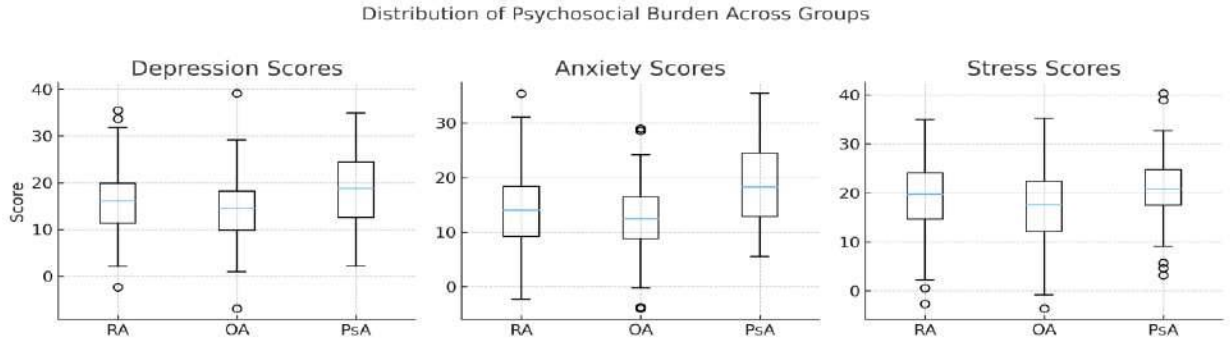
Variable/Group	N (%)
<35	91(18.2%)
<45	112 (22.4%)
<55	123(24.6%)
<65	117 (23.4%)
>=75	57 (11.4%)
Female	311 (62.2%)
Male	189 (37.8%)
RA	189 (37.8%)
OA	172 (34.4%)
PsA	87 (17.4%)

Majority of the patients were between the ages of 45 & 65, and 62.2% of them were women. The most common condition identified was RA, followed by PsA and OA.



Stress, anxiety & depression levels varied significantly among groups, with patients of PsA showing the highest psycho-social burden

Figure No.1: Psychosocial Burden Comparison by Group



Boxplots indicate that PsA patients have higher median ratings for stress, anxiety, & depression than the RA and OA patients.

Figure No.2: Boxplots of the DASS-21 Distribution

DISCUSSION

These results demonstrate that rheumatoid-arthritis, osteo-arthritis, and psoriatic-arthritis all have variable emotional burdens; patients with psoriatic-arthritis seem to be most affected. This is in line with previous research showing that people with psoriatic-arthritis commonly experience more emotional difficulties, maybe as a result of pain, and obvious skin involvement that could lead to embarrassment and reduced social confidence[12-14].

The depression levels seen in rheumatoid-arthritis patients are also consistent with previous studies that reveal a greater prevalence of depressive features in this population. The moderate emotional disturbance among osteo-arthritis patients is consistent with earlier studies demonstrating that persistent pain can significantly affect mood and daily life functioning[15]. The greater stress ratings associated with psoriatic-arthritis are particularly significant because they emphasise how important it is to include mental health in normal care for these individuals.

Higher levels of social support were linked to decreased anxiety & depression ratings, which is another important finding. This lends credence to the idea that those who have support from friends & family members may be better equipped to face emotional difficulties[16-18]. This study's comparison of rheumatoid-arthritis, osteo-arthritis, and psoriatic-arthritis in the same environment and with the same evaluation protocols is one of its key strengths. This made it easier to find similarities and differences between these illnesses.

Overall, this study lends credence to the idea that patients with these three types of arthritis have different emotional challenges. Given the greater level of discomfort shown in psoriatic-arthritis patients, mental health screening ought to be a important component of rheumatology therapy rather as an optional extras. Care plans that combine medical care & emotional support may be beneficial for patients, especially those who have both visible skin disease & joint involvement.

This study offers many advantages as well as few drawbacks. The high sample size, which enhances the validity of the results within the study context, is one of its primary benefits. The use of reputable tools to calculate social support, anxiety & depression is another advantage. However, because the research relied on self-reported questionnaire responses, some people might have given socially acceptable answers or underreported their emotions. Furthermore, because the study was limited to a single centre, the results might not be entirely applicable to other areas. In order to ascertain whether emotional support interventions can enhance long-term outcomes, future research should follow patients over time and incorporate several locations.

CONCLUSION

The emotional burden of different forms of arthritis varied significantly, according to this study. PsA patients had the higher depression, anxiety & stress levels and the lowest documented social support. RA patients showed a moderate emotional challenges, while OA patients generally reported lower levels.

Author's Contribution:

Concept & Design or acquisition of analysis or interpretation of data:	Muhammad Ammar Khan, Mahpara Munir, Syed Kamal Husnain Shah
Drafting or Revising Critically:	Muhammad Maroof, Salman Azhar, Ayesha Shahab
Final Approval of version:	All the above authors
Agreement to accountable for all aspects of work:	All the above authors

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REFERENCES

1. GBD 2019 Diseases and Injuries Collaborators. Global burden of 369 diseases and injuries in 204 countries and territories, 1990–2019. The Lancet 2020;396(10258):1204–1222. doi:10.1016/S0140-6736(20)30925-9
2. Engnar AÜ. Ab1203 Evaluation of the uric acid and hematological parameters in patients with nodal hand osteoarthritis. Annals of the Rheumatic Diseases 2023;82:1830.
3. Mease PJ. Psoriatic arthritis: update on pathophysiology, assessment and management. Ann Rheum Dis 2021;80(6):712–720. doi:10.1136/annrheumdis-2020-218555
4. Coates LC, Soriano ER, Corp N, et al. GRAPPA treatment recommendations for psoriatic arthritis 2021 update. Nat Rev Rheumatol 2022;18:465–479. doi:10.1038/s41584-022-00798-0
5. D'Angelo S, Atzeni F, Miceli MC, et al. Management of psoriatic arthritis: a consensus opinion by expert rheumatologists. Front Med (Lausanne) 2023;10:1327931. doi:10.3389/fmed.2023.1327931
6. Katz P. Fatigue in rheumatoid arthritis. Current rheumatology reports 2017;19(5):25.
7. Luna PC, Chu C-Y, Fatani M, et al. Psychosocial burden of psoriasis: a systematic literature review of depression. Dermatol Ther (Heidelb) 2023;13:3043–3055. doi:10.1007/s13555-023-01060-5
8. Uritani D, Kubo T, Yasuura Y, Fujii T. Reliability and validity of the Japanese short-form arthritis self-efficacy scale (ASES-8J). PLoS One 2023;18(10):e0292426. doi:10.1371/journal.pone.0292426
9. Picardi A, Adler DA, Chang H, Lega I, Gigantesco A, Pasquini P, et al. Development and preliminary validation of the PC-SAD5, a screener-derived short depression severity measure. J Eur Acad Dermatol Venereol 2012;26(2):165-71.
10. Matcham F, Rayner L, Steer S, Hotopf M. The prevalence of depression in rheumatoid arthritis: a systematic review and meta-analysis. Rheumatology (Oxford) 2013;52:2136–2148. doi:10.1093/rheumatology/ket169
11. Straub RH. Stress in RA: a trigger of proinflammatory pathways? Nature Reviews Rheumatol 2014;10(9):516-8.
12. Kitamura N, Shiraiwa H, Inomata H, Nozaki T, Ikumi N, Sugiyama K, et al. Efficacy and safety of minodronic acid hydrate in patients with steroid-induced osteoporosis. Int J Rheumatic Dis 2018;21(4):813-20.
13. Allen KD, Golightly YM. Epidemiology of osteoarthritis: state of the evidence. Curr Opin Rheumatol 2015;27:276–283. doi:10.1097/BOR.0000000000000161
14. Chopra A. The COPCORD world of musculoskeletal pain and arthritis. Rheumatol (Oxford) 2013;52(11):1925–1928. doi:10.1093/rheumatology/ket222
15. Lada G, Chinoy H, Talbot PS, Warren RB, Kleyn CE. Associations between psoriatic arthritis and mental health among psoriasis patients (BADBIR). Skin Health Dis 2022;2(4):e149. doi:10.1002/ski2.149
16. Mease PJ, Helliwell PS, Morita A, et al. Deucravacitinib in psoriatic arthritis: phase II trial. Ann Rheum Dis 2022;81(6):815–822. doi:10.1136/annrheumdis-2021-221664
17. Vestergaard SB, Esbensen BA, Midtgaard J, et al. Anxiety, depression and self-management in >12,000 inflammatory rheumatic disease patients. RMD Open 2024;10(1):e003412. doi:10.1136/rmdopen-2023-003412
18. Ionescu C-E, Popescu CC, Codreanu C. Prevalence and impact of depression and anxiety in rheumatoid arthritis. J Clin Med 2025;14(5):1718. doi:10.3390/jcm14051718.

Original Article

Comparison of the Efficacy of Intravenous Dexmedetomidine, and Tramadol for Control of Post-Spinal Shivering in Obstetric Patients Undergoing Lower Segment Caesarean Section

Sana Bahadur[1], Saira Sadaf[2] and Maira Ambreen[3]

ABSTRACT

Objective: To compare the efficacy of intravenous dexmedetomidine and tramadol in controlling post-spinal shivering among obstetric patients undergoing lower segment caesarean section under spinal anesthesia.
Study Design: A randomized clinical trial study
Place and Duration of Study: This study was conducted at the Department of Anesthesia and Intensive Care, Sheikh Zayed Medical College and Hospital, Rahim Yar Khan, Pakistan, from August 2025 to January 2026.
Methods: A total of 142 pregnant women aged 18 to 60 years scheduled for lower segment caesarean section under spinal anesthesia were enrolled and randomly allocated into two equal groups: dexmedetomidine group (n = 71) and tramadol group (n = 71). Patients in the dexmedetomidine group received intravenous dexmedetomidine 0.5 g/kg, while those in the tramadol group received intravenous tramadol 0.5 mg/kg prior to spinal anesthesia.
Results: Baseline demographic and physiological characteristics were comparable between the two groups. The incidence of post-spinal shivering was significantly lower in the dexmedetomidine group compared with the tramadol group (16.9% vs 38.0%, $p = 0.006$). The onset of shivering occurred later in the dexmedetomidine group (24.6 ± 5.3 minutes) than in the tramadol group (18.2 ± 6.1 minutes, $p < 0.001$). Sedation scores were higher in patients receiving dexmedetomidine ($p = 0.001$).
Conclusion: Intravenous dexmedetomidine demonstrated superior efficacy compared with tramadol in reducing the incidence and severity of post-spinal shivering in obstetric patients undergoing caesarean section.

Key Words: Dexmedetomidine, Tramadol, Spinal Anesthesia, Cesarean Section, Postoperative Shivering

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INTRODUCTION

Spinal anesthesia is widely regarded as the preferred anesthetic technique for lower segment caesarean section (LSCS) because of its technical simplicity, rapid onset, cost-effectiveness, and favorable maternal and neonatal safety profile[1]. However, perioperative shivering remains one of the most frequent and troublesome complications of neuraxial anesthesia in obstetric practice.

[1.] Department of Resident / Head of Department[2] / Consultant[3], Department of Anesthesia and ICU, Sheikh Zayed Hospital, Rahim Yar Khan, Pakistan.

Correspondence: Sana Bahadur, Resident, Department of Anesthesia and ICU, Sheikh Zayed Hospital, Rahim Yar Khan, Pakistan.
Contact No: 03331621841
Email: sanabahadur96@gmail.com

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The reported incidence of shivering during caesarean delivery under spinal anesthesia ranges from 40% to 80%[2], while the median incidence in parturients has been estimated at approximately 52%[3]. Shivering is defined as involuntary, repetitive skeletal muscle activity triggered by thermoregulatory mechanisms in response to perioperative hypothermia[4]. It is commonly precipitated by redistribution of core heat to the periphery after sympathetic blockade, peripheral vasodilation, heat loss from exposure to a cool operating environment, and loss of warm body fluids during surgery[2,5].

The consequences of perioperative shivering extend beyond discomfort alone. It increases oxygen consumption, carbon dioxide production, and lactic acid generation, and may interfere with monitoring of blood pressure, pulse oximetry, and electrocardiography[5]. In addition, shivering may increase intraocular and intracranial pressure, worsen postoperative pain, and delay postoperative recovery[6]. In obstetric patients, severe shivering may also negatively affect maternal satisfaction and early maternal-newborn interaction[7].

A range of pharmacological agents has been investigated for prevention and control of post-spinal shivering, including meperidine, tramadol, clonidine, fentanyl, ketamine, ondansetron, and dexmedetomidine[8]. Tramadol is a centrally acting analgesic with anti-shivering properties mediated through modulation of central thermoregulation, inhibition of serotonin and norepinephrine reuptake, and weak -opioid receptor agonism[9,10]. In obstetric patients, intravenous tramadol has shown effective control of shivering and has been reported to achieve faster shivering cessation than pethidine in some studies[10]. Dexmedetomidine, a highly selective 2 -adrenergic receptor agonist, exerts anti-shivering effects by suppressing central thermoregulatory control, decreasing sympathetic outflow, and lowering the shivering threshold without clinically significant respiratory depression[5,11]. Its efficacy has been demonstrated in both obstetric and non-obstetric populations, and growing evidence suggests that it may be superior to several conventional anti-shivering agents[11,12]. Despite the high burden of caesarean deliveries in Pakistan, locally relevant comparative evidence regarding anti-shivering agents in obstetric patients remains limited. A Pakistani randomized trial demonstrated the clinical utility of dexmedetomidine as an adjuvant during caesarean section[1], while another local study from Quetta highlighted the continuing relevance of post-spinal shivering and compared tramadol with ondansetron in caesarean patients[13].

METHODS

A randomized clinical trial was conducted in the Department of Anesthesia and Intensive Care, Sheikh Zayed Medical College and Hospital, Rahim Yar Khan, Pakistan, over a period of six months from August 2025 to January 2026 after approval from the institutional ethical review committee. Pregnant women scheduled for lower segment cesarean section under spinal anesthesia were enrolled after obtaining written informed consent. The study compared the efficacy of intravenous dexmedetomidine and tramadol for the prevention of post-spinal anesthesia shivering in obstetric patients. The sample size was calculated using the WHO sample size calculator, and a total of 142 patients were included and randomly allocated into two equal groups using simple random sampling: Group D (Dexmedetomidine, n=71) and Group T (Tramadol, n=71).

Females aged between 18 and 60 years of age who had a cesarean were eligible to be included. The patients who were hypersensitive to opioids or bupivacaine, cardiovascular disease, hypertension, psychosis, antepartum hemorrhage, cord prolapse, or fetal distress were excluded. Preoperative demographic and clinical data took place. An 18-gauge intravenous cannula was placed on admission to the operating room, and the standard monitoring (electrocardiography, heart rate, non-invasive blood pressure, oxygen saturation, and temperature) was implemented.

Group D patients were using dexmedetomidine 0.5 g/kg in 10 mL normal saline, and Group T patients were using tramadol 0.5 mg/kg in 10 mL of normal saline. The study medication was as an intravenous infusion during 10 minutes just before spinal anesthesia. All patients were given warmed lactated Ringer solution at the ratio of 10 mL/kg during 30 minutes before anesthesia. The spinal anesthesia was done at L3-L4 or L4-L5 between 25-gauge Quincke needle containing 2.8 mL (14 mg) of 0.5% hyperbaric bupivacaine. The intraoperative monitoring comprised of heart rate, blood pressure, mean arterial pressure, oxygen saturation, and temperature at baseline and every five minutes.

A four-point scale of shivering (0-4) was used with a grade of 0 representing no shivering and 4 representing generalized shivering. The Ramsay sedation scale was used to determine sedation. In case of grade 3 or 4 shivering 15 minutes after the drug administration, rescue treatment was performed with intravenous pethidine 25mg. Unfavorable events such as hypotension, bradycardia, nausea, vomiting, and hallucinations were noted and handled following the usual procedures.

Data were analyzed using SPSS version 20. Continuous variables were presented as mean ± standard deviation, while categorical variables were expressed as frequencies and percentages. Comparisons between the two groups were performed using analysis of variance (ANOVA) for continuous variables and the chi-square test for categorical variables. A p-value of less than 0.05 was considered statistically significant.

RESULTS

The mean age of the overall study population was 29.4 ± 4.8 years (range 19–39 years). Patients in Group D had a mean age of 29.1 ± 4.7 years while those in Group T had a mean age of 29.7 ± 4.9 years, with no statistically significant difference between groups (p=0.48). Most patients were between 26 and 35 years of age.

Baseline hemodynamic parameters were also comparable between both groups before spinal anesthesia. The mean baseline mean arterial pressure (MAP), heart rate, and oxygen saturation showed no statistically significant difference between groups.

The incidence of post-spinal shivering was significantly lower in the dexmedetomidine group compared with the tramadol group. Shivering occurred in 12 patients (16.9%) in Group D compared with 27 patients (38.0%) in Group T, showing a statistically significant difference (p=0.006).

Table No.1: Demographic and baseline characteristics of the study population (n=142)

Variable	Group D (Dexmedeto-midine) n=71	Group T (Tramadol) n=71	p-value
Age (years) Mean ± SD	29.1 ± 4.7	29.7 ± 4.9	0.48
Age Group (years)			
18–25	18 (25.4%)	16 (22.5%)	
26–30	29 (40.8%)	31 (43.7%)	
31–35	17 (23.9%)	18 (25.4%)	
>35	7 (9.9%)	6 (8.4%)	0.89
Gestational Age(weeks) Mean ± SD	38.2 ± 1.1	38.4 ± 1.0	0.31
Duration of Surgery (min) Mean ± SD	54.7 ± 9.3	56.1 ± 8.9	0.37
Parity			
Nulliparous	19 (26.8%)	21 (29.6%)	
Primiparous	20 (28.2%)	18 (25.4%)	
Multiparous	32 (45.0%)	32 (45.0%)	0.92

Table No.2: Baseline physiological parameters of patients

Parameter	Group D (n=71) Mean ± SD	Group T (n=71) Mean± SD	p-value
Mean Arterial Pressure (mmHg)	91.3 ± 7.2	92.1 ± 6.9	0.53
Pulse Rate (bpm)	88.6 ± 9.1	89.8 ± 8.7	0.44
SpO_2 (%)	98.4 ± 1.1	98.2 ± 1.2	0.37
Tympanic Temperature (°C)	36.7 ± 0.3	36.8 ± 0.3	0.28
Room Temperature (°C)	24.1 ± 0.6	24.0 ± 0.7	0.61

Table No.3: Incidence and severity of shivering

Variable	Group D (n=71)	Group T (n=71)	p-value
Shivering present	12 (16.9%)	27(38.0%)	0.006
Shivering absent	59 (83.1%)	44(62.0%)	
Severity of Shivering			
Grade 1	5 (7.0%)	7 (9.9%)	
Grade 2	4 (5.6%)	9 (12.7%)	
Grade 3	2 (2.8%)	7 (9.9%)	
Grade 4	1 (1.4%)	4 (5.6%)	0.03

The mean time to onset of shivering was longer in the dexmedetomidine group compared with the tramadol group. Patients in Group D experienced shivering at a mean time of 24.6 ± 5.3 minutes, while Group T developed shivering earlier at 18.2 ± 6.1 minutes, which was statistically significant ($p<0.001$).

Table No.4: Time to onset of shivering

Variable	Group D (n=71)	Group T (n=71)	p-value
Time to shivering (minutes) Mean ± SD	24.6 ± 5.3	18.2 ± 6.1	<0.001

The dexmedetomidine group recorded higher scores on the sedation scale, which is indicative of the established sedative quality of the medication. The majority of patients in Group D reported a Ramsay sedation of 2-3, which is a sign of calm and cooperative sedation, but the patients in the tramadol group tended to be completely awake.

Table No.5: Ramsay sedation score distribution

Sedation Score	Group D (n=71)	Group T (n=71)	p-value
Score 1	14 (19.7%)	39 (54.9%)	
Score 2	33 (46.5%)	23 (32.4%)	
Score 3	18 (25.4%)	7 (9.9%)	
Score 4	6 (8.4%)	2 (2.8%)	0.001

DISCUSSION

The demographic profile of the study population was widely similar to other studies of obstetric anesthesia that were previously published. The average age of 29.4 +/- 4.8 years was also similar to the population of parturients in the study by Yaakop et al, which investigated women undergoing a caesarean section under spinal anesthesia with an average age of 30.2 +/- 5.2 years (10). In our study, the internal validity of the comparative results is supported by the similarity in baseline hemodynamics of the two groups of treatment. The frequency of post-spinal shivering in our cohort was 27.5 percent compared to 40-80 percent of incidence described in the literature[2,14]. But, published obstetric data indicate that shivering is frequent during caesarean section, with the rates ranging about 50 in most institutions[3,11]. The relatively lower rate in our research could be due to the differences in the institutional temperature control, intraoperative warming, patient factors, or local anesthesia. We find that dexmedetomidine was more effective than tramadol in the control of post-spinal shivering, most episodes of shivering were mild in nature in the dexmedetomidine group, and the incidence of shivering is significantly lower in Group D than in Group T (16.9% vs 38.0% p=0.006). The meta-analysis of Wang et al. findings is in agreement with these findings as these results indicated that dexmedetomidine had a

much higher effective rate of shivering control and shorter time to shivering cessation than tramadol in randomized controlled trials[15]. Better prevention of intraoperative shivering was also reported by Kumar and Ammu in patients under surgery under subarachnoid blockade by dexmedetomidine as compared to tramadol[16]. On the same note, Venkatraman et al. discovered that dexmedetomidine was more effective at providing speed in shivering control and reducing recurrence compared to tramadol[17]. All these studies added up to support the higher anti-shivering efficacy of dexmedetomidine that we found in our patients. The fact that shivering in the dexmedetomidine group was greatly delayed also indicates that a stronger prophylactic thermoregulatory effect was likely to be present. According to Zhang, dexmedetomidine pretreatment decreased the rate of shivering during caesarean section and augmented the anti-shivering impact of tramadol when administered as having rescue treatment[18]. Jayaraj et al. also reported that tramadol is also a successful prophylaxis agent in caesarean surgery under spinal anesthesia[7]. Moreover, Mades et al. also have reported successful shivering and constant hemodynamic conditions using tramadol in patients under spinal anesthesia[6]. Such results point to the fact that tramadol can still be used as an option in the case where dexmedetomidine is not either available or contraindicated. The increased scores in Ramsay sedation scale in dexmedetomidine group are in line with its pharmacological characteristics of an alpha 2 adrenergic agonist. According to Wang et al., dexmedetomidine sedation was much more frequent than tramadol[15]. Kawsar et al. also reported a better sedation score of patients undergoing dexmedetomidine in order to prevent the occurrence of post-spinal shivering[4]. Sedation in our study was not excessive in any way and no patient became excessively or unarousable. The majority of the patients were peaceful and cooperative which can be a better experience during spinal anesthesia. Observation of the increased rate of nausea and vomiting in the tramadol group is congruent with the earlier published results. According to Wang et al., dexmedetomidine showed significantly reduced cases of nausea and vomiting as opposed to tramadol[15]. Yu et al. also noted decreased gastrointestinal adverse effects using dexmedetomidine in patients undergoing caesarean section[5]. These results were in favor of dexmedetomidine with regards to its gastrointestinal tolerance profile. The incidence of bradycardia was higher in the dexmedetomidine group though this was not significant. This finding is in line with the meta-analysis carried out by Wang et al. which indicated that dexmedetomidine had a higher risk of causing bradycardia[15]. Patel and Halvadia also found that dexmedetomidine was an effective control of intraoperative shivering but hemodynamic monitoring was necessary[19]. Thus, dexmedetomidine seems to be an excellent candidate in controlling shivering, but clinicians are to be aware of possible cardiovascular consequences.

CONCLUSION

A single intravenous dose of dexmedetomidine seems to be more effective than tramadol to decrease the incidence and severity of post-spinal shivering among patients undergoing cesarean section with acceptable safety and sedation profiles. Its application can help to enhance intraoperative comfort and perioperative in obstetric anesthesia.

Author's Contribution:

Concept & Design or acquisition of analysis or interpretation of data:	Sana Bahadur, Saira Sadaf
Drafting or Revising Critically:	Sana Bahadur, Maira Ambreen
Final Approval of version:	All the above authors
Agreement to accountable for all aspects of work:	All the above authors

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REFERENCES

1. Urooj S, Mughal A, Shareef M, Naz A, Shah M, Siddiqui S. Intrathecal bupivacaine-fentanyl and bupivacaine-dexmedetomidine for cesarean section: a randomized controlled trial. Anaesth Pain Intensive Care 2022;26(5):616-622. doi:10.35975/apic.v26i5.2019
2. Feng G, Wang Y, Jie-hua F, Luo X, Li C, Yao S. The relationship between core temperature and perioperative shivering during caesarean section under intrathecal anesthesia with bupivacaine and ropivacaine: a randomized controlled study. J Anesth 2021;35(6):889-895. doi:10.1007/s00540-021-02995-9
3. Bautista L, George R. Dexmedetomidine for every Cesarean delivery…maybe not? Can J Anaesth 2019;66(7):751-754. doi:10.1007/s12630-019-01355-2
4. Kawsar M, Das S, Banik D, Mondal S, Islam M, Hossain M, et al. Comparative study between dexmedetomidine and nalbuphine for prevention of post spinal shivering in obstetrics cases: a randomized controlled trial. J Bangladesh Soc Anaesthesiol 2022;35(2):3-11. doi:10.3329/jbsa.v35i2.67886
5. Yu G, Jin S, Chen J, Yao W, Song X. The effects of novel 2 -adrenoreceptor agonist

dexmedetomidine on shivering in patients underwent caesarean section. Biosci Rep 2019;39(2). doi:10.1042/bsr20181847

6. Madem A, Parusha S, Mallem D, Pacharla I, Kotra V, Chooi W, et al. Comparing the effect of intravenous tramadol and intravenous nalbuphine in addition to midazolam for the control of shivering after spinal anesthesia. J Pharmacol Pharmacother 2024;15(3):264-276. doi:10.1177/0976500x241262076
7. Jayaraj A, Balachander H, Kuppusamy S, Arusamy S, Rai Y, Siddiqui N. Comparison of meperidine, tramadol and fentanyl for post-spinal shivering prevention during cesarean delivery: a double-blind randomized controlled trial. J Obstet Gynaecol Res 2019;45(11):2202-2208. doi:10.1111/jog.14106
8. Misra S, Singh S, Sarkar S, Behera B, Jena S. The effect of prophylactic steroids on shivering in adults undergoing surgery: a systematic review and meta-analysis of randomized controlled trials. Anesth Analg 2023;137(2):332-344. doi:10.1213/ANE.0000000000006578
9. Afifi E, Abouseeda M, Mohamed T. New approach in prevention of shivering with spinal anesthesia. Benha J Appl Sci 2023;8(11):1-11. doi:10.21608/bjas.2023.242669.1269
10. Yaakop A, Hassan M, Omar S, Mazlan M, Mukmin L, Hassan W. Tramadol vs. pethidine to control perioperative shivering in cesarean section under spinal anesthesia: a double-blind study. Anaesth Pain Intensive Care 2022;26(3):283-290. doi:10.35975/apic.v26i3.1893
11. Lamontagne C, Lesage S, Villeneuve É, Lidzborski E, Derstenfeld A, Crochetière C. Intravenous dexmedetomidine for the treatment of shivering during Cesarean delivery under neuraxial anesthesia: a randomized-controlled trial. Can J Anaesth 2019;66(7):762-771. doi:10.1007/s12630-019-01354-3
12. Lamontagne C, Lesage S, Villeneuve É, Lidzborski E, Derstenfeld A, Crochetière C. In reply: Is an intravenous bolus of dexmedetomidine really a safe and effective option in treating shivering following neuraxial anesthesia? Can J Anaesth 2019;67(1):145. doi:10.1007/s12630-019-01430-8
13. Kashif S, Azam F, Mehmood K, Tasneem S, Shamim A, Alam F, et al. Comparison of intravenous ondansetron versus intravenous tramadol on post-spinal shivering and nausea/vomiting in cesarean sections. Life Sci 2020;1(4):6. doi:10.37185/lns.1.1.102
14. Zhang Y, Zhang J, Hu J, Wen C, Dai S, Yang D, et al. Neuraxial adjuvants for prevention of perioperative shivering during cesarean section: a network meta-analysis following the PRISMA guidelines. World J Clin Cases 2019;7(16):2287-2301. doi:10.12998/wjcc.v7.i16.2287
15. Wang J, Wang Z, Liu J, Wang N. Intravenous dexmedetomidine versus tramadol for treatment of shivering after spinal anesthesia: a meta-analysis of randomized controlled trials. BMC Anesthesiol 2020;20(1). doi:10.1186/s12871-020-01020-y
16. Kumar R, Ammu S. Comparing the efficacy of tramadol, ketamine and dexmedetomidine in the prevention of intraoperative shivering in patients undergoing surgery under subarachnoid blockade. Ind J Clin Anaesth 2021;8(3):446-451. doi:10.18231/j.ijca.2021.085
17. Venkatraman R, Karthik K, Pushparani A, Annadurai M. A prospective, randomized, double-blinded control study on comparison of tramadol, clonidine and dexmedetomidine for post spinal anesthesia shivering. Braz J Anesthesiol 2018;68(1):42-48. doi:10.1016/j.bjane.2016.08.001
18. Zhang Z. Prophecy with dexmetomitidine will decrease the incidence of pre-operative shivering and enhance anti-shivering-effect of tramadol during cesarean section. Biomed J Sci Tech Res 2021;35(1). doi:10.26717/bjstr.2021.35.005650
19. Patel V, Halvadia S. Comparison of pethidine and dexmedetomidine for the control of intraoperative shivering under spinal anesthesia. Academia Anesthesiol Int 2020;5(1):96-99. doi:10.21276/aan.2020.5.1.19

Original Article

Comparison of Hospital Stay Length with Day-Of-Surgery Mobilization Versus Control after Cemented Total Hip Arthroplasty

Adeel Hameed[1], Syed Imran Haider[2], Zahid Hafeez[1], Muhammad Ziad[1], Rehman Azmat[2] and Ali Ammad[2]

ABSTRACT

Objective: To compare the length of hospital, stay in patients undergoing cemented total hip arthroplasty who were mobilized on the day of surgery versus those mobilized on the first postoperative day.

Study Design: Randomized controlled trial study

Place and Duration of Study: This study was conducted at the Department of Orthopedic Surgery, Unit I, King Edward Medical University/Mayo Hospital, Lahore, Pakistan, from January 2025 to June 2025.

Methods: A total of 180 patients aged 40–70 years undergoing cemented total hip arthroplasty were randomly allocated into two groups (n=90 each). Group A patients were mobilized on the day of surgery, while Group B patients were mobilized on the first postoperative day. Hospital stay was recorded in hours from surgery to discharge. Data were analyzed using SPSS version 21, and an independent sample t-test was applied.

Results: The mean age was 56.36±8.27 years in the early mobilization group and 55.49±9.17 years in the control group, with females constituting 63.9% of participants. The overall mean hospital stay was 64.52 ± 9.43 hours. Patients mobilized on the day of surgery had a significantly shorter hospital stay (60.82±7.61 hours) compared with the control group (68.21±9.65 hours) (p=0.001).

Conclusion: Day-of-surgery mobilization after cemented total hip arthroplasty significantly reduces hospital length of stay compared with conventional postoperative mobilization.

Key Words: Total hip arthroplasty, Early mobilization, Hospital stay, Rehabilitation

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INTRODUCTION

One of the most successful and widely practiced orthopedic surgeries globally is the total hip arthroplasty (THA), which offers significant benefits in pain relief, mobility, and overall quality of life to patients with advanced hip disease[1,2]. The THA, which has been dubbed the operation of the century, has shown better functional results than non-surgical management[3].

[1.] Senior Registrar / Consultant[2], Department of Orthopedic Surgery, Unit 1, King Edward Medical University/Mayo Hospital, Lahore.

Correspondence: Dr. Adeel Hameed, Senior Registrar, Department of Orthopedic Surgery, Unit 1, King Edward Medical University/Mayo Hospital, Lahore.
Contact No: 03216800900
Email: adeelxp@gmail.com

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The prevalence of THA in the world has been on the rise in the past ten years by a wide margin because of aging societies and the continued growth of hip osteoarthritis[4]. Among fixation methods, cemented THA is common, especially in older patients with osteoporotic bone, where cemented femoral stems provide reliable fixation with a reduced incidence of periprosthetic fracture compared with cementless implants[5,6].

Hospital length of stay (LOS) is a valuable outcome that influences healthcare costs and patient recovery after THA[7,8]. One of the major elements of the enhanced recovery after surgery (ERAS) pathways is early mobilization, and it has been suggested that early mobilization after surgery can reduce length of stay without increasing complications[7,9]. Quick rehabilitation programs that begin with mobilization immediately after surgery have been associated with significant decreases in LOS and functional recovery outcomes[2]. A modest yet statistically significant reduction in hospital stay has also been attributed to early physiotherapy intervention, which is consistent with the clinical and economic advantages of day-of-surgery (DOS) mobilization strategies[10].

Although it has been well-proven in several countries for early mobilization following THA, it has not been widely practiced in Pakistan. The Pakistani healthcare system is based on the lack of resources, such as hospital beds, and the high number of patients, which is why long-term hospitalization is especially problematic[2,11].

Because most healthcare expenses are borne directly by patients and their families, reducing inpatient stays is clinically and economically important (6). Demonstrating the effectiveness of DOS mobilization in reducing LOS after cemented THA may therefore contribute to improved perioperative care pathways and more efficient resource utilization in Pakistani hospitals. Thus, this study aimed to compare the length of hospital stay among patients undergoing cemented total hip arthroplasty who were mobilized on the day of surgery with those mobilized on the first postoperative day.

METHODS

This randomized controlled trial was conducted in the Department of Orthopedic Surgery, Unit I, at Mayo Hospital, Lahore, over six months, from January 2025 to June 2025. A total of 180 patients aged 40–70 years, of either gender, undergoing cemented total hip arthroplasty were enrolled using a non-probability, consecutive sampling technique. Patients with open fractures, comminuted fractures on radiography, multiple fractures, bilateral hip involvement, delayed presentation beyond 72 hours, or underlying metabolic bone disorders such as osteoporosis, osteomalacia, osteoarthritis, or rheumatoid arthritis were excluded from the study. All participants provided written informed consent before enrolling in the study, and baseline demographic and clinical variables, such as age, gender, body mass index (BMI), and side of surgery, were collected using a structured data collection form.

All the surgical procedures were conducted by the same orthopedic surgeon in general anesthesia and regular surgical procedures to allow uniformity. The transfer of patients to the orthopedic ward was done to monitor and provide overall care to the patients.

The participants were randomly allocated in two equal groups through the lottery approach. Group A (early mobilization group): patients were mobilized on the day of surgery in case they are medically stable. The mobilization of the Group B (control group) was started on the first postoperative day as a normal postoperative practice. The primary time-based outcome measure was hospital stay, which was measured in hours of surgery to discharge. Both parties were standardized on discharge criteria which included clinical stability, ambulation (assisted) and oral medication tolerance.

Data analysis and entry were done using Statistical Package of Social Sciences (SPSS) version 21. The age, BMI and number of hospital stays are quantitative variables that were presented as standard deviations and means. The categorical variables, including gender and surgical side, were, on the contrary, expressed in frequency and percentages. The independent samples t-test was applied to test the difference of the mean hospital stay of the two groups. Stratified analyses were done to determine the effects of the possible confounders, such as age, gender, BMI category, and surgical side. The p-value of 0.05 was considered as significant.

RESULTS

This randomized controlled trial enrolled 180 patients undergoing cemented total hip arthroplasty (THA). The average age of patients in the early mobilization group was 56.36±8.27, and the average age of the control group was 55.49±9.17. The study was predominantly female, with 63.9% of cases. The two groups showed a similar distribution of body mass index (BMI) and surgical side, indicating similar baseline characteristics. (Table 1)

Table No.1: Baseline Demographic Characteristics of the Study Population

Variable	Early Mobilization (n=90)	Control (n=90)	Total (n=180)
Age (years), Mean ± SD	56.36 ± 8.27	55.49 ± 9.17	—
BMI (kg/m²), Mean ± SD	26.98 ± 4.57	26.98 ± 4.57	—
Male, n (%)	28 (31.1%)	37 (41.1%)	65 (36.1%)
Female, n (%)	62 (68.9%)	53 (58.9%)	115 (63.9%)
Left side surgery, n (%)	51 (56.7%)	51 (56.7%)	102 (56.7%)
Right side surgery, n (%)	39 (43.3%)	39 (43.3%)	78 (43.3%)

The mean total hospital stay was 64.52 hours, with a standard deviation of 9.43 hours, across all participants (48-84 hours). (Table 2)

Table No. 2: Descriptive Statistics of Hospital Stay

Variable	Value
Number of patients	180
Mean hospital stay (hours)	64.52
Standard deviation	9.43
Minimum stay (hours)	48
Maximum stay (hours)	84

A comparison between the study groups demonstrated that patients mobilized on the day of surgery had a shorter hospital stay (60.82±7.61 hours) than those mobilized after the first postoperative day (68.21±9.65 hours). The difference was statistically significant (p=0.001). (Table 3)

Table No. 3: Comparison of Mean Hospital Stay Between Study Groups

Variable	Early Mobilization (n=90)	Control (n=90)	p-value
Hospital stays (hours), Mean ± SD	60.82 ± 7.61	68.21 ± 9.65	0.001

The further stratified analysis revealed that early mobilization was consistently associated with a shorter hospital stay across subgroups of demographics and clinical conditions, including age, gender, surgical side, and body mass index. The decline in hospital stay was statistically significant in the majority of the strata. (Table 4)

Table No.4: Stratified Analysis of Hospital Stay Between Study Groups

Stratification Variable	Category	Early Mobilization (Mean ± SD hours)	Control (Mean ± SD hours)	p-value
Age	60 years	60.63 ± 7.81	69.73 ± 9.54	0.001
	>60 years	61.19 ± 7.32	65.32 ± 9.34	0.058
Gender	Male	59.68 ± 6.97	68.41 ± 9.32	0.001
	Female	61.34 ± 7.88	68.08 ± 9.97	0.001
Surgical Side	Left	61.31 ± 7.98	66.14 ± 9.87	0.008
	Right	60.18 ± 7.14	70.92 ± 8.76	0.001
BMI	Normal	60.50 ± 7.97	67.85 ± 10.35	0.002
	Abnormal	61.02 ± 7.44	68.43 ± 9.29	0.001

DISCUSSION

The current randomized controlled trial showed that day-of-surgery (DOS) mobilization was more effective than traditional mobilization procedures, with a reduced hospital length of stay (60.82±7.61 hours vs. 68.21±9.65 hours; p=0.001). The obtained results are consistent with the growing body of international literature supporting early mobilization following joint replacement surgery.

According to Elmoghazy et al., same-day mobilization and fast-track rehabilitation following THA demonstrated a significant reduction in the LOS (4.5 vs. 7.8 days) and enhanced functional outcomes[2]. Likewise, Bristol discovered that patients who ambulated in less than eight hours after surgery stayed in the hospital much shorter in comparison to patients who ambulated late[12]. Yakkanti et al. further found that postoperative mobilization on day 0 reduced LOS and increased the number of home-discharge patients after arthroplasty surgeries[13].

Perioperative pathways based on ERAS place a high priority on early mobilization. According to a report by Wainwright and Immins, ERAS programs have helped decrease LOS in joint replacement surgery without increasing the risk of complications[14]. The ERAS Society recommendation also reinforces the idea of early mobilization as one of the primary interventions that enhances overall recovery and minimizes the negative physiological consequences associated with long-term bed rest[15]. Bontea et al. have also shown that early mobilization significantly reduces LOS after THA[1].

Other studies support the clinical advantages of early postoperative ambulation. According to Stock et al., postoperative day-0 physiotherapy positively influenced ambulation distance and reduced LOS[16]. Siletz et al. found that delayed mobilization was a high-risk factor for complications and increased hospital stay[17], and Fisher et al. found that inability to ambulate immediately after hip surgery was associated with longer hospitalization and adverse outcomes[18].

Systematic reviews and cohort studies also support these. Nursalam et al. found that shortened LOS was the most reliable benefit of early mobilization in postoperative lower-extremity surgery[19]. In contrast, Huang et al. found similar advantages for postoperative recovery with early ambulation[20]. Another study by Romano et al. revealed that fast-track protocols were associated with remarkable increases in early ambulation rates and shortened hospital stays following joint replacement[21]. According to Thwin et al., patients who received physiotherapy within 24 hours of surgery also had shorter LOS[22].

The benefit of DOS mobilization was similar across sex, BMI, and surgical-side subgroups in the present study, suggesting the generalizability of the intervention. This is consistent with the assessment by Rodriguez et al., who found that age, sex, and BMI did not significantly influence early discharge outcomes following THA[23].

The research was carried out at a single tertiary care center, with a relatively short follow-up, which may limit the extent to which the results can be generalized. Moreover, other postoperative outcomes, such as complications, functional recovery, and long-term patient satisfaction, were not considered.

CONCLUSION

Day-of-surgery mobilization after cemented total hip arthroplasty was associated with a significantly shorter hospital stay compared with next-day mobilization, suggesting that early ambulation may improve recovery and hospital efficiency.

Author's Contribution:

Concept & Design or acquisition of analysis or interpretation of data:	Adeel Hameed, Syed Imran Haider, Zahid Hafeez
Drafting or Revising Critically:	Muhammad Ziad, Rehman Azmat, Ali Ammad
Final Approval of version:	All the above authors
Agreement to accountable for all aspects of work:	All the above authors

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REFERENCES

1. Bontea M, Bimbó-Szuhai E, Macovei I, Maghiar P, andor M, Botea M, et al. Anterior approach to hip arthroplasty with early mobilization is key to reducing hospital length of stay. Medicina 2023; 59(7):1216. https://doi.org/10.3390/medicina 59071216
2. Elmoghazy A, Lindner N, Tingart M, Salem K. Conventional versus fast track rehabilitation after total hip replacement: a randomized controlled trial. J Orthop Trauma Rehabil 2022;29(1). https://doi.org/10.1177/22104917221076501
3. Naylor J, Hart A, Mittal R, Harris I, Xuan W. The effectiveness of inpatient rehabilitation after uncomplicated total hip arthroplasty: a propensity score matched cohort. BMC Musculoskelet Disord 2018;19(1). https://doi.org/10.1186/s12891-018-2134-3
4. Abu-Awwad A, Tudoran C, Ptracu J, Faur C, Tudoran M, Mekere G, et al. Unexpected repercussions of the COVID-19 pandemic on total hip arthroplasty with cemented hip prosthesis versus cementless implants. Materials 2023; 16(4):1640. https://doi.org/10.3390/ma16041640
5. Gasbarra E, Piccirilli E, Greggi C, Trapani F, Iundusi R, Tarantino U. Hip replacement in femoral neck fractures: the role of cementation and its technical difficulties. Ther Adv Musculoskelet Dis 2022;14. https://doi.org/10.1177/1759720X22 1144278
6. Giordano V, Woolley P, Heetveld M, Smith C, Ridder V. Geriatric proximal femur fracture updates. OTA Int 2024;7(3S). https://doi.org/10. 1097/OI9.0000000000000323
7. Chen C, Xin Z, Luo Y, Chen L, Kang P. Key elements of enhanced recovery after total joint arthroplasty: a reanalysis of ERAS guidelines. Orthop Surg 2023;15(3):671-678. https://doi.org/ 10.1111/os.13623
8. Blümel S, Hanauer M, Heimann A, Tannast M, Schwab J. Cost and resource comparison analysis for THA in Switzerland and Austria. Int J Technol Assess Health Care 2024;40(1). https://doi.org/ 10.1017/S0266462324000321
9. Childers C, Siletz A, Singer E, Faltermeier C, Hu Q, Ko C, et al. Surgical technical evidence review for elective total joint replacement conducted for the AHRQ safety program for improving surgical care and recovery. Geriatr Orthop Surg Rehabil 2018;9. https://doi.org/10.1177/215145851875 4451
10. Costa L, Lima V, Barros F, Pereira P, Lima R, Silva A, et al. Hip arthroplasty: effective rehabilitation protocols. Res Soc Dev 2021;10(4): e45510414370. https://doi.org/10.33448/rsd-v10i4.14370
11. Bleß H, Kip M. White paper on joint replacement 2018. https://doi.org/10.1007/978-3-662-55918-5
12. Bristol J. Early ambulation in hip replacement patients regarding length of hospital stay. J Orthop Orthop Surg 2021;2(2):30-34. https://doi.org/10. 29245/2767-5130/2021/2.1137
13. Yakkanti R, Miller A, Smith L, Feher A, Mont M, Malkani A. Impact of early mobilization on length of stay after primary total knee arthroplasty. Ann Transl Med 2019;7(4):69. https://doi.org/10. 21037/atm.2019.02.02
14. Wainwright T, Immins T. Orthopedic surgery in enhanced recovery after surgery 2020:477-486. https://doi.org/10.1007/978-3-030-33443-7_49
15. Wainwright T, Gill M, McDonald D, Middleton R, Reed M, Sahota O, et al. Consensus statement for perioperative care in total hip and knee replacement surgery: ERAS society recommendations. Acta Orthop 2019;91(1):3-19. https://doi.org/10.1080/17453674.2019.1683790
16. Stock L, Dennis K, MacDonald J, Goins A, Turcotte J, King P. Postoperative outcomes of mepivacaine vs bupivacaine in patients undergoing total joint arthroplasty with spinal anesthesia. Arthroplasty 2022;4(1). https://doi.org/10.1186/ s42836-022-00138-3
17. Siletz A, Childers C, Faltermeier C, Singer E, Hu Q, Ko C, et al. Surgical technical evidence review of hip fracture surgery conducted for the AHRQ safety program for improving surgical care and recovery. Geriatr Orthop Surg Rehabil 2018;9. https://doi.org/10.1177/2151459318769215

18. Fisher N, Parola R, Bi A, Konda S, Egol K. Ambulation on hip fracture postoperative day 1: a marker for better outcomes following hip fracture surgery in patients 55 years. Hip Int 2022; 33(4): 779-788. https://doi.org/10.1177/11207000221107853
19. Nursalam N, Mustikasari M, Ifadah E, Hapsari E. Effect of early mobilization on hip and lower extremity postoperative recovery: a literature review. SAGE Open Nurs 2023;9. https://doi.org/10.1177/23779608231167825
20. Huang J, Shi Z, Duan F, Fan M, Yan S, Yi W, et al. Benefits of early ambulation in elderly patients undergoing lumbar decompression and fusion surgery: a prospective cohort study. Orthop Surg 2021;13(4):1319-1326. https://doi.org/10.1111/os.12953
21. Romano L, Rigoni M, Torri E, Nella M, Morandi M, Casetti P, et al. A propensity score-matched analysis to assess outcomes in pre- and post-fast-track hip and knee elective prosthesis patients. J Clin Med 2021;10(4):741. https://doi.org/10.3390/jcm10040741
22. Thwin L, Chee B, Yap Y, Tan K. Total knee arthroplasty: does ultra-early physical therapy improve functional outcomes and reduce length of stay? J Orthop Surg Res 2024;19(1). https://doi.org/10.1186/s13018-024-04776-y
23. Rodriguez S, Shen T, LeBrun D, Valle A, Ast M, Rodríguez J. Ambulatory total hip arthroplasty: causes for failure to launch and associated risk factors. Bone Joint Open 2022;3(9):684-691. https://doi.org/10.1302/2633-1462.39.BJO-2022-0106.R1

Original Article

Comparison of Outcomes of Linagliptin Plus Insulin and Insulin Only Among Type II Diabetes Mellitus Patients with Chronic Kidney Disease

Shumaila Ahmed Khan[1], Nayyar Yaqoob[2], Naseem Ullah[3] and Sana Hassan[4]

ABSTRACT

Objective: To compare the outcomes of linagliptin plus insulin versus insulin alone among patients with type II diabetes mellitus with chronic kidney disease.

Study Design: Randomized clinical trial study

Place and Duration of Study: This study was conducted at the Department of Medicine, Fauji Foundation Hospital, Rawalpindi, Pakistan, from October 2025 to December 2025.

Methods: A total of 284 patients with type II diabetes mellitus and chronic kidney disease were included in the study and randomly allocated into two equal groups. Group A received linagliptin 5 mg once daily in addition to insulin therapy, while Group B received insulin therapy alone. Patients aged 18–75 years with eGFR between 15–45 ml/min and HbA1c >6.5% were enrolled. Baseline demographic and clinical parameters including age, gender, BMI, duration of diabetes, CKD grade, HbA1c, and urine protein-creatinine ratio (UPCR) were recorded. Patients were followed for three months and post-treatment HbA1c and UPCR were measured. Data were analyzed using SPSS version 25. Independent sample t-test was applied to compare outcomes between the groups, with p 0.05 considered statistically significant.

Results: The mean age of the participants was 54.3 ± 10.7 years, with 158 (55.6%) males and 126 (44.4%) females. The mean BMI was 27.6 ± 4.2 kg/m². After three months of treatment, the mean HbA1c was significantly lower in the linagliptin plus insulin group (7.2 ± 0.6%) compared with the insulin-only group (7.6 ± 0.8%) (p = 0.001). Similarly, renal outcomes measured through urine protein-creatinine ratio improved in the combination therapy group (0.82 ± 0.14 mg/g) compared with the insulin-only group (0.91 ± 0.16 mg/g) (p = 0.003). Stratified analysis showed consistent improvement across different age groups and genders.

Conclusion: Linagliptin combined with insulin demonstrated significantly better glycaemic control and improvement in proteinuria compared with insulin monotherapy in patients with type II diabetes mellitus and chronic kidney disease.

Key Words: Type II diabetes mellitus, chronic kidney disease, linagliptin, insulin therapy, HbA1c, proteinuria

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INTRODUCTION

The type 2 diabetes mellitus (T2DM) is one of the most crucial health care issues of this modern era, and the number of affected people in the world is approximated to be 451 million in 2017, and it is predicted to reach 693 million cases by 2045[1]. Progressive dysfunction of the pancreatic beta-cell and insulin resistance characterise the disease, which requires pharmacological intensification as time passes[2]. About 40 percent of patients who have T2DM have chronic kidney disease (CKD), and in the global population, diabetes is the major cause of CKD and end-stage renal disease (ESRD)[1,3,4]. T2DM patients with CKD are at a significant risk of having cardiovascular events, mortality rates, and poor quality of life[5].

Dipeptidyl peptidase-4 (DPP-4) inhibitors are a newer type of glucose-lowering agent which have become a clinical therapeutic option especially in renal-impaired patients[6,3]. Uniqueness of Linagliptin is that, unlike other DPP-4 inhibitors, it does not need an increase or decrease of the dose when patients have any level of renal impairment and thus it is particularly appropriate with CKD population[7,8]. The historic CARMELINA

[1.] Resident / Profesor[2], Department of Medicine, Fauji Foundation Hospital, Rawalpindi
[3.] Resident Department of Neurology / Resident Department of Cardiology[4], Fauji Foundation Hospital, Rawalpindi.

Correspondence: Dr Shumaila Ahmed Khan, Resident, Department of Medicine, Fauji Foundation Hospital, Rawalpindi, Pakistan.
Contact No: 03465134574
Email: shumailakhan5557@yahoo.com

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trial showed that to patients with T2DM at high cardiovascular and renal risk, the addition of linagliptin to usual care was cardiovascularly safe and significantly decreased albuminuria development, but made no hard difference to hard renal endpoints (5,9). A meta-analysis affirmed that the combination of DPP-4 inhibitors and insulin greatly minimized the levels of HbA1c and insulin dose demands without raising the rates of adverse events among T2DM and CKD patients[1].

Pakistan is disproportionately affected by T2DM and South Asians, including Pakistanis, have earlier onset of the disease, more glycaemic decline, and greater diabetic complications than western populations[10,11]. This notwithstanding, South Asians are still less represented in major clinical trials[10]. Insulin is still the most commonly used glucose-lowering agent in the progressive CKD in the low and middle-income countries like Pakistan because of financial limitations and the inaccessibility of other newer drugs[12], although monotherapy insulin has a high chance of causing hypoglycaemia in the CKD environment[13]. Linagliptin as a supplement to insulin has a potentially safer and more effective regimen[8,14]. There is currently no local evidence of linagliptin insulin co-therapy versus insulin therapy in Pakistani patients with T2DM and CKD, and hence the context-specific study is necessary to support clinical practice in such a high-risk group.

Therefore, the study was aimed to compare the efficacy of linagliptin combined with insulin and insulin alone in enhancing the glycaemic control and renal outcomes of type II diabetes mellitus patients with chronic kidney disease.

METHODS

The study was a randomized clinical trial done at the Department of Medicine at Fauji Foundation Hospital (FFH), Rawalpindi, Pakistan. The research was conducted during three months between October of 2025 and December of 2025. The institutional research ethics committee gave ethical approval prior to the study and signed informed consent was given to all the participants.

The WHO sample size calculator was used to compare two population means taking a 5% level of significance and 80% power of test to calculate the sample size. According to the parameters that were previously reported, there were 284 patients in total, 142 patients per group. Non-probability consecutive sampling in the outpatient of the medicine unit was used to select patients. The study participants had to be diagnosed with type II diabetes mellitus on insulin therapy and must have had chronic kidney disease with an estimated glomerular filtration rate (eGFR) of 15 to 45 ml/min calculated using the cockroft-gault formula and needed to have a HbA1C above 6.5.

Patients who had used other oral antidiabetic agents in the past three months, those with temporary ischemic attacks, heart attacks, or stroke, kidney transplantation, urinary tract infection, liver failure, malignancy, immunocompromised conditions or hypersensitivity to linagliptin were not allowed. The patients that were lost to follow-up also were not included in the analysis.

Following the enrollment process, demographic and clinical information such as age, gender, body mass index, duration of diabetes, duration of chronic kidney disease, smoking status, CKD grade, baseline HbA1C and baseline urine protein-creatinine ratio (UPCR) were captured into a structured proforma. The lottery method was used in assigning the participants into two groups randomly. Group A was supplied with insulin therapy plus 5 mg of linagliptin 1 time daily whereas Group B was only given insulin therapy. The patients were followed up over a period of three months and repeat HbA1C and UPCR were determined in the end of treatment to evaluate the level of glycemic control and renal functioning.

The SPSS version 25 was used to analyze data. Quantitative variables were in form of mean and standard deviation and categorical variable was in form of frequencies and percentages. The independent sample t-test was used to compare the post-treatment mean HbA1C and UPCR in both groups. Potential confounders such as age, gender, BMI, CKD grade, and duration of disease, were stratified. The p-value of 0.05 was taken to be statistically significant.

RESULTS

A total of 284 patients diagnosed with type II diabetes mellitus with chronic kidney disease were included in the study. Patients were randomized into two equal groups: Group A (Linagliptin plus insulin) and Group B (insulin only), with 142 patients in each group. The overall mean age of the participants was 54.3 ± 10.7 years. There were 158 (55.6%) males and 126 (44.4%) females. The mean BMI was 27.6 ± 4.2 kg/m². The mean duration of type II diabetes mellitus was 8.4 ± 3.1 years, while the mean duration of chronic kidney disease was 3.6 ± 1.5 years (Table 1).

Smoking status, CKD grade distribution, and diabetes control status were also analyzed. Overall, 82 (28.9%) patients were smokers. CKD stage 3 was the most common stage observed in the study population. Uncontrolled diabetes (baseline HbA1C 9%) was present in 126 (44.4%) patients (Table 2).

Baseline biochemical parameters were comparable between the two groups. The mean baseline HbA1C was 8.9 ± 1.2% in Group A and 8.8 ± 1.1% in Group B. Similarly, the mean baseline urine protein-creatinine ratio (UPCR) was 0.95 ± 0.18 mg/g in Group A and 0.96 ± 0.17 mg/g in Group B (Table 3).

Table No. 1: Demographic and Baseline Characteristics of Study Population (n=284)

Variable	Group A (Linagliptin + Insulin) n=142	Group B (Insulin Only) n=142	Total
Age (years), mean ± SD	53.9 ± 10.5	54.7 ± 10.9	54.3 ± 10.7
Male	79 (55.6%)	79 (55.6%)	158 (55.6%)
Female	63 (44.4%)	63 (44.4%)	126 (44.4%)
BMI (kg/m²), mean ± SD	27.4 ± 4.1	27.8 ± 4.3	27.6 ± 4.2
Duration of T2DM (years), mean ± SD	8.2 ± 3.0	8.6 ± 3.2	8.4 ± 3.1
Duration of CKD (years), mean ± SD	3.5 ± 1.4	3.7 ± 1.6	3.6 ± 1.5

Table No. 2: Clinical Characteristics of Study Participants

Variable	Group A n=142	Group B n=142	Total
Smoking	40 (28.2%)	42 (29.6%)	82 (28.9%)
Non-smokers	102 (71.8%)	100 (70.4%)	202 (71.1%)
CKD Grade 3	86 (60.6%)	88 (62.0%)	174 (61.3%)
CKD Grade 4	56 (39.4%)	54 (38.0%)	110 (38.7%)
Controlled diabetes	78 (54.9%)	80 (56.3%)	158 (55.6%)
Uncontrolled diabetes	64 (45.1%)	62 (43.7%)	126 (44.4%)

After three months of treatment, significant improvement in glycemic control was observed in the Linagliptin plus insulin group. The mean HbA1C after treatment was 7.2 ± 0.6% in Group A compared with 7.6 ± 0.8% in Group B. The difference between the groups was statistically significant (p = 0.001). Similarly, renal function assessed through UPCR showed improvement in Group A with a mean UPCR of 0.82 ± 0.14 mg/g compared with 0.91 ± 0.16 mg/g in Group B (p = 0.003) (Table 4).

Table No. 3: Baseline Laboratory Parameters

Parameter	Group A (Linagliptin + Insulin)	Group B (Insulin Only)	p-value
Baseline HbA1C(%)	8.9 ± 1.2	8.8 ± 1.1	0.46
Baseline UPCR (mg/g)	0.95 ± 0.18	0.96 ± 0.17	0.58

Table No. 4: Comparison of Post-Treatment Outcomes Between Groups

Outcome	Group A (Linagliptin + Insulin)	Group B (Insulin Only)	p-value
HbA1C after 3 months (%)	7.2 ± 0.6	7.6 ± 0.8	0.001
UPCR after 3 months (mg/g)	0.82 ± 0.14	0.91 ± 0.16	0.003

Stratification analysis was performed to evaluate the effect of age, gender, BMI, CKD grade, and smoking status on treatment outcomes. The improvement in HbA1C and UPCR remained consistently greater in the Linagliptin plus insulin group across most stratified subgroups, indicating that the observed treatment benefit was independent of baseline demographic and clinical characteristics (Table 5).

Table No. 5: Stratified Analysis of Post-Treatment HbA1C and UPCR

Stratification Variable	Outcome	Group A Mean ± SD	Group B Mean ± SD	p-value
Age 55 years	HbA1C	7.1 ± 0.5	7.5 ± 0.7	0.004
Age >55 years	HbA1C	7.3 ± 0.7	7.7 ± 0.8	0.008
Male	UPCR	0.83 ± 0.13	0.92 ± 0.17	0.005
Female	UPCR	0.81 ± 0.15	0.90 ± 0.16	0.007

DISCUSSION

The present study demonstrated that linagliptin combined with insulin produced significantly superior glycaemic and renal outcomes compared to insulin monotherapy in patients with T2DM and CKD, with post-treatment HbA1c of 7.2 ± 0.6% versus 7.6 ± 0.8% (p = 0.001) and UPCR of 0.82 ± 0.14 versus 0.91 ± 0.16 mg/g (p = 0.003), respectively.

Regarding glycaemic outcomes, Zhou et al. conducted a meta-analysis of randomized controlled trials and

confirmed that DPP-4 inhibitor and insulin combination therapy significantly reduced HbA1c and insulin dose requirements in patients with T2DM and CKD without increasing adverse events (1). Our findings are consistent with this evidence, further corroborating the additive glycaemic benefit of linagliptin when combined with insulin. Similarly, Deacon reported that the addition of DPP-4 inhibitors to insulin therapy improved glycaemic control without increasing hypoglycaemia risk, including in patients with CKD[14].

Concerning renal outcomes, Karimifar et al. conducted a randomized double-blind clinical trial and demonstrated that linagliptin produced a significantly higher percentage of improvement in microalbuminuria compared to placebo[15]. In our research, there was also a considerable decrease in UPCR with the use of linagliptin in combination with insulin, which indicates that three months of intervention might be enough to identify significant renal improvement in this group. The second study by Perkovic et al., which reported secondary analyses of the landmark CARMELINA trial, established that linagliptin made a significant reduction in albuminuria progression in all eGFR categories with no risk of higher hypoglycaemia[5]. Daza-Arnedo et al. further emphasized that the pleiotropic renal actions of linagliptin such as; antioxidant, antipharmacologic, and antifibrotic action, are more applicable to CKD patients since all DPP-4 inhibitors do not necessitate an increase in dose[3].

The Hoe et al. observed that among patients under insulin monotherapy there was the highest rate of rapid CKD progression than in the patients under DPP-4 inhibitors that demonstrated a significant improvement in proteinuria[16]. This is consistent with our observation that insulin alone treatment was linked to worse renal prognoses. Kawanami et al. also affirmed through meta-analysis that DPP-4 inhibitors have a significant effect in reducing the risk of microalbuminuria and macroalbuminuria in comparison to controls[17].

Our stratified analysis revealed that the treatment effect of linagliptin and insulin was similar between both sexes and age groups and this supported the strength of the observed effects. This is in line with Gomez-Peralta et al. where the combination therapy of DPP-4 inhibitors and basal insulin was found to be highly effective and safe in patients with different patient subgroups such as the elderly and different levels of renal impairment[8].

The study was carried out in one center and had a rather short term of follow up of three months, which could restrict the generalizability of the findings. Multicenter studies are needed over the long period to further test the long-term renal and glycaemic effects of linagliptin in chronic kidney disease patients.

CONCLUSION

Linagliptin added to insulin therapy produced better glycaemic control and reduction in proteinuria compared with insulin alone in patients with type II diabetes mellitus and chronic kidney disease. The findings suggest that combination therapy may provide improved metabolic and renal outcomes in this high-risk population.

Author's Contribution:

Concept & Design or acquisition of analysis or interpretation of data:	Shumaila Ahmed Khan, Nayyar Yaqoob
Drafting or Revising Critically:	Naseem Ullah, Sana Hassan
Final Approval of version:	All the above authors
Agreement to accountable for all aspects of work:	All the above authors

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REFERENCES

1. Zhou X., Shi H., Zhu S., Wang H., Sun S. Dipeptidyl peptidase-4 inhibitor and insulin combination treatment in type 2 diabetes and chronic kidney disease: A meta-analysis. J Diabetes Investigation 2021;13(3):468-477. https://doi.org/10.1111/jdi.13675
2. Rhee E. Extra-glycemic effects of anti-diabetic medications: Two birds with one stone? Endocrinol Metabolism 2022;37(3):415-429. https://doi.org/10.3803/enm.2022.304
3. Daza-Arnedo R, Rico-Fontalvo J, Pájaro-Galvis N, Leal-Martínez V, Abuabara-Franco E, Raad-Sarabia M, et al. Dipeptidyl peptidase-4 inhibitors and diabetic kidney disease: A narrative review. Kidney Med 2021;3(6):1065-1073. https://doi.org/10.1016/j.xkme.2021.07.007
4. Aroor A, Manrique-Acevedo C, DeMarco V. The role of dipeptidylpeptidase-4 inhibitors in management of cardiovascular disease in diabetes; focus on linagliptin. Cardiovascular Diabetol 2018;17(1). https://doi.org/10.1186/s12933-018-0704-1
5. Perkovic V, Toto R, Cooper M, Mann J, Rosenstock J, McGuire D, et al. Effects of linagliptin on cardiovascular and kidney outcomes in people with normal and reduced kidney function: Secondary analysis of the CARMELINA randomized trial. Diabetes Care 2020;43(8):1803-1812. https://doi.org/10.2337/dc20-0279
6. Gallwitz B. Clinical use of DPP-4 inhibitors. Frontiers in Endocrinol 2019;10. https://doi.org/10.3389/fendo.2019.00389
7. Hanssen N, Jandeleit-Dahm K. Dipeptidyl peptidase-4 inhibitors and cardiovascular and renal disease in type 2 diabetes: What have we learned from the CARMELINA trial? Diabetes and

Vascular Dis Res 2019;16(4):303-309. https://doi.org/10.1177/1479164119842339
8. Gómez-Peralta F, Abreu C, Gómez-Rodríguez S, Barranco R, Umpierrez G. Safety and efficacy of DPP-4 inhibitor and basal insulin in type 2 diabetes: An updated review and challenging clinical scenarios. Diabetes Therapy 2018;9(5): 1775-1789. https://doi.org/10.1007/s13300-018-0488-z
9. Schernthaner G, Wanner C, Jurii -Eržen D, Guja C, Gumprecht J, Jarek-Martynowa I, et al. CARMELINA: An important piece of the DPP-4 inhibitor CVOT puzzle. Diabetes Res Clin Prac 2019;153:30-40. https://doi.org/10.1016/j.diabres.2019.05.013
10. Ghouri N, Javed H, Sattar N. Pharmacological management of diabetes for reducing glucose levels and cardiovascular disease risk: What evidence in South Asians? Current Diabetes Reviews 2021;17(9). https://doi.org/10.2174/1573399817666201228120725
11. Hanif W, Ali S, Bellary S, Patel V, Farooqi A, Karamat M, et al. Pharmacological management of South Asians with type 2 diabetes: Consensus recommendations from the South Asian Health Foundation. Diabetic Med 2021;38(4). https://doi.org/10.1111/dme.14497
12. Zhao J, Weinhandl E, Carlson A, Peter W. Glucose-lowering medication use in CKD: Analysis of US Medicare beneficiaries between 2007 and 2016. Kidney Med 2021;3(2):173-182.e1. https://doi.org/10.1016/j.xkme.2020.09.016
13. Kiran M, Vakharia M, Pawaskar L, Sheikh S. Efficacy and safety of teneligliptin in patients of type 2 diabetes mellitus with chronic kidney disease: ATEND-CKD study. Int J Innovative Res Med Sci 2019;4(01). https://doi.org/10.23958/ijirms/vol04-i01/538
14. Deacon C. A review of dipeptidyl peptidase-4 inhibitors: Hot topics from randomized controlled trials. Diabetes Obesity Metabolism 2018;20 (S1):34-46. https://doi.org/10.1111/dom.13135
15. Karimifar M, Afsar J, Amini M, Moeinzadeh F, Feizi A, Aminorroaya A. The effect of linagliptin on microalbuminuria in patients with diabetic nephropathy: A randomized, double-blinded clinical trial. Scientific Reports 2023;13(1). https://doi.org/10.1038/s41598-023-30643-7
16. Hoe K, Han T, Hoe T. Hypoglycemic agents and prognostic outcomes of chronic kidney disease patients with type 2 diabetes. J Nephropathol 2021;12(3):e17294. https://doi.org/10.34172/jnp.2022.17294
17. Kawanami D, Takashi Y, Takahashi H, Motonaga R, Tanabe M. Renoprotective effects of DPP-4 inhibitors. Antioxidants 2021;10(2):246. https://doi.org/10.3390/antiox10020246

Original Article

Synthesis, Characterization and Molecular Docking Study of New Coumarin -Thio Carbonyl Derivatives against MCF-7 Breast Cancer Cell Line

Ali Mohammed Abdul-Hussain, Leaqaa Abd-ul-Redha Raheem and Maan Abdul Razzaq Nema

ABSTRACT

Objective: To prepare and compare a set of derivatives of 7-methoxy-3-(3-(4-R-phenyl)-3-(phenylthio) propanoyl)-2H-chromen-2-one to test their ability to induce anti-proliferative effects on MCF-7 human breast cancer cell line.
Study Design: Experimental study
Place and Duration of Study: This study was conducted at the College of Pharmacy, University of Basrah, Iraq from 15th March 2024 to 30th April 2025.
Methods: Five coumarin-chalcone derivatives were prepared using starting materials. The microculture tetrazolium assay was used to determine the IC50 values of these derivatives against the MCF-7 breast cancer cell line to determine its in vitro anticancer potential. The chemical structures of the synthesized derivatives were determined by determination of the melting point, mass spectrometry, infrared spectroscopy, and nuclear magnetic resonance spectroscopy (1H and 13C). The microculture tetrazolium assay was used to assess antiproliferative activity to evaluate cell viability and calculate IC50 values.
Results: Compound 11 demonstrated the best anti-proliferative activity with an IC50 of 6.25 ug/mL, compared to other derivatives. Compounds 8, 9 and 10 showed moderate cytotoxicity with the IC50 of 26.31, 29.29 and 33.49ug/mL respectively. Compound 7 on the other hand was less active with IC50 of 71.57 ug/mL. All the compounds that were synthesized showed a lower potency than the reference drug doxorubicin, the IC50 of which was 2.40 0 M.
Conclusion: The antiproliferative potency of the synthesized coumarin-chalcone derivatives was different and compound 11 was the strongest against the MCF-7 breast cancer cell line. Such results indicate that additional optimization of such compounds can result in the creation of more potent anticancer agents.
Key Words: Coumarin, -thiocarbonyl, Michael addition, Microculture tetrazolium assay

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INTRODUCTION

Breast cancer is the most common among women worldwide and leading cause of cancer related deaths after that of lung cancer; epidemiological literature revealed a prevalence of 22-26 and a risk of breast cancer-related mortality of about 18%.[1-3] Multidrug resistance (MDR) are some of the significant obstacles to effective treatment of cancer.[4]

Department of Pharmaceutical Chemistry, College of Pharmacy, University of Basrah, Iraq.

Correspondence: Ali Mohammed Abdul Hussain, Department of Pharmaceutical Chemistry, College of Pharmacy, University of Basrah, Iraq.
Contact No: +9647717866860
Email: albandarali829@gmail.com

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In line with the (WHO) tumor data-base of 2021, over 2 million women are screened with breast cancer in the year.[3]

As the latest research indicates, coumarin has also been found to potentially treat cancer, potentially reducing the adverse impacts of radiation. Incorporation of coumarin into the hybridization structures is very effective in cancer treatment because the substance has the capability of destroying tumor cells as seen in various articles.[5,6]

It has vastly studied coumarin compounds in their anticancer effects against numerous cancers such as; melanoma, lymphoma, squamous cell carcinomas, prostate cancer progression, and against breast cancer rise. Toxic effects caused by radiation can be countered by using coumarins, hence, there is need to develop robust anti-tumor agents which are tissue-selective in addition to the distinct gamut of potency as a consequence of emergence of resistance to treatment, development of adverse effects and re-emergence of malignancies. Molecular hybrids have made them a

special agent especially to scientists and researchers because of the synergistic pharmacological effects. In the last 15 years or so, many MH based anticancer therapeutics are discovered.[7]

A key reaction in organic chemistry, the nucleophilic addition of thiols to form a carbon-sulfur bond, is the Michael addition reaction, which entails addition of carban-ions to unsaturated system in conjugation with an activating group (carbonyl group).[8] A wide range of reagents, have been reported in the literature to carry out the addition of thiols to conjugated alkenes.[9]

A very useful reaction in the asymmetric conversion is the catalytic asymmetric Michael addition, which has been developed to a very successful degree in new years in the organocatalytic form of the reaction.[10]

One of the many types of reactions is the sulfa-Michael addition that provides direct access to optically active sulfides, which can be used as a wide range of starting materials in the synthesis of biologically important chemicals.[11]

METHODS

The experimental research was done at the College of Pharmacy, University of Basrah, Iraq from the 15th March 2024 to 30th April 2025 by the letter No. 4545/QM/Approval/SJKDH379 dated March 9, 2024. Ethyl acetoacetate, thiophenol, 4- nitrobenzaldehyde, 4-bromobenzaldehyde, 4-methoxybenzaldehyde and piperidine were purchased off of MERCK. The sources of benzaldehyde, Ethanol and Methanol were purchased through Thomas Baker. Preparation of 3-Acetyl- 7-Methoxycoumarin: In a round bottom flask with 50 mL of ethyl acetoacetate (0.026 mol, 3 mL, 3.06 g), 2-methoxy- 4-hydroxy benzaldehyde (0.028 mol, 3 ml, 3.5 g) was added followed by the addition of dimethylamine (15 drop) as a catalyst, and the mixture was stirred A yellow precipitation formative, recrystallization using ethanol.[12]

Coumarin-Chalcone derivatives (2-6): 3-Acetyl-7-methoxy-2H -chromen-2-one (0.44 g, 2.0 mmol) was dissolved in 25 mL of DCM, and 0.5 mL of piperidine was added to it. The mixture was kept at reflux temperature of 10 hrs. The solution was cooled, filtered, dissolved in a small amount of aliquot of dichloromethane and further methanol was then added to cause precipitation.[13]

Preparation of new coumarin-2-thiocarbonyl derivatives (7-11): In a 250 mL round-bottom flask with magnetic stir bar dissolve coumarin-chalcone derivative (1.43mmol) in 20-25 mL of DCM. Add thiophenol (1.43 mmol) to the solution which is being stirred at room temperature. A base catalyst, triethylamine (0.715 mmol, 0.1 mL) is dropwise added to produce the thiolate species in the solution. The mixture is shaken at room temperature and the reaction is followed by (TLC) with nhexane/ethyl acetate (9:1) as a product. When it is ready, the mixture reaction is filtered into an ice-cold water to separate the product. DCM recrystallization provides the pure 2,14 -thiocarbonyl coumarin product.

Methods of characterization: Stuart SMP apparatus was used to determine the melting points of the synthesized compounds. A spectrophotometer was employed to get the infrared spectrum with a KBr disc (SHIMADZU, Japan). It used Bruker spectrometer (Switzerland) to record the 1H NMR and 1C NMR spectrums, using DMSO and CDCl3 as solvents, tetramethylsilane (TMS) as a reference and mass spectra of the synthesized coumarin beta thiocarbonyl molecule were recorded at the Faculty of Chemistry, Tehran University.

Preliminary cytotoxicity screening: The cells were inoculated on a (96) well plate at a concentration density of 2x104 cells per well. Each well was then filled with 150 0L of DMEM culture with 100 units/mL penicillin, 100 0L streptomycin, and 10 percent fetal bovine serum (FBS). After this, the plate was left at 37 ° C and exposed to 5% CO 2 and 95% relative humidity of a humid atmosphere in a 24 hour incubation. After the incubation period, fresh media having different doses of coumarin-2 compounds (1, 10, 25, 50, and 100 25g) and doxorubicin (1, 2.5, 5, 10, and 20 25g) were added to the media in each of the wells. The plate required 24-hour incubation. Each well was filled with 10 0L of MTT (4mg/mL) and incubated over 4 hours at 37C without light to dissolve formazan. 100 0L of dimethyl sulfoxide (DMSO) was added and allowed to dissolve. The optical density at 570 nm was measured after the full dissolution of the purple formazan using the ELISA microplate (BioRad, USA).15,16 The half maximum inhibitory concentration (IC50) of each cell line is calculated after triplicate treatments were done. Viability was determined by comparing the treated and untreated cells and measures were made thrice. Proliferative rate (PR) percentage =(A/B) 100, Equation (1). Inhibitor Rate % = 100 – PR Equation (2). A is the optical density of wells that are treated. B = Optical density of control (untreated) wells. The data was inputted and was analyzed using SPSS- 26.

RESULTS

The compounds of coumarin- 2 -thiocarbonyl derivatives (7-11) were elucidated with the help of multiple distinctive spectrum changes, which encompassed MS, IR, 1H NMR, and 13C NMR. Mass spectrometry was used to determine the molecular weight of the product synthesized and the majority of derivatives had molecular ion (M+.) peaks that indicated their respective molecular weight (Table 1).

FT-IR of coumarin- -thiocarbonyl Derivatives: FTIR spectral analysis of the synthetic coumarin -thiocarbonyl derivatives (compounds 7 -11) was used to confirm the key functional groups of these coumarin -

thiocarbonyl derivatives. Typical of the derivatives moiety, the high absorption band in the range of 1710-1735 cm -1 was attributed to the C=O vibration of coumarinmoiety. The bands at 650-800 cm -1 were additional proofs of the existence of correlated to aromatic C-S out-of-plane bending vibrations. A broad 3100-3000 cm-1 region of all compounds indicated the presence of aromatic C–H stretching whereas 1200-1250 cm-1 area of O-C of methoxy group. Table 2 shows the spectra that were obtained after correlation with reference to conventional infrared, thus establishing the structural integrity of the prepared compounds.

1H-NMR spectrums of coumarin -2-thiocarbonyl derivatives 7-11: the 1H-NMR spectrums of the five synthesized coumarin-2-thiocarbonyl derivatives as indicated in table 3 have characteristic pattern that is consistent with their speculated structure. The downfield area (6.9-8.2 ppm) will contain numerous aromatic proton peaks in each compound which will be a bearer of a substituted benzene ring of both the coumarin and 1-beta thiocarbonyl. Such signals are normally formed as multiplets or doublets through spin-spin coupling and they are also the outcome of the substituted pattern and symmetry of an aromatic system hence their successful synthesis and structural integrity.

13C-NMR spectra of coumarin -2 thiocarbonyl derivatives 711: The 13C nuclear magnetic resonance (NMR) spectra showed the appearance of the signals at approximately 41ppm and 49ppm, attributed to the evolution of the -thiophenol (CHS) atom which is C11 and C10 respectively. Moreover, there are two peaks of 195.5 and 159.7 ppm. The signals are ketone carbonyl (C=O) of the acetyl (-COCH2) group and the lactone carbonyl (C=O), respectively. In all the synthesized compounds as well two signals in 165 ppm and 56 ppm are credited to the carbon attached with methoxy group on position C7 and methoxy C-7a respectively.

Lipinski Rule of Five (RO5): The generated products (7-11) were assessed based on Lipinski Rule of Five, which is usually used to assess the potential of a compound as an orally active pharmaceutical agent. The theoretical moles weight of the compounds were determined as 416.49 to 395.38 g/mol. The number of hydrogen bond donors was 0 and that of hydrogen bond acceptors was 4-6. The number of calculated rotatable bonds was between 7 and 8. The lipophilicity, as shown by the Log P mentioned was 3.27-3.80. Total polar surface area (T.P.S.A) of the compounds ranged between 81.81 and 127.63 A 2. The parameters fit the acceptable range of values that are set by Lipinski criteria which means that the compounds have favorable pharmacokinetic characteristics and can be orally bio-absorbed (Table 5).

Table No. 1: Physical characteristics and mass spectra of coumarin- -thiocarbonyl derivatives 7-11

Compound	Melting Point (°C)	Yield %	Molecular weight (g/mole)	Mass (M.+) m/e	Appearance
7	138.5–140	45.89	416	416.3	Yellow
8	183–184	38.84	446	446.2	Pale Yellow
9	155–156.5	48.73	495	494.1	Chrome Yellow
10	168–169	39.66	461	461.1	Gold Yellow
11	243.5–245	26.09	460	459.2	Dark Red

Table No. 2: FT-IR characteristics of coumarin- -thiocarbonyl derivatives 7-11

Absorption bond	Comp. 7	Comp. 8	Comp. 9	Comp. 10	Comp. 11
C=O (lactone – coumarin)	1728(s)	1730 (s)	1736(s)	1735 (s)	1728 (s)
C=O (thio-carbonyl)	1658 (m)	1672(m)	1672 (m)	1672 (m)	1643 (m)
C–S (stretching)	692 (m)	787 (m)	680 (m)	650 (m)	655 (m)
C–H (Aromatic)	3024–3074(w)	3040 (w)	3040 (w)	3040 (w)	3078 (w)
C–O (Methoxy)	–	1205-1255 (s)	–	–	–
$–CH_3$ (Methoxy, C–H stretch)	–	2841 (w)	–	–	–
C–Br (stretching)	–	–	574 (w)	–	–
N=O (asym. stretch)	–	–	–	1548 (s)	–
N=O (sym. stretch)	–	–	–	1365 (s)	–
$–CH_3$ (Dimethyl bending)	–	–	–	–	1381 (m)
Alkyl C–H stretching	–	–	–	–	2934 (s)

Table No. 3: ^{1}H-NMR spectra of coumarin - -thiocarbonyl derivatives 7–11

Compound	Chemical shift					
	C4	C11	C10	C-7a	R	Aromatic protons
7	8.30 (s,1H)	4.80-4.84 J=14.4Hz (t,1H)	3.63-3.69 J1=18.2 J2=6.8 (dd,2H)	3.81 (s,3H)	-	6.72-7.6 (m,10H)
8	8.41 (s,1H)	4.33-4.37 J=14.4Hz (t,1H)	3.55-3.61 J1=18.2 J2=6.8 (dd,2H)	3.84 (s,3H)	3.94 (s,3H)	6.74-7.88 (m,9H)
9	8.40 (s,1H)	4.26-4.28 J=13.6Hz (t,1H)	3.69-3.76 J1=18.2 J2=6.8 (dd,2H)	3.83 (s,3H)	-	6.73-7.47 (m,9H)
10	8.51 (s,1H)	4.10-4.14 J=14.4Hz (t,1H)	3.50-3.56 J1=18.2 J2=6.8 (dd,2H)	3.93 (s,3H)	-	6.83-8.13 (m,9H)
11	8.51 (s,1H)	4.30-4.39 J=14.4Hz (t,1H)	3.61-3.66 J1=18.2 J2=6.8 (dd,2H)	3.90 (s,3H)	3.01 (s,3H) N-(CH3)2	6.78-7.88 (m,9H)

Table No. 4: ^{13}C NMR characteristics of coumarin– -thio carbonyl derivatives (Compound 7–11)

Carbon position	Comp. 7	Comp. 8	Comp. 9	Comp. 10	Comp. 11
9	194.77	187.00	195.53	195.53	186.06
7	165.40	165.35	165.51	165.28	165.35
2	159.56	159.36	159.74	159.75	159.89
1b	157.74	157.47	157.75	157.79	157.75
1	141.39	135.05	147.83	152.79	132.05
1``	134.97	140.01	136.94	135.31	140.90
4	134.32	143.70	140.62	138.82	147.84
3	133.01	132.43	133.18	131.51	131.68
2``	131.56	129.54	129.63	128.63	131.08
6``	131.56	129.54	129.63	128.63	131.08
5	130.69	131.21	130.64	129.83	131.19
3``	128.90	129.06	128.87	128.11	125.11
5``	128.90	129.06	128.87	128.11	125.11
3	128.21	120.15	134.94	124.31	113.90
5	128.21	120.15	134.94	124.31	113.90
2	127.50	128.34	131.63	127.51	122.82
6	127.59	128.34	131.63	127.51	122.82
4	127.16	158.94	120.56	147.82	152.14
4``	124.17	125.18	127.12	125.60	120.59
6	113.91	113.99	113.89	113.90	111.71
1a	112.39	112.53	112.00	112.04	110.90
8	100.33	100.83	100.26	100.42	100.40
7a	57.07	56.77	56.07	56.06	56.00
10	48.42	50.75	48.17	50.36	49.96
11	40.54	43.48	40.47	40.03	40.68
R	-	56.68-OCH_3	-	-	44.58-$N(CH_3)_2$

Table No. 5: Lipinski's rules for coumarin- -thio carbonyl compounds (7-11)

Cpd.	Mol. Wt. (g/mol)	NRB	NHA	NHD	TPSA (Å²)	Log P	Lipinski's Rule of Five Violation
7	416.49	7	4	0	81.81	3.27	0
8	446.51	8	5	0	91.04	3.53	0
9	495.38	7	4	0	81.81	3.76	1
10	461.49	8	6	0	127.63	3.11	0
11	459.56	8	4	0	85.05	3.80	0

DISCUSSION

The dose-response curve was obtained and used to determine the half maximal inhibitory concentration (IC50), which was expressed as the percentage of cell death at different drug concentrations. The production of all the produced compounds was cytotoxic with an IC50 range of 6.25 to 71.57 M. [15,16]

Compound 11, which contains a dimethylamine group [-N(CH3)2], was the most active of the compounds produced, with an IC 50 of 6.25 0M. Compound 8 and 10that contained a methoxy, bromo and nitro group showed high activity with an IC of 26.31, 26.49 M and 33.49 33.49 33.49 33.49 33.49 33.49 33.49 33.49 33.49 33.49 33.49 33.49 33.49 33.4 All the produced compounds exhibit less cytotoxic activity in comparison to doxorubicin, with a significantly lower IC50 of 2.40 0M. On the other hand, compounds 7 were less active. With no substituent on compound 7, the IC50 was 71.57mol/kg.[17,18]

CONCLUSION

The cytotoxic activities of the compounds produced were determined using the MCF-7 cell line. Compound 11 [N(CH3)2]substituted was found to have a superior cytotoxic activity with an IC50 value of 6.25 M compared to the other compounds obtained. However, their cytotoxic action was not as much powerful as the conventional doxorubicin.

Author's Contribution:

Concept & Design or acquisition of analysis or interpretation of data:	Ali Mohammed Abdul-Hussain, Leaqaa Abd-ul-Redha Raheem
Drafting or Revising Critically:	Ali Mohammed Abdul-Hussain, Maan Abdul Razzaq Nema
Final Approval of version:	All the above authors
Agreement to accountable for all aspects of work:	All the above authors

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REFERENCES

1. Chan JW, Hoyle CE, Lowe AB, Bowman M. Nucleophile-initiated thiol-Michael reactions: effect of organocatalyst, thiol, and ene. Macromolecules 2010; 43(15):6381–8.
2. Kenari F, Molnár S, Perjési P. Reaction of chalcones with cellular thiols. The effect of the 4-substitution of chalcones and protonation state of the thiols on the addition process. Diastereoselective thiol addition. Molecules 2021;26(14):4332.
3. Amslinger S, Al-Rifai N, Winter K, Wörmann K, Scholz R, Baumeister P, et al. Reactivity assessment of chalcones by a kinetic thiol assay. Org Biomol Chem 2013;11(4):549–54.
4. Movassagh B, Shaygan P. Michael addition of thiols to , -unsaturated carbonyl compounds under solvent-free conditions. Arkivoc 2006; 12:130-7.
5. Stiefel C, Schubert T, Morlock GE. Bioprofiling of cosmetics with focus on streamlined coumarin analysis. ACS Omega 2017;2(8):5242–50.
6. Rios R, Companyó X. Addition to alpha, beta-unsaturated aldehydes and ketones. In: Comprehensive enantioselective organocatalysis: catalysts, reactions and applications. Peter I. Dalko 2013; 977–1012.
7. Azimi S, Zonouzi A, Firuzi O, Iraji A, Saeedi M, Mahdavi M, et al. Discovery of imidazopyridines containing isoindoline-1, 3-dione framework as a new class of BACE1 inhibitors: design, synthesis and SAR analysis. Eur J Med Chem 2017;138: 729-37.
8. Jayasooriya RGPT, Molagoda IMN, Park C, Jeong JW, Choi YH, Moon DO, et al. Molecular chemotherapeutic potential of butein: A concise review. Food Chem Toxicol 2018;112:1-10.
9. Padmavathi G, Rathnakaram SR, Monisha J, Bordoloi D, Roy NK, Kunnumakkara AB. Potential of butein, a tetrahydroxychalcone to obliterate cancer. Phytomedicine 2015;22(13): 1163-71.
10. Wang KL, Yu YC, Hsia SM. Perspectives on the role of isoliquiritigenin in cancer. Cancers (Basel) 2021;13(1):115.
11. Peng F, Tang H, Liu P, Shen J, Guan X, Xie X, et al. Isoliquiritigenin modulates miR-

374a/PTEN/Akt axis to suppress breast cancer tumorigenesis and metastasis. Sci Rep 2017;7(1):9022.
12. Tchoupou IT, Manyeruke MH, Salami SA, Ezekiel CI, Ambassa P, Tembu J V, et al. An overview of the synthesis of coumarins via Knoevenagel condensation and their biological properties. Results Chem 2025;102181.
13. Moya-Alvarado G, Yañez O, Morales N, González-González A, Areche C, Núñez MT, et al. Coumarin-chalcone hybrids as inhibitors of MAO-B: Biological activity and in silico studies. Molecules 2021;26(9):2430.
14. Al-Jaber NA, Bougasim ASA, Karah MMS. Study of Michael addition on chalcones and or chalcone analogues. J Saudi Chem Soc 2012;16(1):45–53.
15. Jaafar ND, Al-Saffar AZ, Yousif EA. Genotoxic and cytotoxic activities of lantadene A-loaded gold nanoparticles (LA-AuNPS) in MCF-7 cell line: an in vitro assessment. Int J Toxicol 2020;39(5): 422–32.
16. Bashir MK. Effects of structural manipulation on the bioactivity of some coumarin-based products. Arch Razi Inst 2021;76(5):1297.
17. Fan D, Wang D, Zhang J, Fu X, Yan X, Wang D, et al. Cobalt-Catalyzed Cascade C–H Activation/ Annulation Polymerizations towards Diversified and Multifunctional Sulfur-Containing Fused Heterocyclic Polymers. J Am Chem Soc 2024; 146(25):17270-84.
18. Yang Y, Hu R, Tang BZ. Exploration of poly (thiazole-2-thione) structures from multicomponent polymerizations of elemental sulfur, dichalcones, and diisocyanides. Macromolecules 2025;13: 6577-89.

Original Article

Echocardiographic Assessment of Left Ventricular Mass Regression and Functional Changes after Bariatric Surgery

Faten Abdul-Lateef Abdul-Zahra[1], Asaad Hasan Noaman[2] and Safauldeen Salim Albaaj[3]

ABSTRACT

Objective: To determine the echocardiographic outcomes of left ventricular mass and diastolic functions in obese patients undergoing bariatric surgery.

Study Design: Prospective study

Place and Duration of Study: This study was conducted at the Al-Batool Hospital (Bariatric Surgery Clinic) between the period of 1st January 2025 and 31st July 2025.

Methods: Enrolment of 51 adult participants was done at the age of 18-65 years. The mass of the left ventricles and the index of diastolic functions were determined preoperative and postoperative through conventional two-dimensional transthoracic echocardiography.

Results: Bariatric surgery showed a substantial decrease on mean left ventricular mass (139.274141.3 g) relative to preoperation levels (175.9648.4 g; $p<0.05$). It was revealed that postoperative assessment showed A-wave velocity and E / e + ratio declined significantly ($p<0.05$), whereas e 2 velocity and E / A ratio increased significantly after surgery ($p<0.05$). The velocity of the E-wave did not differ significantly between the pre and postoperative measurements ($p > 0.05$).

Conclusion: Bariatric surgery enhances diastolic improvement and regression of left ventricular mass in obese patients, indicating substantial cardiac remodelling.

Keywords: Left ventricular mass, Diastolic function, Obesity, Cardiac remodeling, Echocardiography

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INTRODUCTION

Left ventricular hypertrophy (LVH) that is often more likely to develop in obese people is characterized by an increase in the ventricular mass. Obese normotensive subjects exhibited a prevalence rate of left ventricular (LV)-hypertrophy about 14 percent as compared to their slim counterparts (5%). Seventy-eight percent of morbidly obese individuals may develop LV hypertrophy.[1]

Stressors such as obesity, metabolic syndrome, and hypertension noted over a long period of time can produce modifications in the length, shape, and characteristics of the heart, a phenomenon referred to as cardiac remodeling.

[1.] Department of Health, Najaf, Iraq.
[2.] Department of Medical Physiology / General Surgery[3], College of Medicine, University of Kufa, Iraq.

Correspondence: Faten Abdul-lateef Abdul-Zahra,
Department of Health, Najaf, Iraq.
Contact No: 07865147164
Email: fatena.alhchamy@student.uokufa.edu.iq

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Though such changes are also potentially good in the initial stages, they often have maladaptive results such as heart failure. Enhanced LV mass, chamber distension and LV hypertrophy are structural remodeling features in obese individuals.[2]

Left ventricular hypertrophy is classified as eccentric. Eccentric remodeling is not to be confused with concentric remodeling that is usually observed in conditions of pathologically high pressure. Concentric remodeling is featured by an augmentation in the wall-thickness without equivalent augmentation in the ventricles dimensions and it is signalled by augmented relative wall-thickness.[3]

The changes in the hemodynamics of obese people include the increase in left ventricular wall stress and myocardial tension, which are connected to obesity. Increased central blood volume, stroke volume and CO are the major causes of the stress on the LV wall in normotensive obesity.[4] This increases the possibility of LV expansion and eccentric hypertrophy. High-level LV wall stress is likely to be corrected by eccentric LV hypertrophy that leads to diastolic dysfunction in obesity. Obesity is also linked with hemodynamic stress, which can then compete with the dilatation of the chamber but an increasing wall thickening might result in systolic dysfunction later, particularly in combination with neurohormonal and metabolic factors such as sympathetic hyperactivity, activation of renin-

angiotensin-aldosterone system, and adipokine dysregulation.[3]

There are numerous pathophysiological mechanisms that cause left ventricular increase of mass in obesity where the left ventricular mass has a distinct positive correlation with excess body weight severity. Left ventricle hypertrophy is closely associated with cardiac remodeling, diastolic dysfunction, as well as death and cardiovascular events are the other ways to measure cardiac remodeling in obese patients.[5] Diastolic dysfunction and left ventricle hypertrophy is strongly linked with bariatric surgery and achieved significant and sustained weight loss.[6] New evidence suggests that weight loss following bariatric surgery can regress left ventricular hypertrophy, and improve the functional parameters of the heart, notably by improving the diastolic function.[7] There is, however, limited and disparate evidence regarding the degree to which left ventricular mass is being regressed, and how such cardiac functional outcomes are altered after bariatric surgery. Hence, the present study involved echocardiography to determine the regression of left ventricular mass and functional alterations in relation to bariatric surgery.

METHODS

This prospective study will be done in Al-Batool Hospital (Bariatric Surgery Clinic) between 1 st January 2025 and 31 st July 2025 through a letter No. MEC-99 dated 22-12-2024. They were enrolled in the total number of 51 adults aged 18-65 years, whose weight had been planned to undergo bariatric surgery and the eligibility criteria included body mass index of 40kg/m 2 or 30kg/m 2. The transthoracic echocardiography (Mindrayconsona N9) was done pre surgical and following 5 months of the follow up. The echocardiographic measurements of left ventricular mass were made based on the conventional established echocardiographic guidelines provided by American Society of echocardiography. Left ventricular diastolic performance was measured using the indexes of the trans mitral Doppler echocardiographic, early (E) and late (A) diastolic filling velocity, ratio of E/A and E/e, the average between the peak early diastolic velocities at the septal and lateral mitral annulus (é). To determine the structural and diastolic functional change in the heart, Echocardiographic parameters were compared pre- and post-operative. We have gained all our results via SPSS version 26.

RESULTS

The average age was 31.9±7.30f 13 male and 38 female (Table 1). The resulting data of the study which is presented in Table 2 indicated that the mean weight, the body mass index, the systolic blood pressure and the diastolic blood pressure were significantly lower ($p<0.05$) post operation than pre-operation. Table 3 indicates mean of LV mass in preoperative was (175.96±48.4), and the mean of LV mass in postoperative was (139.27±41.3). Thus, the average LV mass decreased considerably postoperative to that pre-operative ($p<0.05$). Also, the postoperative results showed that there was a statistically significant decrease in the A-wave velocity and E/e prime ratio compared to the preoperative values (p less than 0.05) and a significant increase (p less than 0.05) of the mean of e prime wave velocity, and E/A ratio in postoperative as compared to preoperative. E-wave velocity failed to show statistically significant difference between preoperative and postoperative tests (p.05).

Table No. 1: Patients' age and gender distribution

Variable	No.	%
Age (years	31.9±7.3	
Gender		
Male	13	25.5
Female	38	74.5

Table No. 2: Comparison of preoperative and postoperative anthropometric and hemodynamic parameters

Variable	Before surgery	After surgery	P value
Weight	116.2±20.7	86.8±16.9	<0.001
BMI	44.6±6.8	33.4±6.1	<0.001
BSA	2.3±0.2	1.9±0.2	<0.001
SBP	130.39±12.4	119.02±13	<0.001
DBP	78.2±9.5	68.4±12.6	<0.001

Table No. 3: Comparison of Preoperative and Postoperative LV mass and diastolic indices

Variable	Before surgery	After surgery	P value
E wave velocity	85.2±14.6	85.6±16.2	0.8
A wave velocity	62.6±13.4	57.5±10.9	0.01
e` wave velocity	13.06±3.3	15.3±3.3	<0.001
E/A ratio	1.4±0.3	1.5±0.4	0.03
E/e` ratio	6.9±2.4	5.8±1.1	<0.001
LV mass	175.96±48.4	139.27±41.3	<0.001

DISCUSSION

The decrease in LV mass, with a definite indication of reverse hypertrophy, has been proven to take place following bariatric surgery. This remodelling is reversed, probably due to reduced hemodynamic load, reduced blood pressure on weight loss, and reduced neurohormonal activity.[7] It is thought to be an effect of mitigation of obesity-related inflammatory and metabolic derangements that cause ventricular hypertrophy, impaired diastolic filling, reduced myocardial performance, diminished coronary reserve,

continued volume overload, and electrical instability, thus resulting in better hemodynamic status and inducing reverse cardiac remodeling. Reverse remodeling is supported by a large study (n=398) which found improved global longitudinal strain with improvement in LV mass (205 g to 190 g) in the post-surgery period.[8,9]

Diastolic dysfunction is characterized by impaired ventricular relaxation, high filling pressures and a relative normal systolic functioning.[9] Obesity is linked to poorer myocardial relaxation, fibrosis and high LV filling pressures. Weight loss increases weight by increasing the stress on the hemodynamic and metabolic systems, which results in a higher diastolic performance. The idea that a reduction in velocity of A-wave further implies a reduction in the dependence on atrial contraction to fill up the diastolic function which is an indication of normalization of the A-wave filling pattern is justified by the study that weight loss in 12-month diet reduced the velocity of A-wave and augmented E/A ratio without alteration in left atrial diameter. The e-wave velocity and LA size did not differ significantly during the follow up period, and it is possible that, even though relaxation process was improved, there were no significant changes in global early filling flow velocity and structural atrial remodelling. Their data showed a positive decreasing tendency of the mean E/e 7 with weight loss and only slightly greater (between 8 and 10) values at baseline; however, no statistically significant differences were detected.[10]

Hughes et al[11] reported that the E/e ratios dropped dramatically after bariatric surgery or weight loss methods that do not involve surgery.

The proportion of peak velocity blood flow during left ventricular relaxation at early diastole (E wave) compared to peak velocity flow during atrial contraction at late diastole (A wave) is referred to as the E/A ratio. It is thus a pointer of the proper functioning of the left ventricle of the heart.[12] A meta-analysis of 36 studies involving 680 participants showed that there was an average value of the E/A ratio of 0.155 (95% CI: 0.106-0.205; $p < 0.001$) increase in the surgical intervention. The correction of obesity-induced changes in heart shape and performance, regulated by neurohormonal and metabolic status, a major increase in velocity, which is a sign of improved myocardial relaxation, can be achieved by bariatric surgery.[13]

The primary purpose of the study included echocardiographic structural and functional changes, despite the fact that blood pressure and anthropometric changes were improved after surgery, which is consistent with other studies in the field.[14,15]

The weakness of this research is that it has a small population and does not examine systolic performance and LV mass index. Also, the duration of follow-up might restrict the analysis of the long-term cardiac remodeling. Nevertheless, the current research has demonstrated evidence of positive structural and diastolic cardiac remodelling after bariatric surgery in spite of these limitations.

CONCLUSION

Left ventricular mass regression and improvement of diastolic performance are found in relation to bariatric surgery in obese patients. These findings demonstrate the positive impact of weight loss on cardiac remodeling of obesity and justify that echocardiographic determination of the LV mass and diastolic value can be used to assess the cardiovascular recovery after bariatric surgery.

Author's Contribution:

Concept & Design or acquisition of analysis or interpretation of data:	Faten Abdul-lateef Abdul-Zahra, Asaad Hasan Noaman
Drafting or Revising Critically:	Faten Abdul-lateef Abdul-Zahra, Safauldeen Salim Albaaj
Final Approval of version:	All the above authors
Agreement to accountable for all aspects of work:	All the above authors

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REFERENCES

1. Avelar E, Cloward TV, Walker JM, Farney RJ, Strong M, Pendleton RC, et al. Left ventricular hypertrophy in severe obesity: interactions among blood pressure, nocturnal hypoxemia, and body mass. Hypertension (Dallas, Tex.: 1979), 2007; 49(1):34-9.
2. Noaman AH, Dananah FM, Khuthur AAB, Jasim SA. Left ventricle dilatation: early marker of structural remodelling of the heart in obese people. Medical Forum Monthly 2025;36(3): 48-50.
3. Yahya M, Al-Muthanna I, Al-Dujaili AAB. Correlation between the posterior left ventricular wall thickness and relative wall thickness with global longitudinal strain (GLS) in women with preeclampsia. J Rare Cardiovasc Dis 2025;5(1): 1-7.
4. Lastra G, Sowers JR. Obesity and cardiovascular disease: role of adipose tissue, inflammation, and the renin-angiotensin-aldosterone system. Hormone Molecular Biology and Clinical Investigation 2013; 15(2), 49-57.

5. Barzizza F. Obesity and the heart. Minerva gastroenterologica e dietologica 2001;47(4): 229-34.
6. Al-Dejeli AAB, Mohammed HH, Abbas BS, Jbaraah AH, Al-Aboodi AHN. Flow propagation velocity as a marker of impaired early diastolic flow in pre-hypertensive individuals. J Pharm Res 2020;12(3).
7. Alpert MA, Karthikeyan K, Abdullah O, Ghadban R. Obesity and cardiac remodeling in adults: mechanisms and clinical implications. Progress Cardiovascular Diseases 2018;61(2):114-23.
8. Ammar W, Basset HA, al-Faramawy A, Hegazy T, Sharaf Y. Bariatric surgery and cardiovascular outcome. Egyptian Heart J 2020; 72(1): 67.
9. Sargsyan N, Chen JY, Aggarwal R, Fadel MG, Fehervari M, Ashrafian H. The effects of bariatric surgery on cardiac function: a systematic review and meta-analysis. International Journal of Obesity 2024;48(2):166–76.
10. Noaman AH, Jasim SAH, Dananah FM, Hameed HG. Valsalva maneuver is a simple and effective clinical tool for pseudo-normal diastolic dysfunction. Vasc Endovasc Rev 2025;8(1): 37–40.
11. Hughes D, Aminian A, Tu C, Okushi Y, Saijo Y, Wilson, R, et al. Impact of Bariatric Surgery on Left Ventricular Structure and Function. J Am Heart Assoc 2024;13(1):e031505. https://doi.org/10.1161/JAHA.123.031505
12. Karimian S, Stein J, Bauer B, Teupe C. Improvement of impaired diastolic left ventricular function after diet-induced weight reduction in severe obesity. Diabetes, Metabolic Syndrome and Obesity : Targets and Therapy 2017;10:19–25.
13. Yuksel IO, Akar Bayram N, Koklu E, Ureyen CM, Kucukseymen S, Arslan S, et al. Assessment of impact of weight loss on left and right ventricular functions and value of tissue doppler echocardiography in obese patients. Echocardiography (Mount Kisco, NY) 2016; 33(6): 854-61.
14. Humiecka M, Sawicka A, Tarnowski W, Jankowski P. The effect of bariatric surgery on blood pressure in short- and long-term follow-up. J Hypertension 2025;43(Suppl 1): e190.
15. Jamialahmadi T, Abdalla MA, Mirhadi E, Almahmeed W, Sukhorukov VN, Virani S, et al. Impact of metabolic and bariatric surgery on heart rate variability: a systematic review and meta-analysis. Updates Surg 2025;15-9.

Original Article

Epidemiological and Exposure Related Attributes of Crimean-Congo Hemorrhagic Fever during the 2024 Outbreak in Thi-Qar province, Iraq

Azhar Hamid Rasool[1], Dalal Kadhim Almousawi[2], Abdullah Hijaz Hashim[3] and Nasser Saleh Lhwak[1]

ABSTRACT

Objective: To explain the epidemiology and sociodemographic details of Crimean-Congo hemorrhagic fever in Thi-Qar, Southern Iraq.

Study Design: Cross-sectional study

Place and Duration of Study: This study was conducted at the using data from the Department of Public Health, Province of Thi Qar from 15th September 2024 to 31st December 2024.

Methods: A total of 44 cases of Crimean-Congo hemorrhagic fever were identified during the period by reverse transcription polymerase chain reaction or enzyme-linked immunosorbent assay.

Results: The mean age of the patient was 42.05±12.72 years. The majority of patients get the infection during May (N=7, 16%) and June (N=10, 23%). 57% of patients reported having interaction with animals, and slaughter by14% and contact with raw meat 43%. The majority of patients (N=21, 48%) were housewives. Livestock breeders represent (N=8, 18%), and Butcher represent (N=6, 14%). They lived in both rural (46.01%) and urban (33.88%) areas. Death represents (N=6, 13.7%) and patients get complete cure represent (N= 38, 86.3%). The outcome of hemorrhagic fever patients was significantly correlated with the year of infection (P<0.001).

Conclusion: Crimean-Congo hemorrhagic fever is a hazardous illness that can lead to major health issues. Iraq is currently considered to be a country with a high prevalence of Crimean-Congo hemorrhagic fever

Keywords: Hemorrhagic fever, Crimean-Congo haemorrhagic fever virus (CCHFV), Viral infection

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INTRODUCTION

Crimean-Congo hemorrhagic fever (CCHF) is a severe zoonotic viral disease caused by the Crimean-Congo hemorrhagic fever virus (CCHFV), a member of the genus Orthonairovirus within the family Nairoviridae. The virus is primarily transmitted through bites of infected Hyalomma ticks or through direct contact with blood or tissues of infected animals and humans.[1,2]

[1,4.] College of Applied Medical Sciences, Department of Pathological Analysis, University of Al-Shatrah City, Iraq
[2.] Southern Technical University, Nasiriyah Technical Institute Thi-Qar
[3.] Department of Forensic Evidence, College of Applied Medical Sciences, Al-Shatrah University, Al-Shatrah City, Iraq

Correspondence: Azhar Hamid Rasool, College of Applied Medical Sciences, Department of Pathological Analysis, University of Shatrah, Iraq.
Contact No:
Email: azherhamed@shu.edu.iq

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Since there is no known cure or vaccine for CCHF, it is regarded as an emergent arboviral zoonotic disease in many nations, perhaps as a result of increased vector bionomics and changing climates.[3] Due to its high case fatality rate, which may range from 10% to 40%, and the absence of a specific antiviral treatment or licensed vaccine, Crimean-Congo hemorrhagic fever remains a major public health concern worldwide.[4] Iraq is considered one of the endemic countries, where repeated outbreaks have been documented over the past decades. Since the first confirmed cases reported in 1979, CCHF has continued to pose a significant threat, particularly in rural and semi-urban areas where livestock breeding, animal slaughtering, and tick exposure are common practices, CCHF is widespread in Iraq's neighbors, Saudi Arabia, Iran, and Turkey.[5] In recent years, Iraq has experienced a noticeable increase in reported CCHF cases. This rise has been attributed to multiple factors, including climatic changes, increased tick activity, uncontrolled animal movement, and traditional slaughtering practices, particularly during religious occasions.[6,7] Therefore, the purpose of this study was to describe the epidemiological, sociodemographic, and exposure-related characteristics of confirmed CCHF cases reported in Thi-Qar Province, southern Iraq, during the 2024 outbreak.

METHODS

A cross-sectional study was conducted on 44 human CCH-FV cases that were reported in the Thi-Qar Governorates, Iraq from 15th September 2024 to 31st December 2024 letter No. 234/QM/Approval/ieuhhe 97262 dated September 10, 2024. The obtained data were reviewed all of the patient medical documents related to this outbreak. All suspected patients showing symptoms of CCHF were admitted to isolated wards and Intensive Care units in Thi-Qar Hospitals. Blood samples were obtained from every patient during the outbreak. Immediately after collection, the specimens were delivered to Baghdad's Central Public Health Laboratory. Each verified situations identified by the Central Public Health Laboratory (CPHL), Baghdad, utilizing RT-PCR (Real Star® CCHFV RT-PCR Kit) or ELISA IgM (human Crimean Congo haemorrhagic fever virus IgM [CCHF-IgM] ELISA Kit/abbexa) methods.[5] The serological identification of specific IgM and IgG is necessary for a laboratory detection of CCHF. A recent infection is indicated by the presence of IgM. But some IgM and IgG antibodies don't show up until five to seven days after the first sign of symptoms, and in many cases, they might not be found. Early diagnosis of CCHFV in a patient's blood can be achieved by RT-PCR detection of viral RNA.[3] The data was entered and analyzed through SPSS-2024. The Chi-Square Test was used to assess the relationship among categories of variables. By definition, a p-value of less than 0.05 was considered significant.

RESULTS

Table No. 1: Demographic information of the patients (N=44).

Variable	No.	%
Gender		
Male	23	52.0
Female	21	48.0
Age (years)		
< 20	2	4.0
20-30	6	14.0
30-40	10	23.0
40-50	15	34.0
50-60	7	16.0
60	4	9.0
Residence		
Rural	20	45.0
Urban	17	39.0
Suburban	7	16.0
Occupation		
Housewife	21	48.0
Livestock breeders	8	18.0
Butcher	6	14.0
Earner	5	11.0
Student	1	2.0
Employee	3	7.0

There were 23 (52%) males and 21 (48%) females. More than half of patients (N=15, 34%) presented with age group (40-50) years, while the 30-40 years group accounts for 23%. The mean age of the patient was 42.05±12.72 years. Majority of patients 20 (45%) were from rural areas. According to occupation, 21 (48%) were housewives. Livestock breeders represent in 8 (18%) and Butcher represent in 6 (14%) [Table 1]. The majority of patients get the infection during May 7 (16%) and June 10 (23%) [Table 2].

Table 3 showed the distribution of patients with hemorrhagic fever according to the outcome, including (death, cure and discharge on their family responsibility). Death represents (N=6, 13.7%) and patients get complete cure represent (N= 38, 86.3%). Animal contact was reported by 57% of the patients, slaughtering by 14% and contact with raw meat 43% (Table 4).

Table No. 2: Allocation of individuals according to month-wise (N=44)

Month	No.	%
January	1	2.0
February	-	-
March	1	2.0
April	6	14.0
May	7	16.0
June	10	23.0
July	6	14.0
August	4	9.0
September	5	11.0
October	3	7.0
November	1	2.0
December	-	-

Table No. 3: The relationship between hemorrhagic fever patient's outcomes and year of infection (n=44)

Year of infection	Outcome			P value
	Death	Cure	Discharge on their family response-bility	
2024	6 (13.7%)	38 (86.3%)	-	0.0001**

**P0.01

Table No. 4: Epidemiologic association of patients with Crimean-Congo hemorrhagic fever

Link	No.	%
Animal contact		
Yes	25	57.0
No	19	43.0
Slaughtering		
Yes	6	14.0
No	38	86.0
Contact with raw meat		
Yes	19	43.0
No	25	57.0

DISCUSSION

The continued occurrence of Crimean-Congo hemorrhagic fever (CCHF) cases highlights the persistent circulation of CCHFV in southern Iraq and reflects the endemic nature of the disease in the region.[5] It has shown that these livestock are often infected by tick species, particularly Hylomma species, the primary carriers of CCHFV.[8] The biggest problem with this endemic is the lack of collaboration between the human and animal sectors in terms of illnes prevention. The outbreak is made worse by a lack of tick control initiatives. Additionally, there is an absence of laboratory kits for CCHF diagnosis, particularly at the district level. This may result in delayed therapy or inaccurate diagnosis, which would raise the number of case mortality.[9] Among the patients, 57% reported coming into contact with an animal, 43% reported touching raw meat, and 14% reported animal slaughter. In this study, death represents (N=6, 13,7%) and patients who get complete cure represent (N= 38, 86.3%)of total patients recorded in periods of data collection. In this outbreak, males accounted for a slightly higher proportion of cases than females. This finding is consistent with previous studies from Iraq and neighboring countries, where male predominance has been linked to occupational and behavioral exposure, including livestock handling and outdoor activities.[10,11] Nevertheless, the substantial proportion of female cases particularly housewives indicates that domestic exposure remains an important route of infection. Most cases occurred among individuals aged 30–64 years, a pattern commonly reported in CCHF outbreaks and attributed to higher levels of occupational and household exposure to animals and raw animal products.[12] In the our study, The majority of patients get the infection during May (N=7,16%) and June (N=10, 23%). The spread of the virus's vector could be the cause of the rise in CCHFV infections in Iraq. The distribution showed a clear peak during May and June, corresponding to periods of increased tick activity. High temperatures and low humidity enhance tick aggressiveness and human-tick contact, thereby increasing the risk of virus transmission.[13] In addition, increased animal slaughtering during spring and early summer, especially around religious festivals, may further amplify transmission.[6] The study also found that rural, urban, and suburban distributions were (45%, 39%, and 16%) respectively. The incidence of CCHFV is increasing in rural areas due to the large number of livestock breeders. Additionally, sheep wool is sheared during spring without the utilizing of personal protective equipment or safety precautions to avoid direct infection from ticks or tick-infected livestock. In recent decades, there has been an overlap between rural and urban areas, which has led to an increase in cases in urban areas. In additionally, the increasing number of livestock breeders in urban areas.[5,14]

The majority of patients 21 (48%) were housewives, whereas 18% and 14% of the patients were livestock breeders and butchers, respectively. This high percentage of housewives may be due to the fact that, historically, Iraqi housewives frequently handle raw meat, particularly after it has been slaughtered, and they breed animals in rural regions. Exposure analysis revealed that direct animal contact and handling of raw meat were common among patients. These findings support the role of animal-related exposures in maintaining CCHFV transmission and emphasize the importance of household-level risk factors, particularly among individuals not traditionally classified as high-risk occupational groups.[1,15] Overall, these findings underline the need for strengthened surveillance, improved public awareness regarding safe animal handling, and effective tick control programs. Targeted interventions during high-risk seasons and focused health education for vulnerable populations are essential to reduce the impact of future outbreaks.

CONCLUSION

Crimean-Congo hemorrhagic fever is a hazardous illness that can lead to major health issues. Iraq is currently considered to be a country with a high prevalence of CCHF. To lower the death rates, stop infection, and protect public health in Iraq and globally, targeted public health initiatives are required. Firstly, a sufficient number of public health labs with comprehensive PCR testing capabilities are developed across the country. Tick control and stringent slaughtering regulations come in second. Thirdly, it is crucial to regulate the movement of animals both within and outside of Iraq, particularly in the Thi-Qar area. Lastly but not least, improving health education and promotion initiatives, particularly among high-risk individuals.

Author's Contribution:

Concept & Design or acquisition of analysis or interpretation of data:	Azhar Hamid Rasool, Dalal Kadhim Almousawi
Drafting or Revising Critically:	Abdullah Hijaz Hashim, Nasser Saleh Lhwak
Final Approval of version:	All the above authors
Agreement to accountable for all aspects of work:	All the above authors

Conflict of Interest: The study has no conflict of interest to declare by any author.

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REFERENCES

1. Frank MG, Weaver G, Raabe V. State of the Clinical Science Working Group of the National Emerging Pathogens Training; Education Center's Special Pathogens Research Network2; State of the Clinical Science Working Group of the National Emerging Pathogens Training Education Center's Special Pathogens Research Network. Crimean-Congo Hemorrhagic Fever Virus for Clinicians-Epidemiology, Clinical Manifestations, and Prevention. Emerg Infect Dis 2024;30(5):854-63.
2. Jakimovski D, Banovi P, Spasovska K, Rangelov G, Cvetanovska M, Cana F, et al. One health investigation following a cluster of Crimean-Congo haemorrhagic fever, North Macedonia, July to November 2023. Euro Surveill 2025; 30(4): 2400286.
3. Al-Abri SS, Abaidani I, Fazlalipour M, Mostafavi E, Leblebicioglu H, Pshenichnaya N, et al, Current status of Crimean-Congo haemorrhagic fever in the World Health Organization Eastern Mediterranean Region: issues, challenges, and future directions. Int J Infect Dis 2017;58: 82-9.
4. World Health Organization. Crimean-Congo haemorrhagic fever. Geneva: WHO 2025; 15-9.
5. Baghdadi GA, Aakef IR, Mahdi SG, Khaleel RI. Crimean-Congo haemorrhagic fever in Iraq. East Mediterr Health J 2024;30(8):570-76.
6. Atwan Z, Alhilfi R, Mousa AK, Rawaf S, Torre JDL, Hashim AR, et al. Alarming update on incidence of Crimean-Congo hemorrhagic fever in Iraq in 2023. IJID 2024; 10: 75-9.
7. Abdulrahman MA. Crimean-Congo hemorrhagic fever, a real health problem in Iraq, IJID 2025; 14: 100588.
8. Shahhosseini N, Wong G, Babuadze G, Camp JV, Ergonul O, Kobinger GP, et al. Crimean-congo hemorrhagic fever virus in Asia, Africa and Europe. Microorganisms 2021;9(9):1-24.
9. Jafar U, Usman M, Ehsan M, Naveed A, Ayyan M, Cheema HA. The outbreak of Crimean-Congo hemorrhagic fever in Iraq - Challenges and way forward. Ann Med Surg 2022;81:104382.
10. Izadi S, Naieni KH, Madjdzadeh SR, Nadim A. Crimean-Congo hemorrhagic fever in Sistan and Baluchestan Province of Iran, a case-control study on epidemiological characteristics. Int J Infect Dis 2004;8:299-306.
11. Sabir DK, Mohammad SM, Khwarahm NR, Arif SK, Tawfeeq BA. Epidemiological study of the 2023 Crimean-Congo hemorrhagic fever outbreak in Iraq. IJID 2024; 2: 100017.
12. Balinandi S, Patel K, Ojwang J, Kyondo J, Mulei S, Tumusiime A, et al. Investigation of an isolated case of human Crimean–Congo hemorrhagic fever in Central Uganda, 2015. Int J Infec Dis 2018;68: 88-93.
13. Uspensky I. Low air humidity increases aggressiveness of ixodid ticks under high ambient temperatures. Ticks Tick-borne Dis 2019;10: 101274.
14. Fazlalipour M, Jalali T, Hewson R, Pouriayevali MH, Salehi-Vaziri M. Crimean-Congo haemorrhagic fever among healthcare workers in Iran 2000-2023, a report of National Reference Laboratory. BMC Infect Dis 2024;24(1):1312.
15. Bente DA, Forrester NL, Watts DM, McAuley AJ, Whitehouse CA, Bray M. Crimean-Congo hemorrhagic fever: history, epidemiology, pathogenesis, clinical syndrome and genetic diversity. Antiviral Res 2013;100(1):159-89.

Original Article

Dexamethasone Role in Opioid Sparing Pediatric Below Umbilical Surgery Anesthesia - Randomized Control Trial

Muhammad Shazad[1], Saqib Ismail[2], Aiman Ikram[3], Omer Jalil[4] and Saman Omer[5]

ABSTRACT

Objective: To examine the differences between dexamethasone ketamine opioid sparing anesthesia technique with propofol ondansetron in pediatric surgery anesthesia.

Study Design: Randomized control trial study

Place and Duration of Study: This study was conducted at the operating rooms and ICU of Mohiuddin teaching hospital, Mirpur, Azad Kashmir from June 2025 to December 2025.

Methods: Post approval from institutional ethical review board, we randomized ASA I-II pediatric patients. Fifty subjects stratified into two sections, Dexamethasone Ketamine (DK) and Propofol ondansetron (PO). All patients underwent below umbilical surgeries with oro tracheal tube. Primary outcome of interest was prolongement of duration of analgesia and secondary outcomes nausea and vomiting ,rescue opioid analgesia and wound condition.

Results: Fifty pediatric patients meeting inclusion criterion split into two sections at random: DK and PO. The duration of block analgesia improved in group DK than group PO but remained insignificant (p = 0.065). Dexamethasone also spared the rescue opioid in group DK as compared to group PO (p = 0.149). Dexamethasone ketamine combo improved the duration and decrease rescue opioid consumption with significant reduction in postoperative pain (p <0..005) and nausea vomiting (p = 0.297). Wound condition remained satisfactory during hospital stay and in follow up at OPD.

Conclusion: Dexamethasone ketamine combo provides longer duration of analgesia in pediatric surgical patients alongside decreased opioid consumption and lower incidence of nausea and vomiting compared to propofol ondansetron combo making it a better opioid sparing anesthesia technique in multimodal analgesia with good wound healing in pediatric surgery anaesthesia.

Key Words: Dexamethasone, Ketamine, Propofol, Ondansetron, Opioid sparing.

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INTRODUCTION

Opioid sparing to opioid free anesthesia is a move forward from vision of multimodal to preemptive analgesia and anesthesia. Co induction to auto co induction every anesthetist employ for lowest complications for surgical patients with a balanced analgesia and anesthesia technique.

[1.] Assoc. Prof. Anaesthesiology / Professor Paediatric Surgery[2] / Senior Registrar[3] / Assistt. Prof. General Surgery[4] / Asstt. Prof. Pharmacology and Therapeutics[5], Mohiuddin Islamic Medical College, Mirpur, Azad Kashmir.

Correspondence: Dr. Muhammad Shazad, Associate Professor Anesthesia, Mohiuddin Islamic Medical College, Mirpur Azad Kashmir.
Contact No: 03312772213
Email: mshazad1977@yahoo.com

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Reduction in adverse effects is an essential goal in multimodal analgesia.[1] Pain management always require a combination for lasting effect.[2] Single shot usually the strategy to reduce infections[3] but require effective adjuvants to prolong the effective analgesia.

Opioid induced complications leads to thoughts for different mechanisms to manage intraoperative and postoperative pain management. Different intravenous anaesthesia agents been used in pediatric surgery anesthesia but near ideal intravenous anesthetic agent with analgesic activity is Ketamine. Ketamine, magnesium, dexmedetomidine, xylocaine and many others been employed to get an opioid free analgesic technique. We also made a combo of ketamine with dexamethasone as their synergistic effect not only provide an ideal anesthesia but equivalent analgesia with minimal adverse effects. Ketamine and dexamethasone also provide beneficial effect with nerve blocks and a prolong effect of analgesia with minimal rescue analgesia and minimal complications[4]. Propofol most widely used intravenous anesthetic agent but adverse effects like hemodynamic instability and propofol infusion syndrome requires meticulous

reviewing before using it appropriately. Ondansetron and propofol both exhibits antiemetic properties. Dexmedetomidine exhibits excellent characteristics in sedation and anesthesia but it's sympatholytic effect leads to bradycardia and hypotension. It's use need to be very carefully gauged in pediatrics as autonomic nervous system not fully developed and so been experimented in combination with ketamine[6]. Dexamethasone been used as intravenous, regional and perineurally for its anti-inflammatory, anti-emetic and analgesic activity. It's synergistic effect with local anesthetics makes it's an ideal choice to be used neuraxially, systematically and perineurally. Ketamine also been employed extensively in so many ways for a balanced effective technique.[7,8,9] Combining it with ketamine leads to a potent technique alongside local nerve blocks to not only contain polypharmacy but in prevention of chronic pain syndromes.[10]

In this study we strived to find an ideal anesthesia and analgesic technique in pediatric anesthesia that is pre emptive, multi modal and opioid sparing which may lead to a complete opioid free anaesthesia methodology in our next study. We compared it with a conventional technique of propofol so maximum data can be extracted for future studies.

METHODS

Ethical approval from review board of Mohiuddin Islamic Medical College, Mirpur, Azad Kashmir was taken. Informed written consent taken from all study participants. Inclusion criteria meeting fifty consecutive patients were divided into two sections, section DK (dexamethasone ketamine) and section PO (propofol ondansetron) each with twenty-five patients. Randomized using a computer generated pattern to ensure allocation concealment. Section assignments placed in sealed opaque envelope that opened sequentially by medical officers to assign the allocated intervention. All patients had a running intravenous cannula and standard monitors (non invasive blood pressure, pulse oximeter and ECG) before induction. Ringer's lactate used for fluid management. All patients in section DK received intravenous dexamethasone 0.1mg/kg with 1 mg/kg ketamine over 30 seconds. Atracurium 0.5 mg/kg given intravenously. The endotracheal tube inserted after loss of consciousness and eye lash reflex. In case, eye lash reflex is still intact further boluses of 0.5mg/kg ketamine intravenously will be used.

In group PO, patient received intravenous 1mg/kg Propofol over 30 seconds. Nalbuphine 0.1 mg/kg given. The endotracheal tube was inserted after loss of consciousness and eye lash reflex. In case, eye lash reflex is still intact further boluses of 0.5mg/kg propofol intravenously given. All endotracheal tube insertions was done by consultant anaesthetist. Group DK also received periilioinguinal block with intravenous dexamethasone 0.1mg/kg while group PO will receive subcutaneous nerve infiltration at incision site by the operating surgeon. Bupivacaine 0.25% in a safe dose of 1mg/kg given in both groups. Our primary outcome of interest was duration of analgesia as request time for first request for rescue analgesia by patient or attendant for postoperative pain at surgical site in hours. Secondary outcomes included rescue opioid analgesia as per WHO step ladder approach and nausea vomiting requiring medical treatment.

RESULTS

SPSS 27 used for all data entries and their interpretations between groups. This study included fifty elective pediatric surgical patients divided into two groups. Group DK consisted of 24 males and 1 female and with a minimum age was 10 months and maximum 9 years. Group PO consisted of 21 males and 4 females with minimum age of 10 months and maximum 8 years. General presentation of two groups in table 1.

56% underwent herniotomy and other elective below umbilical pediatric surgeries. The primary outcome measure of this study was the duration of block which was quantified by first complain of pain by patient or attendant mainly mothers and assessed using Wong Baker Faces (WBPS) and Modified Objective Pain Scores (MOPS) by medical officers blinded with groups. WBPS and MOPS found significant pain difference at 1st and 6th hours in group PO when compared with group DK (Table 2,3).

Table No.1: General Demographics

Category	Dexamthasone Ketamine group	Propofol Ondansetron group	P value
AGE	10 MONTHS 9 YEARS	10 MONTHS 8 YEARS	
GENDER	MALE 24 FEMALE 1	MALE 21 FEMALE 4	
WEIGHT	MALE 6.7 KG FEMALE 34 KG	MALE 4.5 KG FEMALE 37 KG	P= 0.782
ASA KETAMINE	I 9 II 16 1.7mg/kg mean	I 8 II 17	P= 0.785
PROPOFOL		1.9 MG/KG MEAN	

Table No. 2: Wong baker pain score in number of patients in group DK & PO

Groups	No Pain	Mild Pain	Moderate Pain	Severe Pain	P Value
		WONG BAKER FACES	1ST HOUR		
GROUP DK GROUP PO	13 5	11 06	01 13	0 1	<.001
		WONG BAKER FACES	6TH HOUR		
GROUP DK GROUP PO	13 6	08 08	04 11	0 0	0.054
		WONG BAKER FACES	12TH HOUR		
GROUP DK GROUP PO	20 17	4 6	1 2	0 0	0.614

Table No. 3: MOPS pain score in number of patients in GROUP DK & PO

GROUPS	NO PAIN	MILD PAIN	MODERATE PAIN	SEVERE PAIN	P VALUE
		MOPS	1ST HOUR		
GROUP DK GROUP PO	12 5	11 8	2 12	0 0	0.005
		MOPS	6TH HOUR		
GROUP DK GROUP PO	13 7	8 09	4 8	0 1	0.241
		MOPS	12TH HOUR		
GROUP DK GROUP PO	17 17	7 5	1 3	0 0	0.513

Table No.4: Outcomes Measures

Category	**Dexamthasone Ketamine group**		**Propofol Ondansetron group**		P value
DURATION OF NERVE BLOCK	1 HOUR 6 HOURS 12 HOURS	14 06 05	1 HOUR 6 HOURS 12 HOURS	21 01 03	0.065
VOMITING	YES NO	01 24	YES NO	03 22	0.297
RESTLESSNESS	YES NO	02 23	YES NO	00 25	0.149
POSTOPIOID RESCUE	YES NO	0 25	YES NO	2 23	0.149
MOVEMENTS	YES NO	0 25	YES NO	02 23	0.149

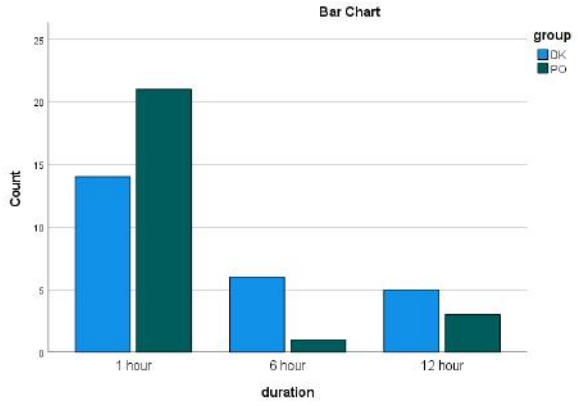

Figure No. 1: Comparison of Duration Block Between Groups

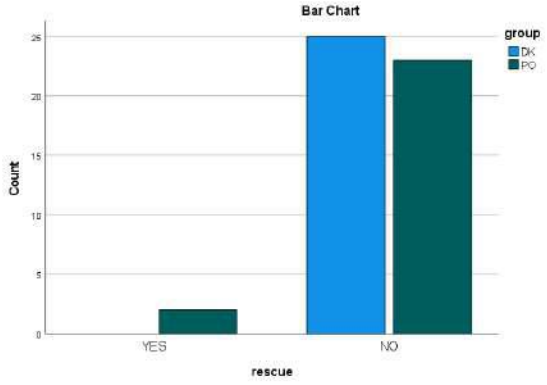

Figure No. 2: Comparison of Rescue Opioids Between Groups

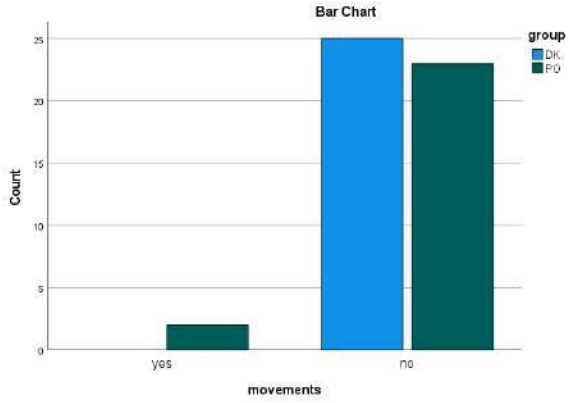

Figure No. 3: Comparison Of Intraoperative Movements Between Groups

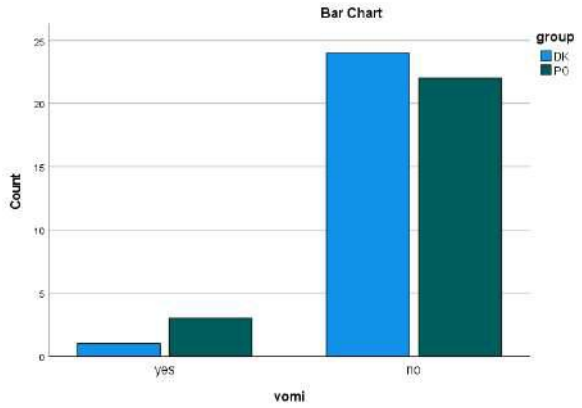

Figure No. 4: Comparison of Nausea Vomiting Between Groups

Duration of nerve block between groups found extended in group DK compared to group PO but non significant (P 0.065) (Table 4 & FIG. 1). The secondary outcome measure of abnormal body movements during surgery were only found in two patients in group PO (P 0.149) (FIG.3). Opioid rescue analgesia following WHO step ladder approach only required in two patients in PO group statistically insignificant P = 0.149 (FIG.2) . Nausea vomiting more in group PO but insignificant (P = 0.297 FIG. 4) . Postoperative restlessness found in two patients of group DK in recovery which resolved spontaneously with O_2. Wound condition remained satisfactory in all patients during admission and follow up visit in OPD. SPO2 remained stable and more than 95 % in both study group patients intraoperatively and in PACU. The statistically significant difference considered as $p < 0.05$ level.

DISCUSSION

Opioid free and opioid sparing anesthesia techniques becoming the new standard in adult and pediatric anesthesia. Our study compared dexamethasone with ketamine enhanced the duration of block in paediatric patients in comparion to propofol and ondansetron to strive forward for an anesthesia technique which is opioid sparing suitable for both elective and emergency pediatric surgeries with minimum resources and less complications. The incidence of any intraoperative nausea vomiting also reduced in dexamethasone metoclopramide group in comparison to propofol ondansetron group.

In our study, we used an opioid sparing technique for moving forward to an opioid free anesthesia technique. We used dexamethasone systematically to see how it will effects the nerve block duration in combination with ketamine in pediatric surgical population. Dexamthasone been extensively studied for prolongation of analgesic effect in spinals, epidurals, caudals, local blocks and also systematically. Perinerally and systematic use of dexamethasone been reviewed and Tan ES[11] found that efficacy of peripheral nerve block duration improved but failed to create a meaningful clinical difference so we used it intravenously to get systematic general benefits also and improved wound healing. Long duration of action of peripheral nerve blocks always desirable for an opioid free analgesia plan so an adjuvant added with local anesthetics. Catheters also been used for prolonging the effect but associated with other adverse effects including dislodgement and infections[3]. In our observations the wound site remained clean and healthy. Single shot effect can be prolonged with use of multiple adjuvants not only perineurally but also systematically. Due to multimodal approach, pain management pain scores remained lower in dexamethasone ketamine group and no requirement of opioids postoperatively. Otherwise, rebound pain not only very difficult to manage but add on opioid induced complications and chronicity. Good nerve block attenuates central sensitization and also decreases release of pain mediators such as bradykinin and substance P controlling pain and indirectly opioid sparing effects[12]. Effective targeted nerve blocks suppress nociceptive stimulus with incision and traction leading to reduction in intraoperative body movements leading to less anesthesia and analgesia increments[13].

Another important aspect is reduction in incidence of nausea vomiting which may be attributed with no or minimal use of postoperative opioids which is related with mu opioid receptors and that is reflected also with findings of adequate oxygenation thoughout the clinical course[14]. Minimal intraoperative body movements noted only in two patients in propofol ondansetron group requiring additional increments of propofol[15]. This been adequately controlled in dexamethasone ketamine group directing towards a synergistic effect which can be quantified using BIS monitoring[16] in future trials. Similarly, postoperative restlessness only noted in two patients of DK group which can't be attributed to inadequate pain control[17] rather ketamine side effect thou resolved spontaneously with provision

of oxygen. We used and applied two pain scales to increase the reliability of our assesssments and results so appropriate management can be provided.[18]

CONCLUSION

Dexamethasone ketamine combo provides longer duration of analgesia in pediatric surgical patients alongside decreased opioid consumption and lower incidence of nausea and vomiting compared to propofol ondansetron combo making it a better opioid sparing anesthesia technique in multimodal analgesia with good wound healing in pediatric surgery anaesthesia.

Limitations: This study has several limitations. Firstly, the sample size was relatively small, which may have introduced a statistical bias so we are planning for a larger multi centre study to validate our current findings. Chronic pain prevention evaluation not done in our study as ketamine, dexamethasone and nerve blocks all been contributed as a positive role.

Author's Contribution:

Concept & Design or acquisition of analysis or interpretation of data:	Muhammad Shazad, Saqib Ismail, Aiman Ikram, Omer Jalil
Drafting or Revising Critically:	Muhammad Shazad, Saqib Ismail, Saman Omer, Omer Jalil
Final Approval of version:	All the above authors
Agreement to accountable for all aspects of work:	All the above authors

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REFERENCES

1. Cardwell TW, Zabala V, Mineo J, Ochner CN. The effects of perioperative peripheral nerve blocks on peri-and postoperative opioid use and pain management. Am Surg 2022;88(12):2842-50.
2. Muñoz-Leyva F, Cubillos J, Chin KJ. Managing rebound pain after regional anesthesia. Korean J Anesthesiol 2020;73(5):372-83.
3. Volk T, Engelhardt L, Spies C, et al. Infection incidence of catheter procedures for regional anesthesia. Anaesthetist 2009;58:1107-1112.
4. Abdallah FW, Johnson J, Chan V, Murgatroyd H, Ghafari M, Ami N, et al. Intravenous dexamethasone and perineural dexamethasone similarly prolong the duration of analgesia after supraclavicular brachial plexus block: a randomized, triple-arm, double-blind, placebo-controlled trial. Regional Anesthesia Pain Med 2015;40(2):125-32.
5. Reysner T, Pietraszek P, Shadi M, Musielak B, Kowalski G, Daroszewski P, et al. Effect of perineural dexamethasone versus dexmedetomidine as adjuvants to ropivacaine on analgesic duration in pediatric popliteal sciatic nerve blocks: A randomized, triple-blinded, placebo-controlled trial. Regional Anesthesia Pain Med 2025 Oct 2. doi: 10.1136/rapm-2025-107096
6. Li HP, Liu KP, Yao L. Dexmedetomidine in combination with ketamine for pediatric procedural sedation or premedication: A meta-analysis. The Am J Emerg Med 2021;50:442-8.
7. Panjabi N, Prakash S, Gupta P, Gogia AR. Efficacy of three doses of ketamine with bupivacaine for caudal analgesia in pediatric inguinal herniotomy. Regional Anesthesia Pain Med 2004;29(1):28-31.
8. Oham A, Ekwere I, Tobi K. Subcutaneous ketamine prolongs the analgesic effect of local infiltration of plain Bupivacaine in children undergoing inguinal herniotomy. Afri Health Sci 2020;20(2):806-14.
9. Abdel-Ghaffar HS, Moeen SM, Moeen AM. Topical versus caudal ketamine/bupivacaine combination for postoperative analgesia in children undergoing inguinal herniotomy. Saudi J Anaesthesia 2017;11(1):41-8.
10. Shabana TS, Ibrahim DM, Ghaly SI. Dexamethasone and ketamine as adjuvants to bupivacaine for incisional infiltration in pediatric abdominal operations. Revista Chilena de Anestesia 2024;53(1).
11. Tan ES, Tan YR, Liu CW. Efficacy of perineural versus intravenous dexamethasone in prolonging the duration of analgesia when administered with peripheral nerve blocks: a systematic review and meta-analysis. Korean J Anesthesiol 2022; 75(3):255-65.
12. Varsha R, Desai SN, Mudakanagoudar MS, Annigeri VM. Comparison between caudal epidural and ultrasound-guided ilioinguinal-iliohypogastric block with bupivacaine and dexmedetomidine for postoperative analgesia following pediatric inguinal hernia surgeries: a prospective randomized, double-blind study. J Anaesthesiol Clin Pharmacol 2021;37(3):389-94.
13. Ohashi N, Denda S, Furutani K, Yoshida T, Kamiya Y, Komura R, et al. Ultrasound-guided ilioinguinal/iliohypogastric block did not reduce emergence delirium after ambulatory pediatric inguinal hernia repair: a prospective randomized double-blind study. Surgery today 2016;46(8): 963-9.
14. Karan D, Swaro S, Mahapatra PR, Banerjee A. Effect of dexmedetomidine as an adjuvant to ropivacaine in ilioinguinal-iliohypogastric nerve blocks for inguinal hernia repair in pediatric

patients: a randomized, double-blind, control trial. Anesthesia Essays Res 2018;12(4):924-9.

15. Li P, Tang W. Efficacy of Ultrasound-Guided Iliohypogastric and Ilioinguinal Nerve Block for Anesthesia in Pediatric Inguinal Surgery. J Pain Res 2025;12:1891-9.
16. Budi I, Djuric Z, Marjanovic V, Djordjevic I, Stevic M, Simic D. Use of bispectral index (BIS) for monitoring of sedation and total intravenous anesthesia (tiva) in pediatric patients undergoing colonoscopy. Facta Universitatis, Series: Medicine and Biol 2022;Oct 20:012-8.
17. Yamada K, Inomata S, Tanaka M. The ropivacaine concentration required for ultrasound-guided ilioinguinal/iliohypogastric nerve block in pediatric patients. Anesth Analgesia 2016;123(1):175-8.
18. Xiao-Jun W, Shan-Qu G, Chun-Lan C, Jian-Fen Z, Yan-Ning Z, Xin-Yi H, et al. The application of two pain assessment methods in clinical rehabilitation medicine. 2025(4 (102)):92 -6.

Original Article

Depersonalization among Nurses prior to implementation of MBCT

Cultivating Compassion and Reducing Depersonalization through Mindfulness-Based Cognitive Therapy in Critical Care Nurses

Hadi Faiz Jazan and Saja Hashim Mohammed

ABSTRACT

Objective: To assess the level of depersonalization among critical care nurses prior to the implementation of the MBCT, to evaluate the effect of mindfulness-based cognitive therapy as a psychological intervention to manage depersonalization among critical care nurses.

Study Design: A quasi-experimental study

Place and Duration of Study: This study was conducted at the Critical Care Units of Al-Hussein Medical City and Imam Al-Hassan Al-Mujtaba Teaching Hospital, in Karbala, Iraq from 7th June 2024 to 13th November 2024.

Methods: This study was conducted involving 88 critical care nurses. Both male and female nurses with at least one year of experience in critical care units who voluntarily agreed to participate. Owing to the specialized nature of critical care units, participants in the study group were assigned to sessions comprising 2 to 5 individuals each. Participants were randomly assigned to either an intervention (n=43) or a control group (n=45). The intervention group participated in an eight-week mindfulness-based cognitive therapy program, while the control group continued with their routine work schedule. Both groups completed the depersonalization subscale of the Maslach Burnout Inventory prior to and following the intervention.

Results: Both groups had high depersonalization at baseline ($p=0.196$). Post-intervention, the experimental group declined from 10.6 to 4.86 (54.1% reduction; $p<0.001$, $d=1.38$), while the control group remained unchanged significantly from 11.7 to 10.9; $p=0.432$, $d=0.02$). Between-group differences were significant ($p<0.001$, $d=1.57$). Improvements were greatest among male nurses, those with insufficient income, and those employed in both government and private hospitals.

Conclusion: Mindfulness-based cognitive therapy is an effective intervention for reducing high levels of depersonalization among critical care nurses, suggesting its potential as a valuable psychological support strategy in high-stress healthcare environments.

Key Words: Depersonalization, Burnout, Mindfulness, Cognitive therapy, Critical care nursing, Occupational stress

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INTRODUCTION

Depersonalization, a central dimension of burnout syndrome, presents significant challenges for critical care nurses (CCNs), adversely affecting both caregiver well-being and the quality of patient care.[1] It is marked by emotional detachment, cynicism, and a diminished capacity for empathy, often manifesting in impersonal or dehumanizing interactions with patients.[2]

Department of Psychiatric and Mental Health Nursing, College of Nursing, University of Babylon, Hillah, Iraq.

Correspondence: Hadi Faiz Jazan, Department of Psychiatric and Mental Health Nursing, College of Nursing, University of Babylon, Hillah, Iraq.
Contact No: 009647753205183
Email: hadi.jazan.nurh123@student.uobabylon.edu.iq

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A study conducted in Erbil that assessed nurses using the Maslach Burnout Inventory found that 40% of the sample experienced depersonalization.[3] Approximately 48% of CCNs experience high levels of depersonalization[4] and 10% of nurses globally exhibit severe symptoms of depersonalization.[5]

Several factors contribute to the high prevalence of depersonalization among CCNs, including excessive workloads, high patient mortality rates, and frequent exposure to traumatic events.[6] These persistent stressors frequently lead to emotional exhaustion, prompting nurses to adopt emotional distancing as a coping mechanism.[7] The ramifications of depersonalization extend beyond the individual, as it significantly undermines the quality of patient care.[8] Nurses experiencing depersonalization may demonstrate reduced compassion and engagement, thereby increasing the risk of medical errors and jeopardizing patient safety.[9] Moreover, emotional detachment can erode patient trust and satisfaction, ultimately weakening the therapeutic nurse-patient relationship.[10]

In response to such challenges, the American Nurses Association launched the "Healthy Nurse, Healthy Nation" initiative, encouraging nurses to prioritize emotional well-being. The initiative underscores the importance of a balanced integration of mind and body in delivering high-quality care.[11] Given their legal and ethical responsibilities, critical care nurses must maintain high standards of care.[8,12] Therefore, addressing and mitigating depersonalization is essential not only for safeguarding nurses' mental health but also for ensuring optimal patient outcomes. This necessitates the implementation of effective strategies and policies.[13] Among these, Mindfulness-Based Cognitive Therapy (MBCT) has emerged as a promising intervention for alleviating depersonalization symptoms and mitigating their negative consequences, thereby enhancing the quality of care provided by CCNs.[14]

MBCT is a modern psychotherapeutic approach that integrates elements of cognitive behavioral therapy (CBT) with mindfulness practices to improve emotional regulation and reduce psychological distress.[15] It combines cognitive strategies such as identifying and reframing maladaptive thought patterns with mindfulness techniques, including meditation and present-moment awareness.[16] This integrative approach cultivates non-judgmental awareness of thoughts and emotions, allowing individuals to respond more adaptively to stress and emotional challenges.[17] Through MBCT, individuals learn to observe their thoughts without engaging in reactive or avoidant behavior, fostering a sense of acceptance and psychological flexibility. This process enhances self-awareness and emotional resilience, enabling individuals to navigate cognitive experiences with greater calm and clarity.[18]

MBCT is recognized for its brevity, cost-effectiveness, simplicity of implementation, and demonstrated efficacy in reducing stress, anxiety, chronic pain, and mood disorders.[19] Despite its well-established evidence base, concerns have been raised regarding its applicability within critical care nursing contexts.[20] In light of these challenges, this study aims to evaluate the effect of MBCT among critical care nurses in Iraq. It will assess depersonalization levels, implement MBCT as a targeted intervention, and examine its cultural relevance and practical utility in a resource-constrained setting.

METHODS

A quasi-experimental study was conducted at Critical Care Units of Al-Hussein Medical City and Imam Al-Hassan Al-Mujtaba Teaching Hospital, in Karbala, Iraq from 7th June 2024 to 13th November 2024 vide letter No. 30 dated 19-5-2024 and 88nurses were enrolled. Participants were recruited from two hospitals: 43 ICU nurses and 28 CCU nurses from Al-Hussein Medical City, and 26 ICU nurses and 21 CCU nurses from Imam Al-Hassan Al-Mujtaba Teaching Hospital. Proportional allocation ensured representation across both hospitals and units, resulting in 33 ICU and 21 CCU nurses from Al-Hussein Medical City, and 20 ICU and 16 CCU nurses from Imam Al-Hassan Al-Mujtaba Teaching Hospital. During the intervention period, two participants voluntarily withdrew, yielding a final sample of 88 critical care nurses.The sample was randomly divided into two groups: an intervention group (Mindfulness Based Cognitive Therapy) and a control group.

Both male and female nurses with at least one year of professional experience in critical care settings were included. Critical care nurses were excluded if they had previously participated in Mindfulness-Based Intervention training programs, received psychosocial or psychiatric treatment, or failed to complete the questionnaire were excluded.

Data were collected using a two-part structured questionnaire. The first section collected information on the characteristics of critical care nurses, including demographic variables such as age, sex, residence, and monthly income, as well as clinical characteristics such as type of work, years of experience, shift pattern, and patient load. The second part utilized the Depersonalization subscale of the Maslach Burnout Inventory–Human Services Survey for Medical Personnel to assess levels of depersonalization.[21] Responses were rated on a seven-point Likert scale ranging from 0 (never) to 6 (every day), allowing participants to report the frequency of depersonalization-related thoughts, feelings, or behaviours.

Content validity of both the instrument and the MBCT intervention program was established by a panel of subject matter experts. Their feedback was incorporated to ensure clarity, relevance, and alignment with the study's objectives. Reliability was assessed using the test–retest method, and the results were analyzed using the Pearson Correlation Coefficient (PCC). A reliability coefficient was 0.79 which exceeding the commonly accepted threshold of 0.70, thereby indicating satisfactory reliability.

The intervention group received a comprehensive introduction to the Mindfulness-Based Cognitive Therapy program, which was implemented between July 6 and November 2, 2024. The control group continued with their routine work schedule. The eight-week program, tailored for high-intensity ICU settings, involved weekly group sessions lasting 10 to 15 minutes. The sessions included task demonstrations and daily mindfulness exercises. Nurses were encouraged to incorporate these techniques into their clinical practice. A posttest using the same MBI-HSS subscale was administered to assess changes in depersonalization levels.

Data were analyzed using SPSS-24. The differences were regarded as statistically significant at a p-value of 0.05. Inferential statistics, including independent - and paired-samples t-tests, were used to examine group differences, while analysis of variance (ANOVA) with Tukey's HSD post-hoc tests was applied for variables with three categories, such as age and monthly income. In addition to p-values, effect sizes were calculated to provide a clearer indication of the intervention's impact. Cohen's d was used, with values of d < 0.5 indicating a small effect, 0.5 d < 0.8 a medium effect, and d 0.8 a large effect.

RESULTS

The majority were aged 22-26, with males slightly outnumbering females in the experimental group. Clinical experience was the most common, with 79.1% in the experimental group and 71.1% in the control group. Nurses with 4-6 years of experience represented 20.9% and 28.9%, respectively. No significant differences were found in years of experience between the groups (Table 1).

Table 2 shows no statistically significant difference between the two groups in the pretest, as reflected in the comparable mean scores of 10.6±4.52 for the experimental group and 11.7±4.92 for the control with small effect size and not significant (p=0.196). However, following the intervention, the experimental group experienced a significant decrease in depersonalization, with the mean score declining to 4.86±1.89, whereas the control group showed a slight decrease to 10.9±5.1. This post-intervention difference was statistically significant (p<0.001) and associated with a large between-group effect size (1.57).

Table No. 1: Distribution of demographic and professional characteristics of critical care nurses by research group at baseline (Pre-test)

Variable		Experimental Group (N=43)		Control Group (N=45)		P value
		F	%	F	%	
Age (Years)	22-26	24	55.8	23	51.1	0.552
	27-31	11	25.6	16	35.6	
	32-36	8	18.6	6	13.3	
Sex	Male	23	53.5	22	48.9	0.666
	Female	20	46.5	23	51.1	
Residence	Rural	7	16.3	8	17.8	0.534
	Urban	36	83.7	37	82.2	
Monthly Income	Sufficient	19	44.2	23	51.1	0.554
	Sufficient to some extent	17	39.5	18	40.0	
	Insufficient	7	16.3	4	8.9	
Type of work	Government hospital only	29	67.4	34	75.6	0.399
	Government and Private hospital	14	32.6	11	24.4	
Years of Experience	1-3	34	79.1	32	71.1	0.389
	4-6	9	20.9	13	28.9	
Shift time	Morning	21	48.8	23	51.1	0.831
	Evening	22	51.2	22	48.9	
Patient load	1-2	39	90.7	38	84.4	0.375
	3-4	4	9.3	7	15.6	

Table No. 2: Detail of depersonalization changes and compassion enhancement after MBCT

Variable	Experimental Group				P value	Control Group				P value
	M.s	Ass	M.s	Ass		M.s	Ass	M.s	Ass	
Feeling impersonally toward patients	2.26	M	0.84	L	0.014 Sig	2.29	M	2.11	M	0.456 Ns
Increase sense of callous to patients of colleges	2.23	M	0.51	L	0.015 Sig	2.40	M	2.42	M	0.521 Ns
Working in ICU makes nurses emotionally harder	2.74	M	1.19	L	0.032 Sig	2.87	M	2.73	M	0.675 Ns
Decrees interesting in what is going on ICU patients or colleagues	1.40	L	0.35	L	0.013 Sig	1.98	L	1.91	L	0.762 Ns
Feeling that the patients blame the nurse regarding their problems	2.00	M	1.98	L	0.638 Ns	2.22	M	1.80	L	0.473 Ns

Table No. 3: Comparison of depersonalization scores before and after MBCT program among critical care nurses in the intervention and control groups

Time Point	Experimental Group (N=43)		Control Group (N=45)		Effect size between groups	P. Value
		SD		SD		
Pre-test	10.6	4.52	11.7	4.92	0.23	0.196
Post-test	4.86	1.89	10.9	5.1	1.57	<0.001
Mean difference Pre – Post	5.76	6.03	0.778	5.88		<0.001
Effect Size within group	1.53	0.15		<0.001		
Percentage change	54.1%	7.4%		<0.001		
P. Value	<0.001sig	0.854				

The significant reductions in depersonalization were observed by sex (p=0.045), monthly income (p=0.006), and type of work (p=0.012), while no significant differences were found for age, residence, years of experience, or shift time (p > 0.05) [Table 3]

DISCUSSION

In the present study, both the experimental and control groups exhibited elevated levels of depersonalization at baseline. Approximately half of the nurses in the experimental group reported high levels of depersonalization, consistent with findings with Nyarko et al[22] and Aragãz et al[23], which reported that roughly one-third of critical care nurses experienced significant depersonalization.

This study showed that MBCT intervention, the experimental group demonstrated a statistically significant reduction in depersonalization scores. This reduction suggests an improvement in emotional engagement and interpersonal responsiveness, indicating a shift away from emotional detachment and cynicism. In contrast, the control group exhibited only a marginal, non-significant change, reinforcing the conclusion that the observed improvements were attributable to the MBCT intervention rather than external variables or natural fluctuations over time. Between-groups, effect size was large, indicating a substantial reduction in depersonalization among those who received MBCT. Similarly, the within-groups effect size for the experimental group also fell within the large range, demonstrating both statistical and practical significance. This improvement may be linked to one of the cores MBCT activities "the experience of inner-outer feelings and emotions exercise" which enables participants to disengage from distressing thoughts, reconnect with bodily and emotional awareness, and regulate their stress responses. By enhancing emotional regulation and fostering empathy, this component of MBCT may help nurses re-engage with their roles more compassionately. These findings align with Othman et al[14], who reported significant reductions in depersonalization following an eight-session MBCT program for critical care nurses. Similarly, Bellehsen et al[24] found it to be feasible and effective, with notable improvements in psychological well-being.

This study also found a statistically significant difference in depersonalization scores by sex with male nurses demonstrating a greater post-intervention reduction than female nurses. Interestingly, male nurses had higher baseline depersonalization scores. This result supports with Diao et al[25] and Almulihi et al[26], they reported that male nurses are more likely to experience higher levels of depersonalization. One possible explanation lies in the cultural context of Iraq, where nursing is traditionally viewed as a female-dominated profession. Male nurses may experience greater societal pressure and role-related stress, contributing to increased depersonalization. The more pronounced reduction among males post-intervention may also be partially attributed to their higher initial scores, allowing for a greater margin of improvement. MBCT's emphasis on emotional awareness and acceptance may be particularly beneficial for male nurses, who may face cultural barriers to emotional expression. Although the decrease was less pronounced among female nurses, it was still meaningful, indicating that MBCT is beneficial for both genders.

In addition to sex, monthly income emerged as a significant predictor of depersonalization change. Nurses with insufficient income reported higher baseline depersonalization levels. This finding corroborate with Yanbei[2] identified financial stress as a predictor of depersonalization among ICU nurses. Zhang et al[27] also confirmed a positive correlation between financial stress and emotional disengagement in healthcare professionals. Despite this financial stressor, participants from low-income backgrounds demonstrated significant reductions in depersonalization after MBCT, likely due to the intervention's capacity to enhance stress management, reduce emotional reactivity, and build resilience.

Another notable finding was the significant reduction in depersonalization among nurses working in both governmental and private healthcare settings. This aligns with Xie et al[28], who found mindfulness-based interventions to be effective in reducing both emotional exhaustion and depersonalization across varied clinical contexts. Nurses working in multiple settings may face

additional stress from balancing workload and responsibilities, but they may also possess greater intrinsic motivation for skill development. MBCT may support this motivation by improving emotional resilience and tolerance for workplace stress, thus reducing depersonalization and fostering stronger patient connections.

CONCLUSION

The critical care nurses experienced high levels of depersonalization, which significantly reduced after Mindfulness-Based Cognitive Therapy intervention. The experimental group showed a significant reduction in depersonalization scores, while the control group showed no change. Male nurses, those with insufficient income, and nurses working in both public and private sectors experienced the greatest reductions.

Author's Contribution:

Concept & Design or acquisition of analysis or interpretation of data:	Hadi Faiz Jazan, Saja Hashim Mohammed
Drafting or Revising Critically:	Hadi Faiz Jazan, Saja Hashim Mohammed
Final Approval of version:	All the above authors
Agreement to accountable for all aspects of work:	All the above authors

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REFERENCES

1. Pakou V, Tsartsalis D, Papathanakos G, Dragioti E, et al. Personality traits, burnout, and psychopathology in healthcare professionals in intensive care units - a moderated analysis. Healthcare 2024;12(5):1-18.
2. Yanbei R, Dongdong M, Yun L, Ning W, Fengping Q. Does perceived organization support moderates the relationships between work frustration and burnout among intensive care unit nurses? A cross-sectional survey. BMC Nurs 2023;22(1):1-9.
3. Karimi Rozveh A, Sayadi L, Hajibabaee F, Alzubaidi SSI. Relationship between intention to leave with job satisfaction and burnout of nurses in Iraq: A cross-sectional correlational study. J Multidiscip Care 2023;12(1): 39-45.
4. Medeiros AIC de, Mesquita RB de, Macêdo F de S, et al. Prevalence of burnout among healthcare workers in six public referral hospitals in northeastern Brazil during the COVID-19 pandemic: a cross-sectional study. Sao Paulo Med J 2022;140(4):553-8.
5. Woo T, Ho R, Tang A, Tam W. Global prevalence of burnout symptoms among nurses: A systematic review and meta-analysis. J Psychiatr Res 2020; 123:9-20.
6. Mohammed MA, Ali MAK, Marzook AA, Albayaty M. Prevalence of Burnout Syndrome and its Association with Job Title and Violence among Physicians in Baghdad: A Triangulated Methodology Study. Al-Kindy Coll Med J 2023;19(1).
   DOI: https://doi.org/10.47723/kcmj.v19i1.882
7. Salas-Bergüés V, Pereira-Sánchez M, Martín-Martín J, Olano-Lizarraga M. Development of burnout and moral distress in intensive care nurses: An integrative literature review. Enferm Intensiva (Engl Ed) 2024 Oct-Dec;35(4):376-409. doi: 10.1016/j.enfie.2024.02.002.
8. Shahin MAH. Job burnout among critical care nurses in the eastern province of Saudi Arabia. Front Nurs 2025;12(1):67-78.
9. Salameh B, Abdallah J, Alkubati SA, Albashtawy M. Alarm fatigue and perceived stress among critical care nurses in the intensive care units : Palestinian perspectives. BMC Nurs 2024;1-12.
10. Eslami A, Hanifi N, Namadian M. Assessment of the Relationship between Patient Safety Culture and the Second Victim Experience in Critical Care Unit and Emergency Department Nurses. J Res Dev Nurs Midwifery 2022;19(2):10-3.
11. Wagner WD. Therapeutic/Expressive Writing and Resilience Promotion for Nurses to Reduce Burnout Syndrome. East Kentucky Univ Encompass 2023;15.
12. International Council of Nurses. International Nurses Day 2024. The economic power of care. 2024; 19.
13. Alnaiem M, Mansour A, Nemir M, Fadlalmola H, Awad HM. Effect of Stress level and Burnout on Quality of Care and Patients Satisfaction among Critical Care Nurses. Int Egypt J Nurs Sci Res 2022;2(2).
14. Othman SY, Hassan NI, Mohamed AM. Effectiveness of mindfulness-based interventions on burnout and self-compassion among critical care nurses caring for patients with COVID-19: a quasi-experimental study. BMC Nurs 2023;22(1):305.
15. Maloney S, Montero-Marin J, Kuyken W. Mindfulness-Based Cognitive Therapy - Taking it Further (MBCT-TiF) compared to Ongoing Mindfulness Practice (OMP) in the promotion of well-being and mental health: A randomised controlled trial with graduates of MBCT and MBSR. Behav Res Ther 2024;173.
16. Burgess EE, Selchen S, Diplock BD, Rector NA. A Brief Mindfulness-Based Cognitive Therapy (MBCT) Intervention as a Population-Level

Strategy for Anxiety and Depression. Int J Cogn Ther 2021;14(2):380-398.
17. Salmon P. Mindfulness-based cognitive therapy. In: Tasman's Psychiatry. In: Tasman's Psychiatry 2024; 3717-35.
18. Marks E, Moghaddam N, De Boos D, Malins S. A systematic review of the barriers and facilitators to adherence to mindfulness-based cognitive therapy for those with chronic conditions. Br J Health Psychol 2023;28(2):338-65.
19. Dou J, Lian Y, Lin L, Asmuri SNB, Wang P, Rajen Durai RA. Effectiveness of mindfulness-based interventions on burnout, resilience and sleep quality among nurses: a systematic review and meta-analysis of randomized controlled trials. BMC Nurs 2025;24(1):739.
20. Pitsillidou M, Roupa Z, Farmakas A, Noula M. Factors Affecting the Application and Implementation of Evidence-based Practice in Nursing. Acta Inform Medica 2021;29(4): 281-287.
21. Maslach BC, Jackson SE, Leiter MP, Schaufeli WB, Schwab RL. Maslach Burnout Inventory 2024; 20.
22. Nyarko BA, Yin Z, Chai X, Yue L. Nurses' alarm fatigue, influencing factors, and its relationship with burnout in the critical care units: A cross-sectional study. Aust Crit Care 2024;37(2):273-280.
23. Aragão NSC de, Barbosa GB, Santos CLC, Nascimento D dos SS, et al. Burnout Syndrome and Associated Factors in Intensive Care Unit Nurses Síndrome. Rev Bras Enferm 2021; 74(3):e20190535.
24. Bellehsen MH, Cook HM, Shaam P, Burns D, et al. Adapting the stress first aid model for frontline healthcare workers during COVID-19. Int J Environ Res Public Health 2024;21(2):171.
25. Diao D, Chen X, Zhong L, Zhang H, Zhang J. Sex differences in burnout and work-family conflict among Chinese emergency nurses: a cross-sectional study. Front Public Heal 2024;12.
26. Almulihi QAA, Almulihi FAA, Alobaidan S khalid S, Alsultan SKA, Alsultan DAH, Alsultan YMH. Gender-based differences in burnout during the COVID-19 pandemic: Are female nurses more prone to burnout than males? A meta-analysis. Int J Health Sci (Qassim) 2022;6(April):2061-73.
27. Zhang D, Lee EKP, Mak ECW, Ho CY, Wong SYS. Mindfulness-based interventions: An overall review. Br Med Bull 2021;138.
28. Xie C, Zeng Y, Lv Y, Li X, Xiao J, Hu X. Educational intervention versus mindfulness-based intervention for ICU nurses with occupational burnout: A parallel, controlled trial. Complement Ther Med 2020;52.

Systematic Review

Transvaginal Sonography and the Clinical Burden of Caesarean Scar Defects: A Systematic Review of Diagnostic and Reproductive Outcomes

Nora Sharafli[1], Kaveeta Ramesh Kumar[2] and Ramesh Kumar[3]

ABSTRACT

Due to the increase in caesarean sections worldwide, caesarean scar defects (CSD), also referred to as niches or isthmoceles, are becoming an increasingly more recognized complication. CSD can create long-term gynecological and reproductive complications. This review was conducted at Zulekha Hospital Sharjah United Arab Emirates from October 2025 till December 2025. This review included 65 studies conducted between the years 2000 and 2025 that examined imaging findings and clinical outcomes in relation to CSD. Transvaginal ultrasound (TVS) was the primary diagnostic method used, occasionally in conjunction with saline infusion sonohysterography (SIS) and three-dimensional (3D) ultrasound, as the 3D viewing angle permitted better accuracy of the diagnosis. There are common associated imaging findings such as niche depth was > 2mm and residual myometrium thickness (RMT) of < 3mm. CSD is also associated with secondary infertility in 28% - 40% of cases due to chronic inflammation with a likely impaired endometrial receptivity period. Obstetrical risks with CSD include uterine rupture, caesarean scar ectopic pregnancy, and placenta accreta spectrum when the RMT is < 2.5 mm. Although CSD is clinically significant in the caesarean population, there is still much inconsistency with the imaging diagnostic methods and management. There is a necessity for and consensus on the diagnostic criteria and further prospective research to establish the best possible management in clinical practice to improve reproductive outcomes for affected women.

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INTRODUCTION

In addressing the shift towards caesarean section (CS) deliveries worldwide, there is an important parallel in the impacts on maternal and neonatal outcomes.[1] However, translating the improvements in maternal and neonatal outcomes to identify a single occurrence of sequelae is complex as an increase in long-term adverse events following CS is witnessed.[2] One such occurrence is a caesarean scar defects (CSD)—also referred to as a niche or isthmocele—is present at where there is a previous uterine incision and is defined as a "pouch" at the site of uterine incision that is a localized myometrial discontinuity that has the potential to compromise uterus integrity and physiological function.[3].

As diagnostic imaging approaches have developed, so too have the diagnostic approaches to the CS scar complication of CSD because transvaginal ultrasound has emerged as a primary imaging approach in the diagnostic pathway for CSD.[4,5] The associated advantages of transvaginal ultrasound, specifically for the assessment of uterine scar morphology with a non-invasive, real-time assessment, have strengthened its position as a primary method of diagnosis.[6] Adjuvant techniques such as saline infusion sonohysterography and/or three-dimensional (3D) ultrasound have contributed to additional modes of assessment as they enable the evaluation of niche depth, width and residual myometrial thickness which are all critical characteristics for diagnosis and risk assessment/ management planning.[7-8]

While some women with a CSD remain asymptomatic, most women report the following symptoms: post-menstrual bleeding, pelvic pain, dysmenorrhea, or secondary infertility.[9] The clinical significance of CSD does not just impact reproductive health, but may also play a significant role in obstetric care.[10-11] These potential complications should emphasize the impact of early and accurate diagnosis.

[1.] Specialist Obstetrician and Gynecologists, Zulekha Hospital Sharjah United Arab Emirates.
[2.] Specialist Obstetrician and Gynecologists, Zulekha Hospital Sharjah LLC United Arab Emirates.
[3.] General Practitioner at Zulekha Hospital Sharjah United Arab Emirates.

Correspondence: Dr. Nora Sharafli, Specialist Obstetrician and Gynecologists, Zulekha Hospital Sharjah United Arab Emirates.
Contact No: +971558849908
Email: nora_sharafli@hotmail.com

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The purpose of this review is to provide an overview of the ultrasound features and clinical significance of caesarean scar defects. We synthesize the available information about CSD and highlight the implications of the need for a standard imaging modality and the necessity for interdisciplinary treatment and care for patient diagnosis and outcomes.

METHODS

This is a systematic review with the intention of reviewing the ultrasound assessment of CSD and implications for clinical practice.

Database searches were conducted on PubMed, Scopus, Web of Sciences, and Google Scholar. The search included articles published from January 2000 to March 2025. The following key search terms and their combinations were utilized:

"caesarean scar defect"
"niche" OR "isthmocele"
"ultrasound" OR "transvaginal sonography"
"saline infusion sonohysterography"
"3D ultrasound"
"residual myometrial thickness"
"infertility", "postmenstrual bleeding", "uterine rupture", "caesarean scar pregnancy"

Boolean operators (AND, OR) were applied to refine the results.

The inclusion criteria was:[11-13]

Peer-reviewed original research articles, reviews, and meta-analyses
Studies focusing on diagnostic imaging, clinical presentation, and management of CSD
English language publications
Human studies involving women with a history of caesarean delivery

The exclusion criteria was:[14-17]

Non-English publications
Case reports, editorials, and conference abstracts without substantial data
Studies focusing solely on surgical techniques without imaging correlation

The methodological quality of the articles that were selected was considered informally based on sample size, design, and clarity of outcome reporting. For quantitative observational studies, the PRISMA guidelines were used, as shown in figure 1.

RESULTS

In total, 65 studies that were published from 2000 to 2025, were included in this review. Most studies were observational designs: prospective cohort studies (n=28), retrospective cohort studies (n=21), systematic reviews (n=8), and cross-sectional studies (n=8). Study populations ranged significantly from small clinical series (<50 patients) to multi-institutional studies with >1,000 patients. Although most studies originated from Europe, Asia, and North America which suggests differences in clinical and imaging practice, approximately 80% of studies focused on diagnostic imaging.

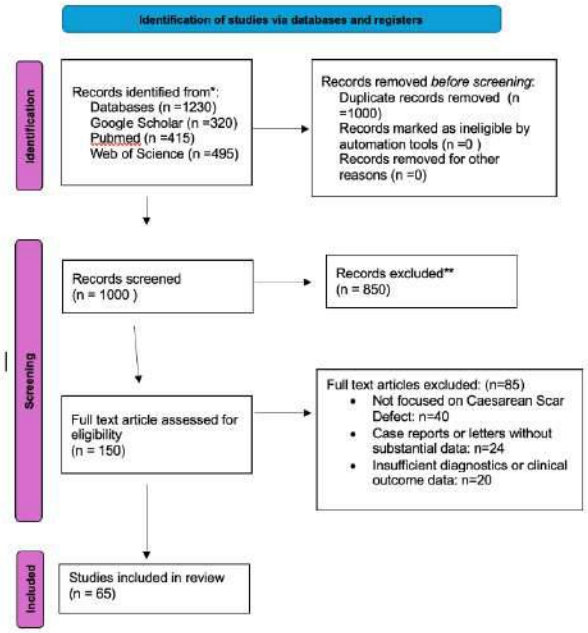

Figure No.1: PRISMA flowchart

Table No.1: Clinical outcomes, reproductive issues, or treatment considerations

Authors	Country	Study Design & Sample Size	Imaging Modality	Key Findings
Armstrong F et al. (2022)	Likely UK/Multicenter*	Narrative review; multi-center data (sample size not specified)	Transvaginal ultrasound (TVS) primarily	Highlights the emerging clinical concern of CSD and its associations with abnormal uterine bleeding, pelvic pain, and potential fertility issues.
Wu Z et al. (2023)	China	Review article; sample details not specified	TVS, with discussion on adjunct techniques	Discusses advances in diagnosis and controversies in treatment of cesarean scar defect, emphasizing diagnostic challenges and treatment considerations.

Drouin O et al. (2014)	Likely Canada/Europe*	Case report (n = 1)	TVS before and after laparoscopic repair	Demonstrated the ultrasonographic evaluation of a uterine scar niche and its improvement following surgical repair.
Zakherah M et al. (2024)	Middle Eastern region (e.g., Egypt)	Narrative review; qualitative synthesis	TVS and 3D ultrasound	Provides a comprehensive narrative on uterine niche evaluation and associated clinical implications, highlighting the 360° assessment approach.
Meuleman SJM et al. (2023)	Netherlands	Systematic review (data pooled from multiple studies)	TVS, saline infusion sonohysterography (SIS), and 3D ultrasound	Identifies the lack of standardized criteria for diagnosing CSD and correlates niche characteristics with symptoms such as abnormal bleeding and pain.
Monteagudo A et al. (2001)	Spain	Observational study in non-pregnant women (sample size not specified)	Saline infusion sonohysterography (SIS)	Detailed the morphological features of the niche in cesarean scars, providing early insights into imaging characteristics.
Polat I et al. (2012)	Turkey	Clinical case series (multiple cases of cesarean scar pregnancy; sample size not explicitly stated)	TVS, with color Doppler adjuncts	Focused on diagnosis and management of cesarean scar pregnancies, stressing the importance of early recognition and intervention.
Chen ZY et al. (2011)	China	Interventional study/case series (small sample series)	TVS and hysteroscopy combined with uterine artery embolization	Evaluated a combined interventional approach for cesarean scar pregnancy, demonstrating successful management with hysteroscopic repair and embolization.
Vervoort AJMW et al. (2015)	Netherlands	Hypothesis/theoretical paper; review of existing data	Discussion centered on ultrasound findings (TVS)	Proposes mechanisms for niche development in cesarean scars, linking surgical technique factors to defect formation.
Donnez O (2023)	Belgium	Review article; narrative synthesis	TVS, SIS, and MRI discussed	Defines “cesarean scar disorder” and reviews management strategies with emphasis on imaging-based diagnosis and surgical repair options.
Bij de Vaate AJ et al. (2011)	Netherlands	Observational study (approx. 200 women)	TVS	Found that niche measurements (e.g., residual myometrial thickness) correlated with the severity of postmenstrual spotting.
Vervoort AJ et al. (2015)	Netherlands	Hypothesis paper; review-based (data synthesis, sample not applicable)	Discussion primarily on TVS parameters	Offers alternative hypotheses regarding the etiology of cesarean scar niches, reinforcing the role of imaging in understanding defect formation.
Tower AM & Frishman GN (2013)	USA	Review of clinical data and case series (narrative review)	TVS as the key imaging tool	Emphasizes that cesarean scar defects contribute to abnormal uterine bleeding and other gynecologic complications, suggesting a need for greater clinical awareness.
Vissers et al. (2020)	Netherlands	Prospective cohort, n=200	TVS, SIS	Incidence of CSD ~32%; CSD associated with 3.47× higher risk of

				abnormal uterine bleeding.
Albonico et al. (2024)	Italy	Systematic review, n=17 studies (laparoscopic repair)	TVS, 3D US	Laparoscopic repair: 62% pregnancy, 72% live birth in infertile women.
Hehenkamp et al. (2019)	Multinational	RCT (2Close trial), n800	TVS	Double-layer uterine closure reduced postmenstrual spotting/niche size compared to single-layer.
Taylor et al. (2018)	USA	Prospective risk-factor study, n=500	TVS	Identified risk factors: single-layer closure, low incision, previa; CSD common (~60%).

DISCUSSION

Transvaginal sonography (TVS) was the main imaging modality used in nearly all studies, and saline infusion sonohysterography (SIS) and 3D ultrasound were used as adjunct imaging modalities in more than half.

Key imaging characteristics of CSD included:

Anechoic or hypoechoic triangular or pouch-like defects at the cesarean scar location.

Depth of niche >2mm and residual myometrial thickness (RMT) <3mm were typically used diagnostic criteria.

3D ultrasound provided better visualization of the morphology of the defect and continuity of the uterine wall.

The studies highlighted that there is still no standardized measurement protocol, with variability in thresholds for a clinically significant niche.

Xu Xj et al. examined the association of caesarean scar defect with risk of abnormal uterine bleeding, they found a pooled prevalence of about 46% for abnormal uterine bleeding in women with caesarean scar defect, and a significantly higher risk for intermenstrual bleeding (RR=2.93).[17] Tsuji S et al. examined the prevalence of postmenstrual spotting, dysmenorrhea, pelvic pain, and dyspareunia among women with caesarean scar defect, respectively; 63.8%, 53.1%, 39.6%, and 18.3%, indicating that these symptom patterns and rates of occurrence among women with caesarean scar defect are notable.[18] Tarafdari A et al. study predicted symptomatic caesarean scar defect: severity of symptoms correlated with defect size and residual myometrial thickness, with RMT <2.5 mm was related to increased severity in symptoms (pelvic pain and dysmenorrhea).[19] Maeda E, et al. study caesarean scar niche-related bleeding: postmenstrual spotting 28.9% of women with caesarean scar defect vs. 6.9% of women without (OR 5.5). [20]

Among the total of 65 studies, 47 studies reported clinical symptoms associated with CSD. Here is a list of the most commonly reported findings:

- Postmenstrual spotting (68%)
- Pelvic pain or dysmenorrhea (45%)
- Dyspareunia (17%)
- Chronic pelvic discomfort or abnormal uterine bleeding (AUB) (52%)

A number of studies noted that niche depth correlated with symptom severity among women with RMT <2.5 mm.

A large number of studies (n = 33) assessed reproductive outcomes:

- Secondary infertility reported in 28-40% of women with CSD
- Associations were observed with:
  a) Impaired endometrial receptivity
  b) Chronic inflammation or fluid (or both) in the niche
  c) Failed embryo implantation in IVF cycles

Jayasundara DMCS et al[21] reported a Secondary infertility incidence in women with a uterine niche of 27.4%-75%. Chronic inflammation, fluid, and RMT reduction were noted as major factors for fertility impairment.

Vissers J et al. cites chronic inflammation, retained fluid, and physical obstruction as mechanisms that can impact implantation and endometrial receptivity.[22-24]

Obstetric risks described in 29 studies were:

- Uterine rupture in labour (especially when RMT < 2.5 mm)
- Caesarean scar ectopic pregnancy (CSP)
- Placenta previa and placenta accreta spectrum (PAS) disorders

Despite the growing awareness of caesarean scar defects (CSD) and the advancements in imaging modalities there is no consensus regarding the threshold to use for diagnosis and treatment of CSD. This review stressed the significant reproductive and obstetric risks associated with CSD, including secondary infertility, abnormal uterine bleeding, cesarean scar pregnancy, and uterine rupture primarily with RMT <2.5 mm[25-27].

Unfortunately, the current literature examining CSD is primarily observational and heterogeneous in type, resulting in limited ability to generalize the findings across populations. Further, the literature shows a significant void in high-quality longitudinal studies examining the long-term effectiveness of surgical repair strategies and the long-term safety regarding potential

restoration of fertility and protection of future pregnancy[28].

The limitations of the review included variability in study design, small sample sizes, and inconsistency in imaging criteria used across the publications. The paucity of randomized controlled trials and excessive reliance on retrospective studies limit the available evidence.

CONCLUSION

Caesarean scar defect (CSD) is an emerging condition due to the increase in caesarean deliveries worldwide, impacting gynecologic, reproductive, and obstetric health. Diagnosis primarily involves transvaginal ultrasound, while adjunct forms of imaging include saline infusion sonohysterography and 3D ultrasound, which improve the assessment of the niche's accuracy and reproducibility. The most commonly reported clinical manifestations—postmenstrual bleeding, pelvic pain, and secondary infertility—are generally correlated with the depth of the niche and residual myometrial thickness (RMT), particularly if RMT is less than 2.5 mm. Despite increasing recognition of CSD and improved diagnostic capability in ultrasound imaging, there is still no universal definition, criteria for measurement, or guidelines for management.

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REFERENCES

1. Armstrong F, Mulligan K, Dermott RM, Bartels HC, Carroll S, Robson M, et al. Cesarean scar niche: An evolving concern in clinical practice. Int J Gyne Obstet 2022;161(2):356-366. https://doi.org/10.1002/ijgo.14509
2. Zhuna Wu, Shunlan Liu, Fang Huang, Yumin Ke. The Diagnosis and Treatment of Caesarean Scar Defect: Progress and Controversies. Clin Exp Obstet Gynecol 2023l50(6):116. https://doi.org/ 10.31083/j.ceog5006116
3. Drouin O, Bergeron T, Beaudry A, Demers S, Roberge S, Bujold E. Ultrasonographic Evaluation of Uterine Scar Niche before and after Laparoscopic Surgical Repair: A Case Report. AJP Rep 2014;4(2):e65-8. doi:10.1055/s-0034-1376187.
4. Zakherah M, Mohamed AA, Rageh AM, et al. Navigating uterine niche 360 degree: a narrative review. Middle East Fertil Soc J 2024;29:29. https://doi.org/10.1186/s43043-024-00185-7
5. Meuleman SJMK, Min N, Hehenkamp WJK, Post Uiterweer ED, Huirne JAF, de Leeuw RA. The definition, diagnosis, and symptoms of the uterine niche – A systematic review. Best Practice & Res Clinical Obstet Gynaecol 2023;90:102390. https://doi.org/10.1016/j.bpobgyn.2023.102390.
6. Monteagudo A, Carreno C, Timor-Tritsch IE. Saline infusion sonohysterography in nonpregnant women with previous cesarean delivery: the "niche" in the scar. J Ultrasound Med 2001;20 (10):1105-1115. doi:10.7863/jum.2001.20.10.11
7. Polat I, Alkis I, Sahbaz A, et al. Diagnosis and management of cesarean scar pregnancy. Clin Exp Obstet Gynecol 2012;39(3):365-368. PMID: 2315704.
8. Chen ZY, Zhang XM, Xu H, et al. Management of cesarean scar pregnancy by hysteroscopy combined with uterine artery embolism. Zhonghua Fu Chan Ke Za Zhi 2011;46(8):591-594. PMID: 22169517.
9. Vervoort AJMW, Uittenbogaard LB, Hehenkamp WJK, et al. Why do niches develop in Caesarean uterine scars? Hypotheses on the aetiology of niche development. Hum Reprod 2015;30(12):2695-2702. doi:10.1093/humrep/dev263
10. Donnez O. Cesarean scar disorder: Management and repair. Best Pract Res Clin Obstet Gynaecol 2023;84:102-110. doi:10.1016/j.bpobgyn.2022. 10.005.
11. Bij de Vaate AJ, Brölmann HA, van der Voet LF, van der Slikke JW, Veersema S, Huirne JA. Ultrasound evaluation of the Cesarean scar: relation between a niche and postmenstrual spotting. Ultrasound Obstet Gynecol 2011;37(1): 93-9. doi: 10.1002/uog.8864.
12. Tower AM, Frishman GN. Cesarean scar defects: an underrecognized cause of abnormal uterine bleeding and other gynecologic complications. J Minim Invasive Gynecol 2013;20(5):562-72. doi: 10.1016/j.jmig.2013.03.008.
13. Savukyne E, Machtejeviene E, Paskauskas S, Ramoniene G, Nadisauskiene RJ. Transvaginal Sonographic Evaluation of Cesarean Section Scar Niche in Pregnancy: A Prospective Longitudinal Study. Medicina (Kaunas) 2021;57(10):1091. doi: 10.3390/medicina57101091.
14. Dinh HT, Vo TM, Tran ANP. A review of the value of transvaginal sonography in the management of caesarean scar defects or pregnancy [Internet]. [cited 2025 Jun 12]. Available from: https://orcid.org/0000-0003-0898-9709
15. Naji O, Abdallah Y, Bij de Vaate AJ, Smith A, Pexsters A, Stalder C, et al. Standardized approach for imaging and measuring Cesarean section scars using ultrasonography. Ultrasound Obstet Gynecol 2012;39(3):252–9. doi:10.1002/uog.10071.
16. Zhou X, Zhang T, Qiao H, Zhang Y, Wang X. Evaluation of uterine scar healing by transvaginal ultrasound in 607 nonpregnant women with a history of cesarean section. BMC Womens Health. 2021;21(1):199. doi: 10.1186/s12905-021-01337-x.

17. Xu XJ, Jia JX, Sang ZQ, et al. Association of caesarean scar defect with risk of abnormal uterine bleeding: results from meta-analysis. BMC Women's Health 2024;24:432. https://doi.org/10.1186/s12905-024-03198-6
18. Tsuji S, Nobuta Y, Hanada T, Takebayashi A, Inatomi A, Takahashi A, et al. Prevalence, definition, and etiology of cesarean scar defect and treatment of cesarean scar disorder: A narrative review. Reprod Med Biol 2023;22(1):e12532. doi: 10.1002/rmb2.12532.
19. Tarafdari A, Nazarpour M, Zargardzadeh N, Hantoushzadeh S, Parsaei M. Comparing Cesarean Scar Defect Incidence After Locked and Unlocked Repair Methods Among Primiparous Patients: A Randomized Double-Blinded Trial. J Family Reprod Health 2024;18(3):146-153. doi: 10.18502/jfrh.v18i3.16655.
20. Maeda E, Ishihara O, Tomio J, Miura H, Kobayashi Y, Terada Y, et al. Cesarean delivery rates for overall and multiple pregnancies in Japan: a descriptive study using nationwide health insurance claims data. J Obstet Gynaecol Res 2021;47:2099–2109.
21. Jayasundara D, Jayawardane I, Jayasingha T, et al. Exploring uterine niche: a systemic review on secondary infertility rates, pathophysiological correlations, impact on assisted reproduction technology (ART), and the efficacy of surgical interventions. BMC Pregnancy Childbirth 2025;25:566. https://doi.org/10.1186/s12884-025-07638-5
22. Vissers J, Hehenkamp W, Lambalk CB, Huirne JA. Post-Caesarean section niche-related impaired fertility: hypothetical mechanisms. Hum Reprod. 2020;35(7):1484-1494. doi: 10.1093/humrep/deaa094. PMID: 32613231; PMCID: PMC7568911.
23. Patil SS, Jadhav VM. Caesarean Scar Pregnancy Presenting With Septic Shock and Multiorgan Dysfunction in a High-Risk Cardiac Patient: A Case Report. Cureus2025;17(6):e86293. doi:10.7759/cureus.86293
24. Regitz-Zagrosek V, Roos-Hesselink JW, Bauersachs J, et al. ESC guidelines for the management of cardiovascular diseases during pregnancy. Eur Heart J 2018;39:3165-241. 10.1093/eurheartj/ehy340
25. Jameel K, Abdul Mannan GE, Niaz R, Hayat DE. Cesarean scar ectopic pregnancy: a diagnostic and management challenge. Cureus 2021; 13: e14463. 10.7759/cureus.14463
26. Miller R, Gyamfi-Bannerman C: Society for Maternal-Fetal Medicine Consult Series #63: cesarean scar ectopic pregnancy. Am J Obstet Gynecol 2022;227:B9-B20. 10.1016/j.ajog.2022.06.024
27. Siu SC, Sermer M, Colman JM, et al. Prospective multicenter study of pregnancy outcomes in women with heart disease. Circulation 2001; 104: 515-21. 10.1161/hc3001.093437
28. Tang X, Wang J, Du Y, Xie M, Zhang H, Xu H, et al. Caesarean scar defect: Risk factors and comparison of evaluation efficacy between transvaginal sonography and magnetic resonance imaging. Eur J Obstet Gynecol Reprod Biol 2019; 242:1-6. doi: 10.1016/j.ejogrb.2019.09.001.

Narrative Review

Breastfeeding Support and Midwives' Role

Breastfeeding Support and Midwives' Role in Early Initiation: A Narrative Review

Wdad Alanazy

ABSTRACT

Introduction: Early initiation of breastfeeding (EIBF), placing the newborn to the breast within the first hour after birth, is one of the most effective and low-cost strategies to improve neonatal survival and maternal outcomes. Despite strong global advocacy, EIBF rates remain below the World Health Organization (WHO) target of 70%.

Aim: This narrative review synthesizes recent evidence (2018–2025) on midwives' roles in promoting and supporting EIBF, highlighting institutional, educational, and socio-cultural factors that influence breastfeeding initiation and continuation.

Place and Duration of Study: Majmaah University, Al-Majmaah, 11952, Saudi Arabia from October 2025 till December 2025.

Methods: A structured narrative review guided by the Joanna Briggs Institute (JBI) methodology and the PRISMA-ScR framework was conducted. Searches were performed in PubMed, CINAHL, Scopus, and Google Scholar. Studies addressing breastfeeding initiation, midwifery support, or postpartum education were included.

Findings: eleven peer-reviewed studies met inclusion criteria. Evidence showed that midwives' education and training significantly improve EIBF outcomes. Institutional policies such as Baby-Friendly Hospital Initiative (BFHI) accreditation, rooming-in, and skin-to-skin contact enhance breastfeeding success. Mothers valued empathetic communication, practical assistance, and continuity of care. Barriers included Cesarean delivery, inadequate staff training, and limited institutional support.

Conclusion: Midwives are pivotal in achieving optimal breastfeeding outcomes through immediate postpartum support, advocacy, and culturally sensitive counselling. Strengthening professional education, enforcing BFHI standards, and expanding family-inclusive community programs are essential to meet WHO and Saudi Vision 2030 targets.

Key Words: Breastfeeding support; Early initiation; Midwives; Postpartum care; Baby-Friendly Hospital Initiative; Saudi Arabia.

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INTRODUCTION

Early initiation of breastfeeding (EIBF)—defined as placing the new-born to the breast within the first hour after birth—is a crucial determinant of infant survival and maternal health [1]. According to the World Health Organization (WHO), timely initiation of breastfeeding can prevent up to 15 % of neonatal deaths worldwide, primarily by reducing the incidence of sepsis, pneumonia, diarrhea, and other preventable infections[2,3]. Early mother-infant contact stimulates oxytocin release, enhances uterine contraction to prevent postpartum haemorrhage, and strengthens emotional bonding[4]. From a public-health perspective, EIBF represents a low-cost, high-impact intervention contributing directly to Sustainable Development Goal 3.2 on reducing neonatal mortality. Despite extensive global advocacy, EIBF rates remain below the WHO target of 70 %, with considerable regional disparities. Only about 57.6 % of infants worldwide are breastfed within the first hour, with the lowest prevalence reported in high-income and Middle-Eastern countries[5,6]. In Saudi Arabia, early initiation occurs in roughly 23 % of births, reflecting systemic and cultural barriers[6]. Contributing factors include cesarean deliveries, limited staffing, inconsistent postnatal education, and inadequate Baby-Friendly Hospital Initiative (BFHI) implementation[3,7].

Midwives occupy a strategic and irreplaceable role in promoting EIBF through immediate postpartum care, counselling, and advocacy for mother- and baby-friendly practices[8]. Positioned at the frontline of maternity services, midwives implement evidence-based interventions—ensuring skin-to-skin contact, facilitating rooming-in, and guiding early latching and positioning[4,9]. Beyond technical competence, their empathy, communication, and cultural sensitivity

Associate Professor, Department of Nursing, faculty of nursing, Majmaah University, Al-Majmaah, Saudi Arabia.

Correspondence: Wdad Alanazy, Associate Professor, Department of Nursing, faculty of nursing, Majmaah University, Al-Majmaah, 11952, Saudi Arabia.
Contact No: +966534817294
Email: wm.alanazy@mu.edu.sa

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directly influence maternal confidence and breastfeeding success [10].

However, gaps persist in midwives' breastfeeding knowledge, institutional backing, and self-efficacy. Heavy workloads, limited continuing education, and fragmented health-care policies restrict the consistency and quality of breastfeeding assistance[11,12]. Sociocultural norms, family influence, and post-cesarean anxiety further complicate EIBF implementation. Breastfeeding is widely recognized as one of the most effective and cost-efficient interventions for improving maternal and neonatal health outcomes. Early initiation of breastfeeding, defined as putting the newborn to the breast within the first hour after birth, plays a critical role in reducing neonatal morbidity and mortality. The World Health Organization (WHO) and the United Nations Children's Fund (UNICEF) strongly recommend early initiation of breastfeeding as an essential component of optimal newborn care. Initiating breastfeeding within the first hour of life helps stimulate the release of oxytocin, promotes uterine contraction, enhances mother–infant bonding, and supports the establishment of an adequate milk supply. Additionally, early breastfeeding allows newborns to receive colostrum, which is rich in immunological components, growth factors, and essential nutrients that protect against infections and support early immune development[13-15].

Despite strong global recommendations, the rate of early initiation of breastfeeding remains suboptimal in many regions, particularly in low- and middle-income countries. Various barriers contribute to delayed initiation, including lack of maternal awareness, cultural practices, medical interventions during delivery, and inadequate breastfeeding support in healthcare facilities. Among healthcare professionals involved in maternity care, midwives play a pivotal role in facilitating early initiation of breastfeeding[16]. As primary caregivers during labor, delivery, and the immediate postpartum period, midwives are uniquely positioned to provide education, emotional support, and practical guidance to mothers. Their clinical skills and counseling abilities significantly influence maternal confidence and the successful initiation of breastfeeding. Midwives contribute to breastfeeding promotion through multiple mechanisms. They assist mothers with proper positioning and attachment, encourage skin-to-skin contact immediately after birth, and provide reassurance and counseling to overcome initial breastfeeding difficulties[17]. Evidence suggests that continuous professional support from trained midwives increases the likelihood of timely breastfeeding initiation and improves exclusive breastfeeding rates during the early postpartum period. In addition, midwives play an important role in implementing evidence-based practices recommended by the Baby-Friendly Hospital Initiative (BFHI), which emphasizes early mother–infant contact and breastfeeding support within healthcare settings[17].

This review therefore synthesizes recent empirical and integrative evidence on midwives' roles, barriers, and enabling factors affecting EIBF. By identifying effective strategies and persistent gaps, it aims to inform educational programs, policy frameworks, and maternal-child health initiatives aligned with WHO goals and Saudi Vision 2030 priorities.

METHODS

A structured narrative review was conducted following the Joanna Briggs Institute (JBI) methodology (2017) and aligned with the PRISMA-ScR framework. The review process included identifying relevant literature, screening for eligibility, charting data, and synthesizing results according to the stated objectives. To synthesize current evidence (2018–2025) on the role of midwives in supporting EIBF and to explore institutional, educational, and sociocultural factors that influence initiation and continuation during the early postpartum period.

Using the PCC framework (Population, Concept, Context):

Inclusion criteria

1. Peer-reviewed empirical or review studies addressing breastfeeding initiation, midwifery support, or early postpartum education.
2. Research involving mothers, midwives, nurses, or health systems supporting EIBF.
3. Published in English (Jan 2018 – Jun 2025).
4. Full-text availability.
5. Quantitative, qualitative, or mixed-methods studies of moderate-to-high quality.

Exclusion criteria

1. Editorials, commentaries, abstracts, or grey literature.
2. Non-English publications or unrelated topics.
3. Studies lacking methodological transparency or full-text access.

Electronic searches were performed in PubMed, CINAHL, Scopus, and Google Scholar (June 2025). Reference lists of included papers were screened manually.

Search terms combined MeSH and free-text keywords: ("early initiation of breastfeeding" OR "EIBF") AND ("midwife" OR "midwifery support" OR "lactation counselling" OR "breastfeeding education") AND ("postpartum care" OR "Baby-Friendly Hospital Initiative" OR "skin-to-skin contact"). After duplicate removal, two reviewers screened titles, abstracts, and full texts independently; discrepancies were resolved by discussion.

Search outcome: 82 records identified 21 duplicates removed 61 screened 37 excluded 24 full texts assessed 15 excluded (low quality) 9 studies included. Data were extracted using a standardized

form capturing author(s), year, country, design, population, and key findings. Quality was assessed using the JBI Critical Appraisal Tools, retaining only studies meeting 70 % criteria for rigor and relevance.

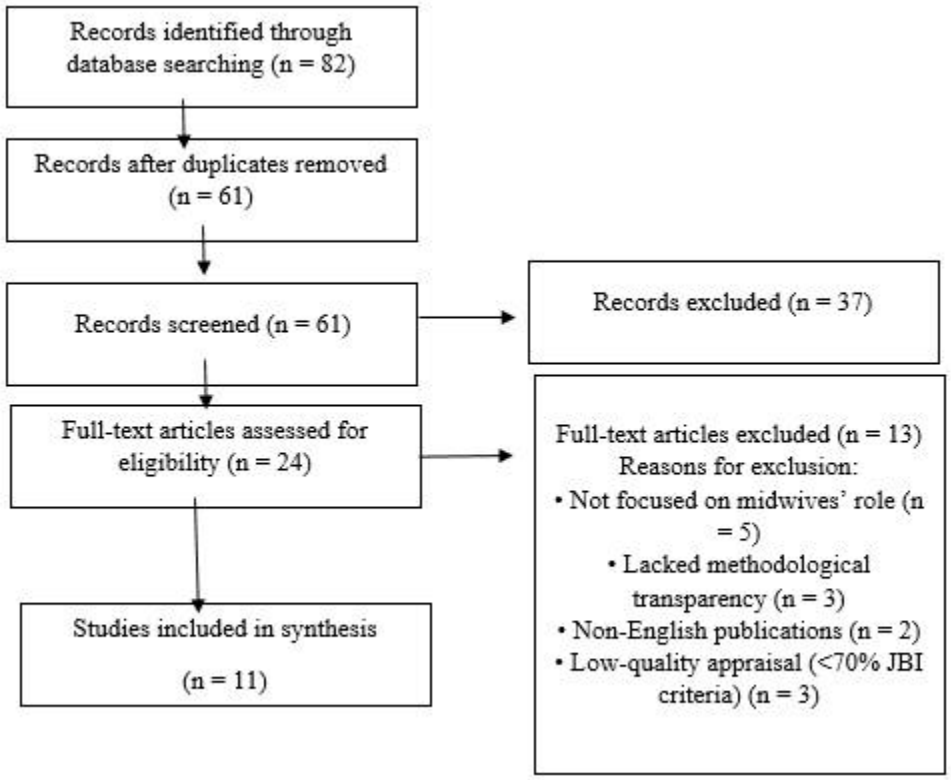

Figure 1. PRISMA 2020 Flow Diagram for Study Selection

FINDINGS AND DISCUSSION

Globally, only ~57.6% of infants are breastfed within 1 hour after birth, a rate dropping sharply following cesarean delivery[3]. Cultural beliefs about colostrum impurity and the prestige of formula remain persistent deterrents. In Saudi Arabia, EIBF rates remain low (~23%) despite institutional policies advocating early feeding[6]. The 2024 study by Alissa and Alshareef in Makkah revealed that mothers who initiated breastfeeding early and received pre-birth education maintained longer exclusive breastfeeding durations — confirming the vital link between EIBF and sustained exclusive breastfeeding.[13-15]

Midwives' clinical competence and confidence are critical determinants of early initiation of breastfeeding (EIBF) success. Wang et al. (2023) and Sato et al. (2022) demonstrated that structured lactation-support programs significantly enhance midwives' knowledge, practical skills, and the overall rate of successful EIBF; however, ongoing reinforcement, mentorship, and performance supervision are necessary to sustain these improvements[9,11]. The French National College of Midwives' guidelines emphasize that midwives must master three essential predictors of breastfeeding success—safe skin-to-skin contact, initiation of the first breastfeed, and continuous 24-hour rooming-in—which together form the foundation of competent perinatal care[16-17].

Training that integrates these competencies within the Baby-Friendly Hospital Initiative (BFHI)—particularly Step 2 (staff competency) and Step 4 (skin-to-skin contact)—has been shown to improve care consistency, adherence to evidence-based practices, and institutional accountability. Nevertheless, many Saudi midwives continue to report limited opportunities for continuing education, high clinical workloads, and a lack of structured mentorship programs, all of which restrict skill retention and confidence in implementing EIBF-supportive interventions. Midwives bridge the gap between clinical protocol and maternal experience. Evidence from Sweden[10] and France[13] shows that midwife-led empathy, hands-on guidance, and reassurance are key determinants of maternal confidence. Saudi mothers echo this need for personalized and trust-based communication[9], yet heavy caseloads limit midwives' availability for extended postpartum counselling. The WHO (2024) and BFHI guidelines recommend 1 trained breastfeeding specialist per 700 births, but many facilities fall short of this ratio[19-21].

Institutional support directly affects EIBF outcomes. Facilities with BFHI accreditation, 24-hour rooming-in, and immediate skin-to-skin show significantly higher

initiation rates[3]. Saudi studies report organizational barriers such as inconsistent BFHI implementation, staff shortages, and limited training in cesarean wards[6]. Midwives often struggle to balance routine clinical tasks with breastfeeding support, especially when policy frameworks lack clarity or resources for protected lactation time and private spaces.

Cultural attitudes and family dynamics significantly influence midwives' ability to implement early initiation of breastfeeding (EIBF). Studies from Indonesia and China have shown that family-inclusive antenatal education substantially improves both initiation and exclusivity rates[22,23]. In Saudi Arabia—where decision-making during childbirth and postpartum often involves fathers and grandmothers—midwives must extend breastfeeding education beyond mothers to include key family members. Engaging these influencers helps dispel myths about colostrum impurity, strengthens emotional support for mothers, and reduces early formula introduction[24]. The French National College of Midwives' guidelines emphasize that cultural and familial perceptions directly shape breastfeeding behaviours. Midwives are therefore encouraged to promote shared parental responsibility, highlighting fathers' active participation not only as emotional supporters but also as advocates for exclusive breastfeeding and baby-friendly practices[25]. Empowering midwives to address these cultural dimensions requires targeted communication training, community engagement programs, and culturally tailored counselling that respects traditional norms while promoting evidence-based care. When midwives are empowered to act as both clinicians and educators, they can build trust, challenge misconceptions, and strengthen maternal autonomy within culturally diverse settings. This dual role positions midwives as key change agents in achieving higher EIBF rates and sustaining breastfeeding beyond the early postpartum period[27]. Effective EIBF support extends beyond hospital discharge. Couto et al. (2025)[4] found that home visits and teleconsultations by midwives sustain breastfeeding intentions. However, returning to work is a major barrier for Saudi mothers. Alissa and Alshareef (2024)[13] reported that short maternity leaves and lack of expressing facilities in workplaces significantly reduced exclusive breastfeeding durations — reinforcing the need for midwives to advocate policy reforms and guide mothers on safe milk expression and storage[27-29].

Midwives face multidimensional barriers in promoting EIBF:

Systemic: workforce shortages and inadequate BFHI integration;

Educational: limited continuing education and training opportunities;

Cultural: beliefs that colostrum is impure and pressure from relatives to formula-feed;

Operational: high workload, insufficient privacy for breastfeeding counselling;

Psychological: midwives own self-efficacy and emotional burnout when support is not institutionally valued.

These findings underscore the need for system-level strategies to empower midwives as frontline advocates for maternal and neonatal health[30]. Early initiation of breastfeeding, defined as placing the newborn to the breast within the first hour after birth, is a key intervention recommended by the World Health Organization and other global health agencies. Initiating breastfeeding soon after delivery allows infants to receive colostrum, which is rich in antibodies, growth factors, and protective proteins essential for early immune development. Early breastfeeding also promotes skin-to-skin contact between mother and infant, enhances maternal–infant bonding, and stimulates the release of oxytocin, which facilitates uterine contraction and reduces the risk of postpartum hemorrhage[31]. In neonatal care settings, particularly among preterm or low-birth-weight infants, early exposure to human milk has been associated with improved feeding tolerance, reduced risk of necrotizing enterocolitis, and decreased rates of late-onset sepsis. Despite strong global recommendations and clear health benefits, the rate of early initiation of breastfeeding remains suboptimal in many regions. Several maternal, cultural, institutional, and healthcare-related factors influence the timing and success of breastfeeding initiation[32]. Lack of maternal knowledge, delayed skin-to-skin contact, medical interventions during childbirth, and insufficient breastfeeding counseling are among the most commonly reported barriers. In healthcare facilities, the support provided by trained health professionals plays a critical role in promoting early initiation of breastfeeding and ensuring successful lactation.

CONCLUSION

Midwives are the linchpin of successful early breastfeeding initiation. When supported through continuous training, adequate staffing, and family-inclusive education, their impact on EIBF is profound. Overcoming barriers such as cesarean births, inconsistent policies, and cultural misconceptions requires an integrated approach involving policy-makers, educators, and midwifery leaders. Establishing BFHI standards nationwide and expanding midwife-led lactation programs will help Saudi Arabia achieve WHO and Vision 2030 targets for maternal and child health.

To advance EIBF outcomes, health systems should:

1. Invest in continuous midwifery education and reflective supervision.
2. Institutionalize BFHI standards and supportive maternity policies.

3. Promote culturally inclusive family participation and community awareness.

These actions are essential for achieving **WHO 2030 breastfeeding targets** and fulfilling **Saudi Vision 2030** health priorities.

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REFERENCES

1. Terefe B, Belachew TB, Asmamaw DB, et al. Determinants of early initiation of breastfeeding following birth in West Africa: A multilevel analysis using data from multi-country national health surveys. PLoS One 2024;19(5):302143. doi:10.1371/journal.pone.0302143
2. Organization WH. Global Strategy for Infant and Young Child Feeding: Progress Report 2024. World Health Organization
3. Ulfa Y, Maruyama N, Igarashi Y, Horiuchi S. Early initiation of breastfeeding up to six months among mothers after cesarean section or vaginal birth: A scoping review. Heliyon 2023;9(5):16235. doi:10.1016/j.heliyon.2023.e16235
4. Couto C, Prata AP, Souto SP, Machado J, Viana CR. Nurse and midwife interventions to protect, promote and support breastfeeding: An umbrella review. Midwifery 2025;144:104337. doi:10.1016/j. midw.2025.104337
5. Hadisuyatmana S, Has EMM, Sebayang SK, et al. Women's empowerment and determinants of early initiation of breastfeeding: A scoping review. Heliyon 2023;9(5):16265. doi:10.1016/j.heliyon. 2023.e16265
6. Alrasheedi AT. Factors associated with early initiation of breastfeeding in central Saudi Arabia: A hospital-based survey. Int Breastfeed J 2023; 18:62. doi:10.1186/s13006-023-00598-6
7. Huang C, Li L, Zhang T, Luo B. Breastfeeding education in Chinese hospitals: A cross-sectional study. Int J Nurs Stud 2022;133:104310. doi:10.1016/j.ijnurstu.2022.104310
8. Stoodley C, McKellar L, Ziaian T, Steen M, Fereday J, Gwilt I. The role of midwives in supporting the development of the mother–infant relationship: A scoping review. BMC Psychol 2023;11(1):71. doi:10.1186/s40359-023-01092-8
9. Wang T, Shang M, Chow KM. Effects of breastfeeding training programmes for midwives on breastfeeding outcomes: A systematic review and meta-analysis. BMC Pregnancy Childbirth 2023;23(1):262. doi:10.1186/s12884-023-05540-6
10. Castro B, Johnsson A, Karlsson M. Mothers' experiences of breastfeeding support at a family centre. Nurs Open 2025;12:70152. doi:10.1002/nop2.70152
11. Sato I, Imura M, Kawasaki Y. Efficacy of a breastfeeding support education program for nurses and midwives: A randomized controlled trial. Int Breastfeed J 2022;17(1):92. doi:10.1186/s13006-022-00532-2
12. Lubbe W, Niela-Vilén H, Thomson G. Impact of the COVID-19 pandemic on breastfeeding support services. Int J Women's Heal 2022;14:1447–1457. doi:10.2147/IJWH.S342754
13. Alissa N, Alshareef M. Factors influencing exclusive breastfeeding in Saudi Arabia. Healthcare 2024;12(6):639. doi:10.3390/ healthcare12060639
14. Pommeret-de Villepin B, Barasinski C, Rigourd V. Initiating and supporting breastfeeding: Guidelines for interventions during the perinatal period from the French National College of Midwives. J Midwifery Women's Heal 2022;67(S1):56-73. doi:10.1111/jmwh.13420
15. Alves E, Magano R, Amorim M, Nogueira C, Silva S. Factors influencing parent reports of facilitators and barriers to human milk supply in neonatal intensive care units. J Hum Lact 2016;32(4):695-703. doi:10.1177/0890334416664071
16. Lawrence RA, Lawrence RM. Breastfeeding: A Guide for the Medical Profession. 9th ed. Philadelphia: Elsevier; 2022. doi:10.1016/C2018-0-02113-1
17. Bowatte G, Tham R, Allen KJ, Tan DJ, Lau MX, Dai X, et al. Breastfeeding and childhood acute otitis media: a systematic review and meta-analysis. Acta Paediatr 2015;104(S467):85-95. doi:10.1111/apa.13151
18. Horta BL, Loret de Mola C, Victora CG. Long-term consequences of breastfeeding on cholesterol, obesity, systolic blood pressure and type 2 diabetes: a systematic review and meta-analysis. Acta Paediatr 2015;104(S467):30-37. doi:10.1111/apa.13133
19. Berlanga-Macías C, Álvarez-Bueno C, Martínez-Hortelano JA, Garrido-Miguel M, Pozuelo-Carrascosa DP, Martínez-Vizcaíno V. Relationship between exclusive breastfeeding and cardiorespiratory fitness in children and adolescents: a meta-analysis. Scand J Med Sci Sports 2020;30(5):828-836. doi:10.1111/sms. 13622
20. Xu L, Lochhead P, Ko Y, Claggett B, Leong RW, Ananthakrishnan AN. Breastfeeding and the risk of Crohn's disease and ulcerative colitis: a systematic review with meta-analysis. Aliment Pharmacol Ther 2017;46(9):780-789. doi:10.1111/apt.14291
21. Amitay EL, Keinan-Boker L. Breastfeeding and childhood leukemia incidence: a systematic review and meta-analysis. JAMA Pediatr 2015;169(6): e151025. doi:10.1001/jamapediatrics.2015.1025
22. Thompson JMD, Tanabe K, Moon RY, Mitchell

EA, McGarvey C, Tappin D, et al. Duration of breastfeeding and risk of sudden infant death syndrome: an individual participant data meta-analysis. Pediatr 2017;140(5):e20171324. doi:10.1542/peds.2017-1324

23. Lapillonne A, Bronsky J, Campoy C, Embleton N, Fewtrell M, Mis NF, et al. Feeding the late and moderately preterm infant: a position paper of the ESPGHAN Committee on Nutrition. J Pediatr Gastroenterol Nutr 2019;69(2):259-270. doi:10.1097/MPG.0000000000002397
24. Meek JY, Noble L. Section on Breastfeeding. Policy statement: breastfeeding and the use of human milk. Pediatr 2022;150(1):e2022057988. doi:10.1542/peds.2022-057988
25. OuYang X, Yang CY, Xiu WL, Hu YH, Mei SS, Lin Q. Oropharyngeal administration of colostrum for preventing necrotizing enterocolitis and late-onset sepsis in preterm infants 32 weeks: a randomized controlled trial. Int Breastfeed J 2021;16(1):59. doi:10.1186/s13006-021-00408-x
26. Sullivan S, Schanler RJ, Kim JH, Patel AL, Trawöger R, Kiechl-Kohlendorfer U, et al. An exclusively human milk-based diet is associated with a lower rate of necrotizing enterocolitis than a diet of human milk and bovine milk-based products. J Pediatr 2010;156(4):562-567.e1. doi:10.1016/j.jpeds.2009.10.040
27. Maayan-Metzger A, Avivi S, Schushan-Eisen I, Kuint J. Human milk versus formula feeding among preterm infants: short-term outcomes. Am J Perinatol 2012;29(2):121-126. doi:10.1055/s-0031-1295652
28. Saxton A, Fahy K, Rolfe M, Skinner V, Hastie C. Does skin-to-skin contact and breastfeeding at birth affect the rate of primary postpartum haemorrhage? Midwifery 2015;31(11):1110-1117. doi:10.1016/j.midw.2015.07.008
29. Sobhy SI, Mohame NA. The effect of early initiation of breastfeeding on the amount of vaginal blood loss during the fourth stage of labor. J Egypt Public Health Assoc 2004;79(1-2):1-12.
30. Dias CC, Figueiredo B. Breastfeeding and depression: a systematic review of the literature. J Affect Disord 2015;171:142-154. doi:10.1016/j.jad.2014.09.022
31. Jordan SJ, Na R, Johnatty SE, Wise LA, Adami HO, Brinton LA, et al. Breastfeeding and endometrial cancer risk: an analysis from the Epidemiology of Endometrial Cancer Consortium. Obstet Gynecol 2017;129(6):1059-1067. doi:10.1097/AOG.0000000000002057
32. Huang C, Hu L, Wang Y, Luo B. Effectiveness of early essential newborn care on breastfeeding and maternal outcomes: a nonrandomized controlled study. BMC Pregnancy Childbirth 2022;22:707. doi:10.1186/s12884-022-05037-8.

Narrative Review

OLP vs OLL: Diagnostic Challenges and Malignancy Risk

Oral Lichen Planus VS Lichenoid Lesions: Diagnostic Challenges and Risk of Malignant Transformation – A Narrative Review

Faraj Alotaiby

ABSTRACT

Objective: The aim of the narrative review is to compare the incidence of the malignant transformation of oral lichen planus (OLP) and oral lichenoid lesions (OLL) in patients.

Place and Duration of Study: The literature review was undertaken at the Department of Oral and Maxillofacial Diagnostic Sciences, College of Dentistry, Qassim University, Saudi Arabia from January 2025 to May 2025.

Methods: The review of literature was undertaken with the help of electronic data bases, including Web of Science, PubMed, Google Scholar, Scopus, Medline, Embase, NCBI, Elsevier. The following keywords were used to search for the present study: oral lichen planus, oral lichenoid lesions, malignant transformation, and diagnostic challenges: 2014, May 2024.

Results: The reported rates of malignant transformation of OLP and OLL ranged from 0 to 5.4. The incidence of malignant transformation in OLP is uncertain due to overlap with OLL and with early-stage oral squamous cell carcinoma (OSCC) and lichenoid lesions.

Conclusion: Malignant transformation risk in OLP and OLL is variable with a low average risk. However, a combination of clinical and histological features complicates risks assessment and there is a need to put more emphasis on follow-up and consistent diagnosis.

Key Words: Oral lichen planus (OLP); Oral lichenoid lesions (OLL); Malignant transformation; Oral squamous cell carcinoma (OSCC)

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INTRODUCTION

Oral mucosal lesions are frequently seen in clinical practice, and oral lichen planus (OLP) and oral lichenoid lesions (OLL) can be challenging to diagnose and treat due to their similar clinical and histopathological appearances and unclear risk of malignant transformation[1]. Lichen planus (LP) or lichen ruber planus is autoimmune inflammatory skin and mucosal disease of the stratified squamous epithelium that is mainly associated with the damage caused by the cytolytic $CD8^+$ T-cells on the basal keratinocytes[2]. LP is also associated with a poor quality of life, both psychologically and socially, and hence better understanding of the disease pathophysiology is required for effective management. LP is clinically classified into cutaneous LP, mucosal LP and scalp LP, with variations in presentation but similar immunopathogenic process.

Overview of Oral Lichen Planus: Oral lichen planus (OLP), first described in 1869 by William James Erasmus Wilson, is an inflammatory, remitting and relapsing, chronic oral mucosal disease[3]. The disease typically presents as bilateral, white, reticular white lines (Wickham striae). OLP can be clinically classified into six types: reticular, erosive, atrophic, papular, plaque-like and bullous, and some also include additional types[4]. The cause and pathogenesis of OLP remain uncertain, but it is apparent that an immune dysfunction is present, with altered expression of cytokines (such as interleukins, transforming growth factor-, interferon - and tumor necrosis factor -) in lesional and peripheral samples.

Clinical Characteristics of Oral Lichen Planus: Oral lichen planus (OLP) may involve the oral and genital mucosa, oesophagus, scalp, nails and the eye, and is more common in middle aged females. The most frequent reticular form is usually asymptomatic with bilateral white lacy lines on the buccal mucosa whereas

Department of Oral and Maxillofacial Diagnostic Sciences, College of Dentistry, Qassim University, Qassim, Saudi Arabia.

Correspondence: Faraj Alotaiby, Department of Oral and Maxillofacial Diagnostic Sciences, College of Dentistry, Qassim University, Qassim, Saudi Arabia.
Contact No: 966500863652
Email: f.alotaiby@qu.edu.sa

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papular OLP is rare and resembles small white coalesced papules. The plaque-like variant is similar to leukoplakia and usually occurs on the buccal mucosa and tongue[5]. While reticular, papular and plaque-like OLP is usually asymptomatic and hyperkeratotic, the erosive, atrophic and bullous varieties are symptomatic and display erythema, ulceration and easily ruptured vesicles. And lastly, stress has been reported to induce or worsen the condition, possibly as a result of stress-induced immune responses with increased levels of cortisol and cytokines[6].

Oral Lichen Planus versus Oral Lichenoid Lesions: Oral lichen planus (OLP) and oral lichenoid lesions (OLL) are often confused due to similar appearances. Erosive OLP is often painful, with burning on eating spicy foods and xerostomia in nearly 45% of cases. OLP and OLL may be associated with a variety of systemic conditions such as Sjögren's syndrome, hepatitis C infection, type 1 diabetes mellitus and graft-versus-host disease[7]. OSCC, which accounts for 90% of oral cancers, has also been reported to undergo malignant transformation in OLP as early as 1910. But the WHO diagnostic criteria may not be specific enough to distinguish OLP from OLL. However, Van der Meij and Van der Waal proposed diagnostic criteria for OLP including clinical and histopathological features; lesions not fulfilling these criteria are defined as OLL and are often less homogeneous and may be lichenoid reactions or contact stomatitis[8].

Malignant Potential and Management: Oral lichen planus (OLP) occurs in 0.5% to 2.6% of the global population, most commonly on the buccal mucosa, followed by the gingiva, tongue and lips. The WHO classifies OLP as a potentially malignant condition, but the malignant potential of this condition is unclear; some studies have reported that malignant transformation described in OLP is due to misdiagnosis of an oral lichenoid lesion (OLL). Primary treatment goals of OLP are symptomatic relief and improved quality of life, with initial steps being education, stress management and elimination of potential local irritants, such as sharp tooth surfaces, ill-fitting dentures, candidiasis and occlusal trauma[9]. Topical corticosteroids, particularly 0.1% triamcinolone acetonide, are still the primary treatment and others including calcineurin inhibitors (tacrolimus) are used in non-responsive cases; systemic corticosteroids are reserved for severe cases. Recently, photodynamic therapy and ozone therapy have proven effective with few side effects[10].

METHODS

Search Strategy: A literature review was undertaken to determine the risk of malignant transformation of oral lichen planus (OLP) and oral lichenoid lesions (OLL). The study was conducted from January 2025 to May 2025, with data extracted, reviewed and analysed. Data extraction and literature review was undertaken at the Department of Oral and Maxillofacial Diagnostic Sciences, College of Dentistry, Qassim University, Saudi Arabia.

An electronic search was performed using various databases including Web of Science, PubMed, Google Scholar, Scopus, MEDLINE, Embase, NCBI and other Elsevier-indexed publications. The search was conducted for all publications between January 2014 and May 2024. Keywords searched included oral lichen planus, oral lichenoid lesions, malignant transformation, and diagnosis. These terms were searched individually and in conjunction with Boolean operators. The last step was to manually search the references of the selected studies to find more studies. A systematic screening process was used. The titles and abstracts of identified studies were reviewed to determine their level of relevance and then full-text screening was undertaken. Eligible studies were included.

Eligibility Criteria: This narrative review included original articles, review articles and case reports of patients with oral lichen planus and/or oral lichenoid lesions. The studies must be published in or after 2014, and the article must be in English. Articles were excluded if they had insufficient or unclear information on malignant transformation, focused on oral potentially malignant disorders other than OLP or OLL, or were published in any other language than English.

FINDINGS

Malignant Transformation Rates: The papers comprising this review are all consistent in their findings, showing that oral lichen planus (OLP) and oral lichenoid lesions (OLL) both have a quantifiable but comparatively small risk of developing into malignant lesions. The majority of the reported transformation rates vary between 0.5-3.9. Rates of large cohort studies are often below 2 and higher estimates more often so associated with OLL. Such variability is likely due to differences in the criteria of diagnosis, follow-up time, and population. The evidence, in general, confirms the assertion that OLL has a greater malignant potential than OLP, and correct diagnosis and classification needs to be performed.

3.2 Risk Factors and Predisposing Conditions: Not all patients run the risk of developing malignant transformation. Malignant change seems to have a specific vulnerability to lesions of the lateral margin of the tongue, as well as the lingual gingiva. Besides this, erosive and atrophic variations of OLP are also more risky than reticular or plaque-like OLP. The lifestyle determinants like smoking and alcoholism could also contribute to carcinogenesis. Systemic diseases such as thyroid disorders, diabetes mellitus, and hepatitis C infection are also often linked to OLP but there is no conclusive evidence that they cause it. These results

highlight the necessity to risk stratify patients and use individual follow-up guidelines.

Diagnostic Challenges: The high clinical and histopathological overlap between OLP and OLL (Fig. 1) is also one of the key barriers to estimating the malignant risk. Differentiating the two entities is frequently based on the minor diagnostic guidelines or exclusion of discernible precipitants like dental materials or drugs. This error in classification can explain the variation in the reported rates of malignant transformations in the studies. New diagnostic modalities, such as narrow-band imaging (NBI) have potential in improving the characterization of lesions and may be useful in the process of identifying regions that need to be biopsied or followed up.

Table No. 1: Description of studies selected for Narrative Review

Name and year of the study	Study design	Duration	Sample size	Purpose	Outcome
(Tsushima et al., 2021)[11]	Retrospective study		n=565	1- To evaluate the demographic and clinical characteristics of patients with OLP. 2- Rate of malignant transformation of OLP patients.	OLP is associated with a low rate of malignant transformation.
(Zotti et al., 2021)[12]	Retrospective study	5-10 years	N= 100	1- Evaluate the duration of OLP transformation in OSCC. 2- Risk factors of OLP diagnosed with OSCC. 3- Forms of OLP evolved in cancer.	4 out of 8 malignant transformations in 4 years. Odd ratios between malignant transformation and location.
(Guan et al., 2020)[13]	Longitudinal Retrospective Cohort study	14 years	Females= 548 Males=281	1- Evaluate the rate of malignant transformation in patients with OLP and OLL. 2- To assess the link between clinicopathologic aspects and malignant transformation.	Oral epithelial dysplasia occurs in <1% of patients with OLP/OLL. And OSCC was at 2.8% during the follow-up period.
(Ruokonen et al., 2017)[14]	Retrospective observational study		N=323 females:164 males: 159	1- Evaluate the OLP and OLL as precursor lesions in OSCC.	1- TN class 1 tumors-prevalent among patients with OLP or OLL (P=0.006). 2- Importance of active follow-up of patients with OLP and OLL.
(Cai et al., 2022)[15]	Retrospective cohort study		N= 3568	To evaluate the association between OLP and OSCC.	3 out of 10 primary cancers were distinct from the site of OLP. 2 were malignant of proliferative verrucous leukoplakia. No OSCCs are transformed from OLP.
(Arduino et al., 2021)[16]	Cohort Study	103.61 months	N= 3173	Histopathological diagnosis of oral cancer	32 men and 50 women developed OSCC. 21 patients died of oral cancer.
(Bandyopadhyay et al., 2017)[17]	Retrospective case series	3.5 Years	N= 143 cases	Evaluate the histopathologically diagnosed OLP and associated malignant transformation.	Two patients (1.4%) previously diagnosed with OLP developed OSCC.
(Gonzalez-Moles et al., 2017)[18]	Retrospective study	11 Years	N= 102 OLP= 21 OLL= 81	Evaluate the cancer incidence in case series of patients with OLP and OLL.	4 (3.9%) of patients developed cancer. One had OLL, three in OLP. Among three carcinomas (2 in the lower gingiva, 1 in the floor of the mouth).
(Kakoei et al., 2022)[19]	Retrospective study	23 years (1998-20)	N= 356 patients	Malignant transformation in OLP. OLL and associated risk factors.	Dysplastic changes occur in 6.2% of the patients.
(Saepoo et al., 2023)[20]	Retrospective cohort study	7 years	N= 117 OLP= 103(88%)	Prevalence of malignant transformation and incidence rate of OSCC	Prevalence of malignant transformation OLP/OLR (1.71%).

			OLR=14 (12%)		2 out of 117 patients. MT in OLP= 1.94% (2/103) The overall incidence rate of MT into OSCC= 0.0060
(Cozzani et al., 2019)[21]	Prospective study		N= 32 with OLP.	Evaluate value of Narrow-band imaging in selecting patients for biopsy, allowing early detection of malignancy from OLP.	Two patients marked positive through NBI and diagnosed with SCC after histological examination.
(Bindakhil et al., 2022)[22]	Retrospective study		N= 82 Women= 48 (58.25%) Men= 34 (41.5%) Mean age = 65.9yrs.	To examine if Topical Corticosteroid Therapy impacts the time of malignant transformation of OLP to OSCC.	The time duration between OLP and OSCC increased by 4 years in patients with TCT therapy. And decreased by 3 years in patients with candida overgrowth.
(Casparis et al., 2015)[23]	Retrospective study	10 years	N=542 patients 692 biopsies Men= 207 (38.2%) Women= 335(61.8%)	Incidence of malignant transformation of OLP.	Malignant transformation rate [MTR] = Higher in OLL (4.4%) in OLP (1.2%).

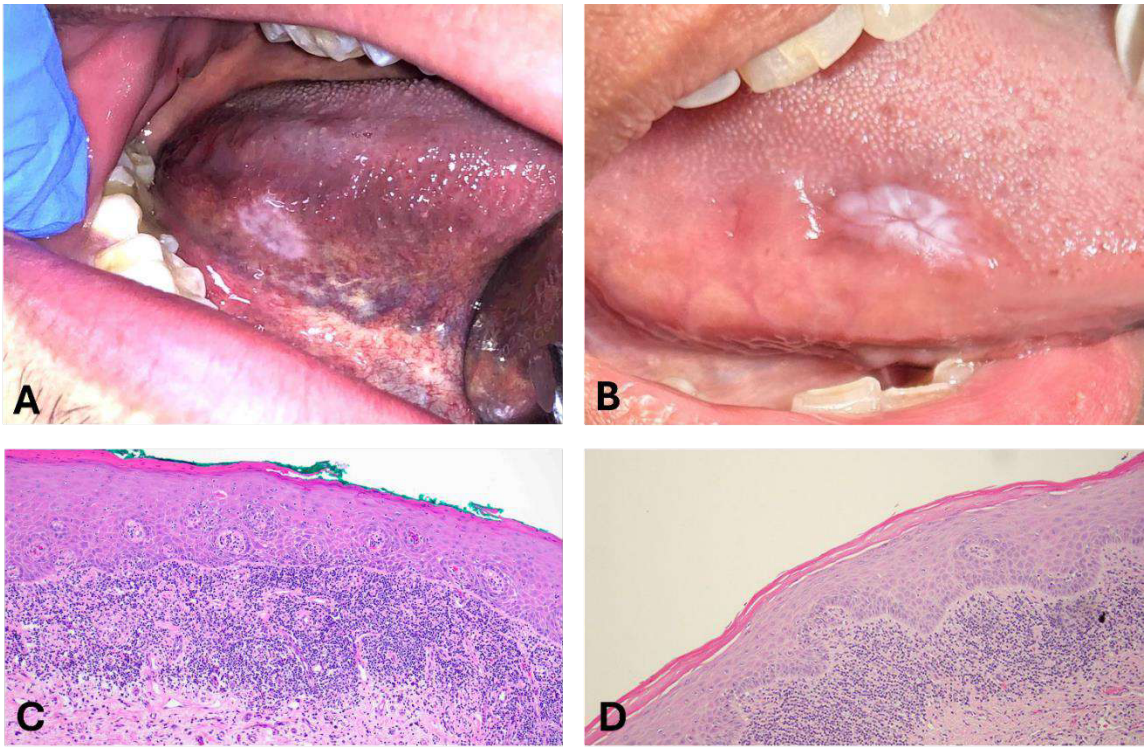

Figure No. 1: clinical and histological pictures of OLP and OLL. OLP (A) and OLL (B) Both have similar clinical features of Wickham stria within erythematous background. Histological features are also indistinguishable. (C) and (D) Show band like lymphocytic infiltrate subjacent to mucosal epithelium with basal layer degeneration and hyperkeratosis. (Clinical and histological photos are retrieved from the author's own archive)

Management and Future Directions: Treatment of OLP and OLL is mainly related to the control and reduction of symptoms and mitigation of malignant risk. Topical and systemic corticosteroids form the basis of treatment and there is some evidence to show that they can slow malignant transformation, though no established effect of protection has been recognised. Therapies adjunctive like photodynamic therapy, ozone

therapy and others have been researched and have shown benefits mostly due to symptomatic relief and not cancer prevention. Future studies must focus on the discovery of credible biomarkers and new imaging modalities to facilitate early distinguishing OLP and OLL and longitudinal studies on the effects of therapeutic interventions on the malignant outcomes in the long term.

DISCUSSION

This review suggests that the rate of malignant transformation of oral lichen planus (OLP) is low but clinically significant (0-5.4%), although risk assessment is made difficult by its association with oral lichenoid lesions (OLL) and its similarities to early oral squamous cell carcinoma (OSCC). It seems OLL may have a greater malignant potential, highlighting the need for accurate diagnosis[9]. The inflammatory process in OLP leads to oxidative stress, DNA damage and molecular changes, such as p53 overexpression, which supports its involvement in carcinogenesis, especially in erosive and erythematous forms and at high-risk sites, such as the lateral tongue. Moreover, systemic disease, lifestyle factors and misdiagnosis (e.g. leukoplakia and lichenoid drug reactions) add to the challenge[16]. This underscores the importance of clear diagnostic criteria, risk stratification based on lesion type, and regular surveillance, with early detection through clinical assessment being crucial for better outcomes.

CONCLUSION

This review highlights that while OLP/OLL carry a low but significant malignant potential, the diagnostic challenge due to overlapping clinical and histologic features of both conditions still persists. Advances in imaging and targeted therapy show promise, but long-term follow-up and precise diagnostic criteria are essential for reducing chances of malignant transformation.

Conflict of Interest: The study has no conflict of interest to declare by any author.

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REFERENCES

1. Zahid E, Bhatti O, Zahid MA, Stubbs M. Overview of common oral lesions. Malaysian family physician: the official J Academy Family Physicians Malaysia 2022;17(3):9.
2. Mortazavi H, Safi Y, Baharvand M, Jafari S, Anbari F, Rahmani S. Oral white lesions: an updated clinical diagnostic decision tree. DentistryJ 2019;7(1):15.
3. Boch K, Langan EA, Kridin K, Zillikens D, Ludwig RJ, Bieber K. Lichen planus. Frontiers Med 2021;8:737813.
4. Solimani F, Forchhammer S, Schloegl A, Ghoreschi K, Meier K. Lichen planus–a clinical guide. JDDG: J der Deutschen Dermatologischen Gesellschaft 2021;19(6):864-882.
5. Villa TG, Sánchez-Pérez Á, Sieiro C. Oral lichen planus: A microbiologist point of view. Int Microbiol 2021;24:275-289.
6. Cheng YSL, Gould A, Kurago Z, Fantasia J, Muller S. Diagnosis of oral lichen planus: a position paper of the American Academy of Oral and Maxillofacial Pathology. Oral Surg Oral Med Oral Pathol Oral Radiol 2016;122(3):332-354.
7. Wang Y, Zhou J, Fu S, Wang C, Zhou B. A study of association between oral lichen planus and immune balance of Th1/Th2 cells. Inflammation 2015;38:1874-1879.
8. DeAngelis LM, Cirillo N, McCullough MJ. The immunopathogenesis of oral lichen planus—Is there a role for mucosal associated invariant T cells? J Oral Pathol Med 2019;48(7):552-559.
9. Schmidt-Westhausen AM. Oral lichen planus and lichenoid lesions: what's new? Quintessence Int 2020;51(2).
10. Gupta S, Jawanda MK. Oral lichen planus: An update on etiology, pathogenesis, clinical presentation, diagnosis and management. Ind J Dermatol 2015;60(3):222-229.
11. Tsushima F, Sakurai J, Uesugi A, Oikawa Y, Ohsako T, Mochizuki Y, et al. Malignant transformation of oral lichen planus: A retrospective study of 565 Japanese patients. BMC Oral Health 2021;21(1):298.
12. Zotti F, Nocini R, Capocasale G, Bertossi D, Fior A, Peretti M, et al. Oral Lichen Planus: risk factors of malignant transformation and follow up. Ten years retrospective study. J Clin Exp Dentistry 2021;13(7), e630.
13. Guan G, Mei L, Polonowita A, Hussaini H, Seo B, Rich AM. Malignant transformation in oral lichen planus and lichenoid lesions: a 14-year longitudinal retrospective cohort study of 829 patients in New Zealand. Oral Surg Oral Med Oral Pathol Oral Radiol 2020;130(4):411-418.
14. Ruokonen HM, Juurikivi A, Kauppila T, Heikkinen AM, Seppänen-Kaijansinkko R. High percentage of oral lichen planus and lichenoid lesion in oral squamous cell carcinomas. Acta Odontologica Scandinavica 2017;75(6):442-445.
15. Cai X, Zhang J, Zhang H, Li T. Overestimated risk of transformation in oral lichen planus. Oral Oncol 2022;133:106025.
16. Arduino PG, Magliano A, Gambino A, Macciotta A, Carbone M, Conrotto D, et al. Risk of malignant transformation in 3173 subjects with

histopathologically confirmed oral lichen planus: a 33-year cohort study in northern Italy. Cancers 2021;13(22):5740.
17. Bandyopadhyay A, Behura SS, Nishat R, Dash KC, Bhuyan L, Ramachandra S. Clinicopathological profile and malignant transformation in oral lichen planus: a retrospective study. J Int Society Preventive Comm Dentistry 2017;7(3):116-124.
18. Gonzalez-Moles M, Gil-Montoya J, Ruiz-Avila I, Bravo M. Is oral cancer incidence among patients with oral lichen planus/oral lichenoid lesions underestimated? J Oral Pathol Med 2017;46(2): 148-153.
19. Kakoei S, Torabi M, Rad M, Karbasi N, Mafi S. Retrospective study of oral Lichen Planus and oral lichenoid lesions: Clinical Profile and Malignant Transformation. J Dent 2022;23(4):452.
20. Saepoo J, Kerdpon D, Pangsomboon K. Malignant Transformation in Oral Lichen Planus and Lichenoid Reactions in Southern Thai Population. Oral Sci Rep 2023;44:27-34.
21. Cozzani E, Russo R, Mazzola F, Garofolo S, Camerino M, Burlando M, et al. Narrow-band imaging: a useful tool for early recognition of oral lichen planus malignant transformation? Eur J Dermatol 2019;29:500-506.
22. Bindakhil M, Akintoye S, Corby P, Stoopler ET, Greenberg MS, Shanti R, et al. Influence of topical corticosteroids on malignant transformation of oral lichen planus. J Oral Pathol Med 2022;51(2): 188-193.
23. Casparis S, Borm J, Tektas S, Kamarachev J, Locher M, Damerau G, et al. Oral lichen planus (OLP), oral lichenoid lesions (OLL), oral dysplasia, and oral cancer: retrospective analysis of clinicopathological data from 2002–2011. Oral and Maxillofacial Surg 2015;19:149-156.

Case Report

Massive Pericardial Effusion in Young Woman as Initial Presentation of Systemic Lupus Erythematosus

Hashfi Khairuddin[1] and Deri Arara[2]

ABSTRACT

Life-threatening cardiovascular compromise may occur when extensive pericardial effusion represents the initial manifestation of an underlying autoimmune disorder such as systemic lupus erythematosus. An 18-year-old woman presented with worsening dyspnea, palpitations, and peripheral edema. Physical examination revealed tachycardia and muffled heart sounds. Laboratory evaluation demonstrated anemia, leukopenia, thrombocytopenia, elevated creatinine levels, and significant proteinuria. Electrocardiography showed low-voltage QRS complexes, while chest radiography revealed a characteristic "water bottle" cardiac silhouette. Transthoracic echocardiography confirmed massive pericardial effusion with right atrial systolic collapse and marked respiratory variation in tricuspid inflow, indicating hemodynamic significance. The diagnosis was established by a positive antinuclear antibody test and an EULAR/ACR classification score of 13. Treatment with anti-inflammatory agents, immunosuppressive therapy, and supportive cardiovascular management resulted in clinical improvement, and the patient was discharged after five days. This case underscores the importance of considering autoimmune etiologies in young patients presenting with unexplained massive pericardial effusion.

Key Words: Pericardial Effusion, Systemic Lupus Erythematosus, Women and Cardiovascular Disease

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INTRODUCTION

Systemic lupus erythematosus represents a long-standing immune-mediated condition characterized by dysregulated antibody production and inflammatory processes driven by immune complex deposition, with the capacity to involve multiple organ systems across the body. It disproportionately impacts women of reproductive age, with a clinical spectrum ranging from mild mucocutaneous involvement to life-threatening organ dysfunction. SLE is associated with a diverse array of cardiovascular manifestations, including pericarditis, myocarditis, coronary artery disease, and conduction abnormalities.[1] Pericardial involvement is one of the most prevalent manifestations of cardiac disease in SLE, identified in 20–50% of patients during the illness when assessed using echocardiography.[2,3]

[1.] General Practitioner / Cardiovascular Department[2], Primaya Hospital Depok.

Correspondence: Hashfi Khairuddin, General Practitioner Department, Primaya Hospital Depok,
Postal Address: Jl. Dewi Sartika RT 03 RW 10 No. 56A, Cawang, Kramat Jati, Jakarta Timur 13630
Contact No: +62-858-9353-2122
Email: hasshfi@gmail.com

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CASE PRESENTATION

A previously healthy 18-year-old female sought medical attention after experiencing progressive shortness of breath over two days, associated with episodic palpitations, along with bilateral leg swelling that had developed over the preceding month. Initial assessment revealed stable arterial pressure with marked tachycardia and tachypnea, while body temperature and peripheral oxygenation remained within normal limits. Cardiovascular examination demonstrated diminished cardiac auscultation findings in the absence of neck vein distension.

Hematologic evaluation demonstrated a reduction across all major blood cell lines, including decreased hemoglobin concentration, suppressed leukocyte count, and a markedly low platelet level. Renal function was impaired, with serum creatinine elevated to 2.4 mg/dL and significant proteinuria (+3). Electrocardiography showed low-voltage QRS complexes. Chest radiography revealed a "water bottle" cardiac silhouette, and transthoracic echocardiography confirmed a massive pericardial effusion (2.5–3.5 cm) with right atrial systolic collapse and a 50% respiratory variation in tricuspid inflow, consistent with hemodynamically significant effusion.

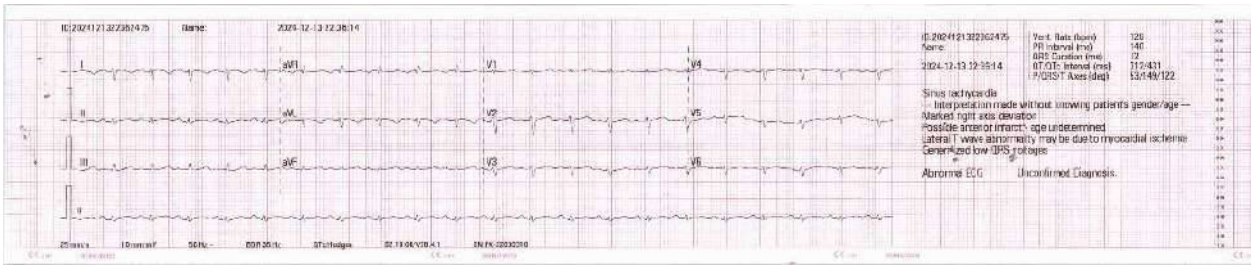

Figure No. 1: Electrocardiogram showed sinus tachycardia with right axis deviation and generalized low QRS voltages

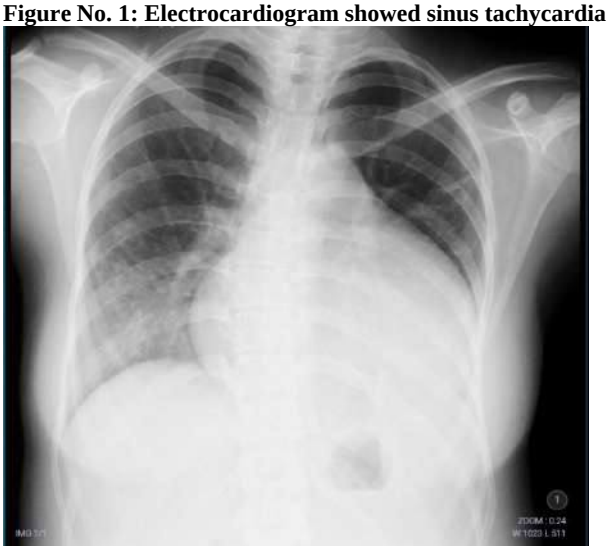

Figure No. 2. The 'Water Bottle' Sign

Figure No. 3: Transthoracic echocardiography showed Good global LV systolic function, LVEF 62% (Teich); massive pericardial effusion around the heart (2.5-3.5 cm); right atrium systolic collapsed (+); tricuspid inflow variation 50%

Serologic evaluation demonstrated a markedly elevated antinuclear antibody level, with a titer reaching 1:320. Diagnostic classification was subsequently established through application of the European Alliance of Associations for Rheumatology and American College of Rheumatology criteria, yielding a cumulative score of 13. Management consisted of combined anti-inflammatory, immunosuppressive, and cardiovascular supportive therapy. Following treatment initiation, the patient showed progressive clinical recovery and was discharged after a five-day inpatient course.

DISCUSSION

While cardiac involvement forms an integral part of lupus-related organ damage, it is often overlooked in routine assessment of disease activity. Pericardial fluid collection remains the most frequently observed cardiac feature, with imaging studies documenting its presence in a significant subset of patients over time. In contrast, massive pericardial effusion causing clinically significant hemodynamic compromise as an initial presentation of SLE is rare. Only a small proportion of patients present with severe pericardial involvement at onset, which illustrates the importance of high clinical suspicion in young patients with unexplained pericardial effusion.[4,5]

Pericardial effusion in systemic lupus erythematosus (SLE) results from autoimmune-mediated serosal inflammation. Immune complex deposition on pericardial surfaces activates complement and recruits inflammatory cells, increasing vascular permeability and fluid exudation into the pericardial space. Serositis is part of the SLE classification criteria, but most effusions are small, don't cause any symptoms, and are found by chance. In contrast, massive effusions with echocardiographic features of tamponade indicate more severe inflammatory activity and are often associated with additional systemic manifestations, such as cytopenias and renal involvement.[6–8]

Management of SLE-associated pericardial effusion centers on suppression of autoimmune inflammation with supportive therapy. High-dose corticosteroids are first-line treatment for significant lupus serositis, with additional immunosuppressive agents, such as hydroxychloroquine or azathioprine, considered according to disease severity and systemic involvement.[9] Diuretics may alleviate symptoms of volume overload, particularly in patients with concomitant renal disease. Nonsteroidal anti-inflammatory drugs and colchicine are standard therapies for inflammatory pericarditis, reducing symptoms and recurrence risk. Colchicine exerts anti-inflammatory effects through inhibition of leukocyte activation, complementing corticosteroid therapy in controlling pericardial inflammation.[10]

CONCLUSION

The rarity of massive pericardial effusion as an initial feature of SLE emphasizes the need for clinicians to maintain a broad differential diagnosis when encountering young patients with large effusions, especially in the context of hematologic abnormalities or proteinuria. Recognition of this association can accelerate diagnosis, enable timely immunomodulatory treatment, and prevent progression to life-threatening complications such as cardiac tamponade.

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REFERENCES

1. Al-Zahir MZ, Chan K-L. Echocardiography in Systemic Lupus Erythematosus. Curr Cardiol Rep 2024;26:1265-1271.
2. Zeb R, Chinome DVC, Chacon M, Singh T, Chowdary MM, Vidals CJM, et al. Cutaneous Manifestations of Systemic Lupus Erythematosus and Their Correlation With Cardiac Involvement. Cureus 2024;16.
3. Mehta P, Kharouf F, Carrizo-Abarza V, Li Q, Akhtari S, Harvey P, et al. Prevalence, clinical associations and outcomes of pericarditis in systemic lupus erythematosus: insights from the University of Toronto Lupus Clinic. Rheumatol 2025:keaf669.
4. Khawar Z, Herrera-Gonzalez MB, Mirza M, Mirza N, Suleiman A, Herrera-Gonzalez M. Cardiac Adaptation in Lupus: A Case of Massive Pericardial Effusion With Preserved Hemodynamics. Cureus 2025;17.
5. Dobos MC, Ungurean V, Costan DE, Russu M, Ouatu A, Morariu PC, et al. Cardiovascular Involvement in Systemic Lupus Erythematosus: Focus on Arrhythmias. Diagnostics 2026;16:372.
6. Barradas MI, Coutinho dos Santos I, Duarte F, Tavares A, Martins D. Systemic disease presenting as cardiac tamponade: a case report. Eur Hear Journal-Case Reports 2024;8:ytae137.
7. Stoichitoiu LE, Ionescu GD, Neatu I, Baicus C. Causes of polyserositis: a systematic review. J Pers Med 2023;13:834.
8. Li X, Luo K, Yang D, Hou C. A case report of systemic lupus erythematosus complicating interstitial lung disease and thickened pericardium treated with tofacitinib. Medicine (Baltimore) 2024;103:e39129.
9. Fanouriakis A, Kostopoulou M, Andersen J, Aringer M, Arnaud L, et al. EULAR recommendations for the management of systemic lupus erythematosus: 2023 update. Ann Rheum Dis 2024;83:15-29.
10. Wassif H, Ghandakly E, Layoun H, Bhalla JS, Littlejohn E, Wang TKM, et al. Autoimmune pericarditis: diagnosis and new therapeutics. Curr Cardiol Rep 2025;27:114.