Vol. 36, No. 8 August, 2025

ISSN 1029 - 385 X (Print) ISSN 2519 - 7134 (Online)

MEDICAL FORUM MONTHLY

RECOGNISED BY PMDC & HEC

APNS Member | CPNE Member | ABC Certified

On OJS

Scopus, Open Access, Online, Peer Reviewed Journal

Journal of all Specialities

"Medical Forum" Monthly Recognised, Indexed and Abstracted by

- PMDC with Index Pakistan No.48 since 1998
- HEC since 2009
- Pakmedinet Since 2011
- Medlip (CPSP) Since 2000
- PASTIC & PSA Since 2000
- NLP Since 2000
- WHO, Index Medicus (IMEMR) Since 1997
- EXCERPTA MEDICA, Netherlands Since 2000
- EMBASE SCOPUS Database Since 2000
- Registered with International Standard Serial Number of France bearing ISSN 1029-385X (Print), ISSN 2519-7134 (Online) Since 1992
- Registered with Press Registrar Govt. of Pak bearing No.1221-B Copr. Since 2009
- ABC Certification Since 1992
- On Central Media List Since 1995
- Medical Forum Affiliated with Medical Academic Foundation (MAF)
- On OJS, SCOPUS, Open Access, Online, Peer Reviewed Journal
- EScience Press (CrossRef DOI)
- Email: med_forum@hotmail.com, medicalforum@gmail.cicalom
- website: www.medicalforummonthly.com, www.medforum.pk

MEDICAL FORUM MONTHLY

ISSN 1029 - 385 X (Print) ISSN 2519 - 7134 (Online)

APNS Member * CPNE Member * ABC Certified

Online Journal Published Since 1989

Online www.medicalforummonthly.com

on OJS | Scopus | Open Access | Peer Reviewed

Affiliation With: Medial Academic Foundation (MAF) (Regd.)

Recognized, Indexed & Abstracted by

PMDC-IP-0048 (1998), HEC-Y-Category (2009), Excerpta Medica Netherlands (2000), EMBASE SCOPUS Database (2000), Index Medicus (IMEMR) WHO (1997), Cross Ref (DOI), SJR, HJRS, SCI Journal, Research Gate, Resurchify, Editage, Enago, Research Bib, Research Bite, Pastic and PSA, NLP, Pakmedinet & CPSP

doi Now Ease of Access in Article through doi in One Click doi:10.60110/medforum

Editorial Executives

Patron-in-Chief
Prof. Mahmood Ali Malik
Medicine

Editor-in-Chief
Prof. Azhar Masud Bhatti
Public Health Specialist & Nutritionist

Managing Editor
Prof. Nasreen Azhar
Consultant Gynaecologist

Co-Editors
Tahir Masud Jan (Canada)
Dr. Meshaal Azhar (Pak)
Dr. Faryal Azhar (Pak)

Editor
Dr. Mohsin Masud Jan

Associate Editors
Prof. Syed Mudassar Hussain (Pak)
Prof. M. Mohsin Khan (Pak)
Dr. Iftikhar A. Zahid (Pak)

National Editorial Advisory Board

Prof. Abdul Hamid	Forensic Medicine	Sialkot	03239824782	drabdulhamid12345@hotmail.com
Prof. Abdul Khaliq Naveed	Biochemistry	Rawalpindi	03215051950	khaliqnaveed2001@yahoo.com
Prof. AftabMohsin	Medicine	Lahore	03314101516	aftabmohsin@yahoo.com
Prof. Anjum Habib Vohra	Neurosurgery	Lahore	03008443218	omer@brain.net.pk
Prof. Asad Aslam Khan	Ophthalmology	Lahore	03008456377	prof.asad.a.khan@gmail.com
Prof. Haroon Khurshid Pasha	Paed. Surgery	Multan	03008633433	haroonkpasha@hotmail.com
Prof. Haroon Nabi	Dermatology	Lahore	03004000216	haroonnabi@hotmail.com
Prof. Javed Akram	Medicine	Lahore	03008450505	jakramsmc@gmail.com
Prof. Kh. M. Azeem	Surgery	Lahore	03334242122	khawaja.azeem@sihs.org.pk
Prof. Khalid Masood Gondal	Surgery	Lahore	03328483823	khalidmasoodgondal@yahoo.com
Prof. M. Amjad	ENT	Lahore	03334254695	professoramjad@yahoo.com
Prof. M. Amjad Amin	Surgery	Multan	03336103262	dramjadamin@gmail.com
Prof. M. Sabir	Anatomy	Sialkot	03005183021	raosabirdr62@gmail.com
Prof. Mahmood Nasir Malik	Medicine	Lahore	03009487434	nasirphysician@yahoo.com
Prof. Majeed Ahmad Ch.	Surgery	Lahore	03008440415	prof_abdulmajeed@hotmail.com
Prof. Mian Rasheed	Forensic Medicine	Rawalpindi	03025033559	drmian1000@hotmail.com
Prof. Pervez Akhtar Rana	Forensic Medicine	Lahore	03009422511	pzrana@gmail.com
Prof. Rukhsana Majeed	Community Medicine	Quetta	03337808138	majidrukhsana@hotmail.com

Prof. Safdar Ali Shah	Urology	Lahore	03334391474	drsafdar-ali@hotmail.com
Prof. SardarFakhar Imam	Medicine	Lahore	03008451843	drfakhar@lhr.paknet.com.pk
Prof. Shahid Mehmood	Surgery	Rawalpindi	03215001120	shahiddr63@gmail.com
Prof. Syed M. Awais	Orthopaedics	Lahore	03334348716	awais@kemu.edu.pk
Prof. Syed Nazim Hussain Bukhari	Medicine & Chest	Lahore	03009460515	nhbokhari@yahoo.com

International Editorial Advisory Board

Dr. Tahir Abbas	Oncology	Canada	+13067178592	drtgabbas@hotmail.com
Dr. Amjad Shad	Neurosurgery	UK	447963442419	amjad.shad@uhcw.nhs.uk
Dr. Ghazanfar Ali	Gastroenterology	UK	447800760008	ghazanfarali@hotmail.com
Dr. Haider Abbas	Urology	UK	447816149374	haidersyed@hotmail.com
Dr. Khalid Rashid	Cardiology	UK	447740477756	khalid.rashid@cht.nhs.uk
Dr. M. Shoaib Khan	Medicine	UAE	00971503111420	msksd2000@yahoo.com
Dr. Basil Nouman Hashmi	Surgery	UK	00447806611517	basilhashmi@doctor.net.uk
Dr. Sohail Saied	Surgery	UK	00441923285114	sohailsaied@gmail.com
Dr. Safdar Ali	Cardiology	USA	0016307816668	safdarali@sbcglobal.net
Dr. Parashu Ram Mishra	Surgery & Gastroenterology	Nepal	+9779841233450	drparashuram.mishra@gmail.com
Dr. Mansoor M. Mian	Psychiatry	USA	+1 (972)375 7821	mmian2000@yahoo.com
Dr. Sohail Qureshi	Orthopaedic	UK	00447734329666	quraishisohail@yahoo.com
Dr. Mushtaq Ahmad Mughal	Orthopaedics	UK	00447971886006	mahmed01@blueyounder.co.uk
Dr. Mansoor Tahir	Radiology	UK	00447921838093	drmansoortahir@yahoo.com

Business Manager: Nayyar Zia Ch.

Legal Advisors: Kh. EjazFeroz (Barrister),
Kh. Mazhar Hassan &Firdos Ayub Ch. (Advocates)

Published By: Prof. Nasreen Azhar, Gohawa Road, Link Defence / New Airport Road, Opposite Toyota Motors, Lahore Cantt. Lahore.
Mobile Nos. 0331-6361436, 0300-4879016, 0345-4221303, 0345-4221323.
E-mail: med_forum@hotmail.com, medicalforum@gmail.com
Website: www.medicalforummonthly.com

Printed By: Naqvi Brothers Printing Press, Darbar Market, Lahore.

Affiliation With: Medial Academic Foundation (MAF) (Regd.)

Ombudsman: Dr. Munawar Abbas, Assistant Professor / HOD Medical Sciences, Times University, Multan.
Mobile No. 0312-9233333 Email: drmabbas786@gmail.com

Rate per Copy: Rs.3000.00

Subscription Rates : (annually) Pakistan (Rs.30000.00), USA & Canada (US$ 500.00),
China, Japan, UK &Middle East (US$ 450.00)

Med. Forum, Vol. 36, No.8 August, 2025 ISSN 1029-385-X (Print) ISSN 2519-7134 (Online)

CONTENTS

Editorial

Health Benefits of Ginger ______ **1-2**
Prof. Dr. Azhar Masud Bhatti

Original Articles

1. **Enhanced Recovery After Surgery (ERAS) Guidelines in Emergency General Surgery: A Prospective Evaluation of Feasibility and Clinical Outcomes in a Developing Country** ______ **3-7**
1. Muhammad Munir Memon 2. Faiza Riaz Malik
2. **Study of Oxidative Stress and Relationship with Se(selenium), cu(copper), cd(cadmium) and pb(lead) levels in Obese Patients with diabetes and Hypertension** ______ **8-12**
1. Ruaa. K. Abbas 2. Jamal Harbi Hussein Alsaadi
3. **Comparison Between Urinary Tract Infection Bacteriuria in Diabetic and Non-Diabetic Patients Identified by VITEK 2 and 16S rRNA Sequencing Against Some Biological Factors** ______ **13-18**
1. Zainab S. Baqer 2. Munaff J. Abd Al-Abbas
4. **Postnatal Mothers' Satisfaction Regarding Informational Nursing Care during Labor** ______ **19-22**
1. Sara Ahmed Rashid 2. Wafaa Ahmed Ameen
5. **The Predicting Effect of ASXL1 Mutation on BCR-ABL Transcript Types and Responses to Tyrosine Kinase Inhibitors in Patients with Chronic Myeloid Leukemia** ______ **23-26**
1. Rabab Ajmi Askar 2. Bassim I. Mohammad 3. Hussein. A Sahib
6. **Role of Nurses in Nutritional Assessment of Patients with Cancer** ______ **27-32**
1. Noor Ali Abdul Hussein 2. Sahar Adham Ali
7. **Real-World Treatment Outcomes and Safety Profiles of Tyrosine Kinase Inhibitors in Iraqi Patients with Chronic Myeloid Leukemia** ______ **33-37**
1. Mohammed Jafar Al-Kabi 2. Doaa Husam Abdulqader 3. Bassim I. Mohammad
8. **Dual-Energy X-Ray Absorptiometry (DEXA) Scan and Biochemical Evaluation of Bone Mineral Density in Beta-Thalassemia Major** ______ **38-42**
1. Huda Diaa Hussain 2. Affan E. Hasan
9. **The Impact of Alpha Lipoic Acid Supplementation on Women with Polycystic Ovarian Syndrome who are Being Treated with Metformin** ______ **43-48**
1. Fatima Ali Hussein 2. Sinaa Abdul Amir Kadhim 3. Asma Abdul Jaleel Swadi
10. **Effects of Socratic Questioning on Academic Performance and Critical Thinking Dispositions Among Nursing Students** ______ **49-53**
1. Imran Masih 2. Madiha Mukhtar 3. Azeem Kaleem
11. **Work Family Conflict and Their Outcome Regarding Job Satisfaction of Female Nursing Staff** ______ **54-58**
1. Zumirah Atiq 2. Aniba Zahid 3. Athar Maqbool 4. M. Sohaib Siddiq 5. Azmat Ali Rawn 6. Humna Akhtar Ali
12. **The Influence of Sociodemographic Factors on Resilience and Subjective Wellbeing among University Students** ______ **59-63**
1. Abeer Abd AL-Abass Sattar 2. Sarab Nasr Fadhil
13. **Effects of Mediating Model-Based Nursing Intervention on Nurse Retention and Employee Engagement in Organizational Culture** ______ **64-69**
1. Muhammad Tahir 2. Madiha Mukhtar 3. Sarfraz Masih

Review Article

14. **Therapeutic Play as a Tool for Emotion Regulation in Children with Anxiety and Behavioral Challenges** ______ **70-74**
1. Syaiful Anwar 2. Yunias Setiawati

Case Report

15. **When Survival Hurts: A Case of Burn Trauma Complicated by Parental Grief and Displaced Guilt** ______ **75-76**
1. Dayu Triana Rahmawati 2. Azimatul Karimah

Editorial

Health Benefits of Ginger

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

Ginger has been used as spice as well as medicine in India and China since ancient times. It was also known in Europe from the 9th century and in England from the 10th century for its medicinal properties[1]. Native Americans have also used wild ginger rhizome to regulate menstruation and heartbeat.

Because of its warming effects, ginger acts as antiviral for treatment of cold and flue. Ginger is also used as a flavoring agent in foods and beverages and as a fragrance in soaps and cosmetics. Ginger is naturally occurring food that has a lot of health benefits associated with it.

Benefits

Possible health benefits include relieving nausea, loss of appetite, motion sickness, and pain. The root or underground stem (rhizome) of the ginger plant can be consumed fresh, powdered, dried as a spice, in oil form, or as juice. Ginger is part of the Zingiberaceae family, alongside cardamom and turmeric.

1. Digestion: The phenolic compounds in ginger are known to help relieve gastrointestinal (GI) irritation, stimulate saliva and bile production, and suppress gastric contractions as food and fluids move through the GI tract.

At the same time, ginger also appears to have beneficial effects on the enzymes trypsin and pancreatic lipase, and to increase motility through the digestive tract. This suggests ginger could help prevent colon cancer and constipation.

2. Nausea: Chewing raw ginger or drinking ginger tea is a common home remedy for nausea during cancer treatment.

Taking ginger for motion sickness seems to reduce feelings of nausea, but it does not appear to prevent vomiting.

Ginger is safe to use during pregnancy, to relieve nausea. It is available in the form of ginger lozenges or candies.

3. Cold and flu relief: During cold weather, drinking ginger tea is good way to keep warm. It is diaphoretic, which means that it promotes sweating, working to warm the body from within.

To make ginger tea at home, slice 20 to 40 grams (g) of fresh ginger and steep it in a cup of hot water. Adding a slice of lemon or a drop of honey adds flavor and additional benefits, including vitamin C and antibacterial properties.

This makes a soothing natural remedy for a cold or flu.

4. Pain reduction: A study involving 74 volunteers carried out at the University of Georgia found that daily ginger supplementation reduced exercise-induced muscle pain by 25 percent.

Ginger has also been found to reduce the symptoms of dysmenorrhea, the severe pain that some women experience during a menstrual cycle.

5. Inflammation: Ginger has been used for centuries to reduce inflammation and treat inflammatory conditions.

A study published in Cancer Prevention Research journal reported that ginger supplements, which are available to buy online, reduced the risk of colorectal cancer developing in the bowel of 20 volunteers.

Ginger has also been found to be "modestly efficacious and reasonably safe" for treating inflammation associated with osteoarthritis.

6. Cardiovascular health: Other possible uses include reducing cholesterol, lowering the risk of blood clotting, and helping to maintain healthy blood sugar levels. More research is needed, but if proven, ginger could become part of a treatment for heart disease and diabetes.

7. Improves Immunity: Gingerol the bioactive compound found in raw ginger, boosts immunity with its antimicrobial and antifungal properties Ginger also contains antioxidants and anti-inflammatory properties the combination of these properties has many benefits.

8. Alleviates PMS Symptoms: Menstrual pain is a common symptom during a woman's cycle. but incorporating Ginger might make it more manageable. Using ginger during the first 3daysof your menstrual cycle helps with pain relief

9. Relieves Nausea and Upset Stomach: Most well known health side effects of ginger Is its ability to relieve nausea. whether it's from motion sickness, migraines, morning sickness.

10. Healthier Skin: Ginger improve the health of your skin with antioxidants, increased blood circulation, and antiseptic properties. The antioxidants protect the skin look younger and rauter.

11. Weight Loss Aid: Some studies have shown that consuming ginger helps aid in weight loss.

12. Lowers Blood Pressure

13. Anti-bacterial properties

14. Blood sugar regulator

15. Lower the cholesterol level

16. Improve Brain function

Improve brain functions and protect alzheimer's disease.

17. Prevent different cancers like: The occurrence of GI cancer is very high in developed countries. In the United States, G1 cancer accounts to 20 percent of all newly diagnosed cancer cases. Among different G1 cancers, colorectal cancer is the most common cancer and is the second leading cause of death[2].

Accumulated evidences revealed that changing lifestyle could prevent all these cancers. The major change in

lifestyle which proves beneficial include avoiding tobacco, increased ingestion of fruits and vegetables, moderate use of alcohol, caloric restriction, exercise, minimal meat consumption, intake of whole grains, proper vaccinations, and regular health checkups. The link between healthy diet and cancer has been revealed in numerous studies[3-5].

Evidences from in vitro, animals, and epidemiological studies suggests that ginger and its active constituents suppress the growth and induce apoptosis of variety of cancer types including skin, ovarian, colon, breast, cervical, oral, renal, prostate, gastric, pancreatic, liver, and brain cancer. These properties of ginger and its constituents could be associated with antioxidant, anti-inflammatory, and antimutagenic properties as well as other biological activities[6].

Ginger and its constituents are also effective against pancreatic cancer. Park et al have shown that 6 gingerol inhibits the growth of pancreatic cancer.

Colorectal Cancer:

Anticancer activities of ginger against colorectal cancer have been well documented. Numerous in vitro studies showed that ginger and its active components inhibit growth and proliferation of colorectal cancer cells.[7] Whole ginger extract also prevent the primary stage of colon carcinogenesis.

Clinical Studies of Ginger against G1 cancer

Study in human subjects showed that ginger delays the nausea which is stimulated during chemotherapy. In this clinical study, patients with cancer receiving chemotherapy were given normal diet, protein drink with ginger, and additional high protein with ginger twice daily. They found that protein meals with ginger reduced and delayed nausea due to chemotherapy and reduced the use of antiemetic medications[8].

REFERENCES

1. Sasidharan I, Menon AN. Comparative chemical composition and antimicrobial activity fresh & dry ginger oils (zigiber officinale roscoe). Int J Current Pharmaceutical Res 2010;2:40-43.
2. Siegel R, Desantis C, Jemal A. Colorectal cancer statistics. CA Cancer J for Clinicians 2014;64(2):104-117.
3. Prasad S, Kim JH, Gupta SC, Aggarwal BB. Targeting death receptors for TRAIL by agents designed by mother nature. Trends in Pharmacological Sciences 2014;35(10):520-536.
4. Prasad S, Sung B, Aggarwal BB. Age-associated chronic diseases require age-old medicine: role of chronic inflammation. Preventive Med 2012;54:S29-S37.
5. Sung B. Prasad S, Yadav VR, Lavasanifar A, Aggarwal BB. Cancer and diet: how are they related? Pree Radical Res 2011;45(8): 864-879.
6. Stinivasan K. Antioxidant potential of spices and their active constituents. Critical Reviews Food Science Nutr 2014;54(3):352-372.
7. Jeong CH, Bode AM, Pugliese A, et al. Gingerol suppresses colon cancer growth by targeting leukotriene A, hydrolase. Cancer Res 2009;69(13): 5584-5591.
8. Levine ME, Gillis MG, Koch SY, Voss AC, Stern RM, Koch KL. Protein and ginger for the treatment of chemotherapy-induced delayed nausea. J Alternative Complementary Med 2008; 14(5): 545-551.

Original Article

Recovery After Emergency General Surgery

Enhanced Recovery After Surgery (ERAS) Guidelines in Emergency General Surgery: A Prospective Evaluation of Feasibility and Clinical Outcomes in a Developing Country

Muhammad Munir Memon[1] and Faiza Riaz Malik[2]

ABSTRACT

Objective: This study aimed to evaluate the suitability and clinical impact of a tailored ERAS protocol in emergency general surgery within a resource-constrained low- and middle-income country (LMIC) setting. The primary focus was on outcomes such as hospital length of stay and postoperative complications.

Study Design: Prospective observational study

Place and Duration of Study: This study was conducted at the Emergency General Surgery of a Tertiary Care Center between January 2024 and December 2024.

Methods: We performed a 12-month prospective observational study involving 150 consecutive adult patients undergoing emergency general surgery at a tertiary care center. Patients were divided into an ERAS group (n=75), managed with adapted emergency-specific protocol, and a control group (n=75) receiving standard postoperative care. The ERAS protocol included preoperative optimization if feasible, early mobilization, multimodal analgesia, early oral intake, and standardized discharge criteria. The primary outcome was length of hospital stay (LOH). Secondary outcomes included postoperative complications (Clavien-Dindo classification), time to first bowel movement, pain scores (Visual Analog Scale), and 30-day readmission rates. Feasibility was inferred as compliance with protocol elements.

Results: ERAS implementation was feasible, with a mean compliance rate of 78%. Median LOH was significantly shorter in the ERAS group (5 vs. 8 days, $p<0.001$). Postoperative complication rates were lower in the ERAS group (21.3%) compared to controls (37.3%) ($p=0.029$), particularly for surgical site infections and ileus. Time to first bowel movement was shorter in the ERAS group (2.8 vs. 4.1 days, $p<0.001$). While pain scores were similar on postoperative day 1, they were significantly lower in the ERAS group from day 2 onward. The 30-day readmission rate was lower in the ERAS group (6.7% vs. 13.3%), though not statistically significant ($p=0.178$).

Conclusion: The implementation of tailored ERAS protocol in resource constrained settings is feasible in emergency general surgery and is associated with shorter hospital stay, reduced complications, Enhanced recovery of bowel activity, and improved pain control. These findings support the broader adoption of ERAS in the EGS setting in under resourced hospitals.

Key Words: Enhanced Recovery After Surgery, ERAS, Acute care Surgery, Length of Stay, Postoperative Complications, Feasibility.

Citation of article: Memon MM, Malik FR. Enhanced Recovery After Surgery (ERAS) Guidelines in Emergency General Surgery: A Prospective Evaluation of Feasibility and Clinical Outcomes in a Developing Country. Med Forum 2025;36(8):3-7. doi:10.60110/medforum.360801.

INTRODUCTION

Enhanced Recovery After Surgery (ERAS) has revolutionized perioperative care beyond traditional surgical management through adoption of structured, evidence-based approach based on minimizing physiological stress. First introduced by Kehlet and later formalized through the ERAS Society, these protocols emphasize multidisciplinary collaboration and have demonstrated substantial benefits in elective surgery[1,2].

Initially developed for colorectal procedures[3], since then ERAS methodology has been tailored to various surgical practices, including gastrointestinal, urologic, hepatobiliary, geriatric, and emergency laparotomy settings[4,5]. Key elements include reduced preoperative fasting, early mobilization, multimodal (opioid-sparing) analgesia, and prompt initiation of enteral nutrition[3].

In elective surgery, this methodology is associated with faster recovery, shorter hospital stays, and lower complication rates. However, their implementation in emergency general surgery (EGS) presents unique challenges[6]. Limited time for preoperative optimization,

[1.] Department of Surgery, College of Medicine. Qassim University, Saudi Arabia.
[2.] Department of Surgery, Qassim University Medical City, Saudi Arabia.

Correspondence: Muhammad Munir Memon, Assistant Professor of Surgery, College of Medicine. Qassim University, Saudi Arabia.
Contact No: 00966542862377
Email: m.ghafar@qu.edu.sa

Received: February, 2025
Reviewed: March, 2025
Accepted: April, 2025

patient instability, and urgent decision-making often constrain adherence to protocol elements[7].

Despite these obstacles, emerging evidence, including systematic reviews and randomized trials, suggests that adapted ERAS pathways can still be feasible, cost-effective[8], and clinically beneficial in emergency settings[6]. Reported improvements include reduced complication rates and decreased length of hospitalization[9]. Nonetheless, there remains a pressing need for prospective evaluations to determine how ERAS can be reliably applied across varied EGS populations.

METHODS

We performed a prospective observational study on 150 consecutive adult patients (≥18 years of age) who underwent emergency general surgery at a tertiary care center between January 2024 and December 2024 in resource constrained settings. Patients undergoing surgery for trauma were excluded, as a separate modified protocol may be more appropriate for this specific population. Patients were eligible for inclusion if they required urgent or emergency surgical intervention for a range of general surgical conditions, including but not limited to acute appendicitis, bowel obstruction, perforated peptic ulcer, diverticulitis, and acute cholecystectomy.

Patients were approached for participation as soon as feasible after admission, and informed consent was obtained. Patients were divided into two groups based on the timing of ERAS protocol implementation within the study period: the control group (first 75 patients) received standard postoperative care, while the ERAS group (subsequent 75 patients) received care according to a newly implemented ERAS protocol.

ERAS Protocol: The ERAS protocol for emergency general surgery was reviewed by a multidisciplinary team comprising surgeons, anesthetists, nurses, and physiotherapists, based on existing ERAS guidelines and adapted to the specific challenges of the emergency setting. The core elements of the protocol included:

- **Preoperative Optimization (where feasible):** Brief preoperative assessment and optimization of fluid status, electrolyte balance, and pain control, when time allowed.
- **Early Mobilization:** Encouragement of early and progressive mobilization starting within 24 hours of surgery.
- **Multimodal Analgesia:** Utilization of opioid-sparing multimodal analgesia regimens, including regional anesthesia techniques where appropriate, and scheduled non-opioid analgesics.
- **Early Oral Intake:** Introduction of clear fluids and progression to a regular diet as soon as bowel function returned, typically within 24-48 hours postoperatively.
- **Avoidance of Routine Nasogastric Tubes:** Selective use of nasogastric tubes only for specific indications (e.g., persistent vomiting, high output obstruction).
- **Standardized Discharge Criteria:** Utilization of predefined criteria for discharge, focusing on pain control, adequate oral intake, ability to ambulate, and understanding of discharge instructions.

Prior to the adoption of the enhanced recovery protocol, the control group was managed with standard postoperative care following institutional guidelines, which typically involved a more gradual advancement of diet, delayed mobilization, and reliance on opioid-based analgesia[4,6].

Outcome Measures:

The primary outcome of the study was the length of hospital stay (LOH), defined as the number of days from the date of surgery to the date of discharge.

Secondary outcomes included:

- Incidence of **complications after surgery**, classified according to the Clavien-Dindo classification[16] of surgical complications.
- **Time to first bowel movement**, defined as the number of days from surgery until the passage of flatus or stool.
- **Pain scores**, measured using a 10-point Visual Analog Scale (VAS) [18] at 6 hours, 12 hours, 24 hours, and daily until discharge.
- **30-day readmission rate**, defined as any unplanned admission to the hospital within 30 days of the index surgery.
- **Feasibility** of ERAS protocol implementation, assessed by the compliance rate with the core elements of the protocol in the ERAS group, documented through daily charting and a dedicated ERAS audit form.

Data Collection and Analysis: Data were collected after surgery by trained research personnel. Adherence with ERAS protocol elements were documented daily for patients in the ERAS group. Data on patient demographics, surgical details, postoperative course, complications, and LOH were extracted from patient charts and electronic medical records for both the ERAS and control groups.

Statistical analysis was performed using SPSS version 27.0 (IBM Corp., Armonk, NY, USA). Continuous variables were tested for normality using the Shapiro-Wilk test. Normally distributed continuous variables were compared using the independent samples t-test, and non-normally distributed continuous variables were compared using the Mann-Whitney U test. Categorical variables were compared using the chi-square test or Fisher's exact test as appropriate. A p-value of <0.05 was considered statistically significant.

RESULTS

Baseline Characteristics: The baseline demographic and clinical characteristics of the patients in the ERAS group and the control group were comparable (Table 1). There were no significant differences in age, sex, BMI, American Society of Anesthesiologists (ASA) classification, or the types of surgical procedures performed between the two groups.

Table No.1: Baseline Characteristics of Study Participants

Characteristic	ERAS Group (n=75)	Control Group (n=75)	p-value
Age (years), mean ± SD	56.3±18.2	58.1±16.9	0.512
Female, n (%)	38 (50.7)	40 (53.3)	0.764
BMI (kg/m2), mean ± SD	26.8±5.1	27.5±4.8	0.391
ASA Classification, n (%)			0.635
I	12 (16.0)	10 (13.3)	
II	35 (46.7)	38 (50.7)	
III	22 (29.3)	20 (26.7)	
IV	6 (8.0)	7 (9.3)	
Type of Surgery, n (%)			0.881
Appendectomy	18 (24.0)	17 (22.7)	
Bowel Obstruction	15 (20.0)	16 (21.3)	
Perforated Peptic Ulcer	8 (10.7)	7 (9.3)	
Diverticulitis	12 (16.0)	10 (13.3)	
Cholecystectomy	10 (13.3)	12 (16.0)	
Other	12 (16.0)	13 (17.3)	

Feasibility of ERAS Implementation: The mean compliance rate with the core ERAS protocol elements in the ERAS group was 78%. Compliance rates for individual elements were as follows: early mobilization (72%), multimodal analgesia (85%), early oral intake (79%), avoidance of routine nasogastric tubes (91%), and standardized discharge criteria (63%).

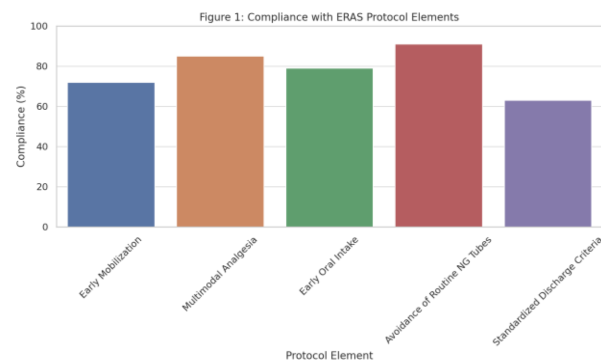


Figure No.1: A bar graph showing the percentage compliance with each of the core ERAS protocol elements in the ERAS group.

Primary Outcome: Length of Hospital Stay: The median length of hospital stay (LOH) was significantly shorter in the ERAS group (5 days, IQR 3-7 days) compared to the control group (8 days, IQR 6-11 days) (Mann-Whitney U test, p<0.001) (Figure 2). The mean LOH was also significantly shorter in the ERAS group (5.6±2.1 days vs. 8.3±3.5 days, p<0.001).

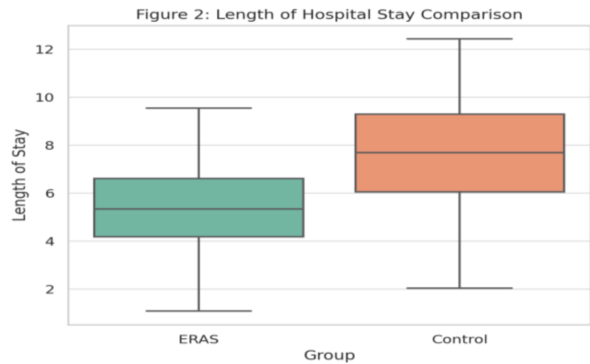


Figure No.2: A box plot demonstrates a shorter median hospital stay in ERAS groups.

Secondary Outcomes: Complications after surgery occurred significantly less frequently in the enhanced recovery group (16/75, 21.3%) compared to the control group (28/75, 37.3%) ($\chi 2$=5.37, p=0.029) (Table 2).

Return of Bowel Function: Patients in the enhanced recovery group experienced an earlier return of bowel function (mean 2.8±0.9 days) compared to the control group (mean 4.1±1.3 days) (t = -6.34, p<0.001) (Figure 3).

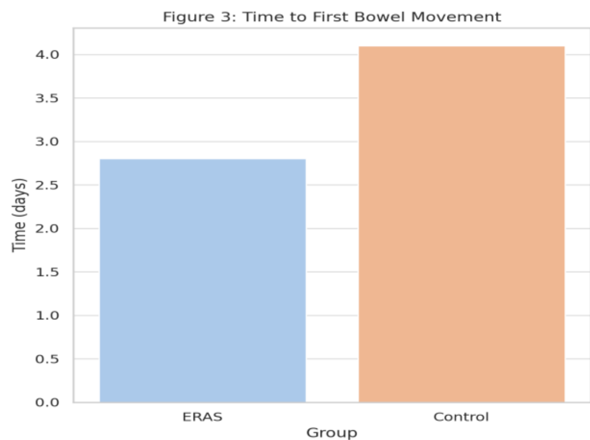


Figure No.3: A bar graph comparing the mean time to first bowel movement (in days) between the ERAS group and the control group.

Postoperative Pain Scores: Pain scores (VAS) were comparable between the groups at 6, 12, and 24 hours

postoperatively (p>0.05). However, from postoperative day 2 until discharge, pain scores were significantly lower in the ERAS group (Figure 4).

Table No.2: Postoperative Complications

Complication	ERAS Group (n=75), n (%)	Control Group (n=75), n (%)	p-value
Overall Complications (Any)	16 (21.3)	28 (37.3)	0.029*
Surgical Site Infection	4 (5.3)	11 (14.7)	0.048*
Postoperative Ileus	3 (4.0)	9 (12.0)	0.065
Pneumonia	2 (2.7)	4 (5.3)	0.432
Urinary Tract Infection	3 (4.0)	2 (2.7)	0.621
Deep Vein Thrombosis/Pulmonary Embolism	1 (1.3)	2 (2.7)	0.559

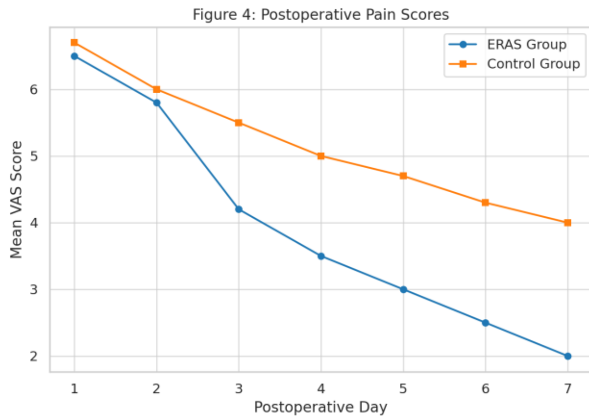


Figure No. 4: Line graph displaying daily postoperative pain scores (VAS) for both groups.

The 30-day readmission rate was 6.7% (5/75) in the ERAS group and 13.3% (10/75) in the control group, but this difference was not statistically significant ($\chi2=2.15$, p=0.178).

DISCUSSION

This prospective study demonstrates that a tailored ERAS protocol can be feasibly implemented in emergency general surgery in resource limited environment and is associated with meaningful improvements in clinical outcomes. Patients managed under the ERAS pathway experienced a significantly shorter hospital stay, lower rates of postoperative complications, particularly surgical site infections and ileus, and faster return of bowel function. Additionally, pain scores were lower from the second postoperative day onward, likely reflecting the effectiveness of multimodal analgesia.

The protocol's 78% compliance rate highlights the feasibility of implementing ERAS principles even in the unpredictable context of emergency surgery. Although full adherence to all components can be challenging, our findings suggest that partial implementation still yields substantial benefits[3,10].

Reduced length of stay not only enhances patient recovery and satisfaction but also has important implications for hospital efficiency and resource allocation[8,9]. Likewise, the decreased complication rate supports the role of ERAS in mitigating surgical risk, particularly for infections and ileus, which are common drivers of morbidity and prolonged hospitalization.[11,12]

The trend toward lower 30-day readmission rates, although not statistically significant in this study, warrants further investigation in larger cohorts. Previous studies have similarly reported the benefits of ERAS in emergency and geriatric populations, reinforcing its applicability beyond elective surgery.[13]

Consistent with prior literature, our results confirm that ERAS protocols contribute to improved postoperative recovery by reducing complications, accelerating gastrointestinal function, and minimizing pain.[2] The success of these programs depends on coordinated multidisciplinary efforts, including surgeons, anesthesiologists, nurses, and physiotherapists and on adherence to protocol elements, which has been shown to correlate with better outcomes.

Standardized outcome reporting, such as through the Clavien-Dindo classification[14], further enhances the comparability of ERAS studies and supports ongoing quality improvement. Moreover, economic evaluations increasingly show that ERAS implementation is cost-effective, largely through reduced complications and shorter hospital stays. [8]

Although some endpoints, such as readmission rates, remain inconsistently significant across studies, the overall evidence supports the broader adoption of ERAS protocols in emergency general surgery[15]. Future multicenter randomized controlled trials are needed to further validate these findings and to refine ERAS strategies for diverse emergency surgical populations.

Limitations: This single-center prospective observational study with a historical control group is subject to potential biases, including unmeasured confounders and temporal changes unrelated to ERAS implementation. Applying ERAS protocols in low and middle income countries can be difficult, as healthcare settings often differ widely in terms of available resources. To make these protocols truly effective, more research is needed to understand how they can be adapted to fit the realities of resource limited environments. A randomized controlled trial (RCT) would provide more robust evidence.

Implications for Practice: Findings support the integration of ERAS protocols into emergency general surgery (EGS), aligning with international guidelines. Institutions should adapt ERAS bundles for emergency settings. Future studies should focus on multicenter RCTs and long-term outcomes.

CONCLUSION

Implementation of a tailored ERAS protocol in emergency general surgery within an LMIC context is feasible and associated with improved clinical outcomes, including reduced hospital stay and postoperative complications. These results advocate for broader ERAS adoption in EGS to enhance recovery and resource efficiency. Future multicenter RCTs are needed to validate these findings and refine ERAS strategies for diverse populations. Standardized outcome reporting, such as using the Clavien-Dindo classification, is essential for future research.

Acknowledgments: The authors extend sincere thanks to the nursing staff, anesthesiology team, and physiotherapists for their dedication to the execution of the ERAS protocol and their assistance with data collection.

Author's Contribution:

Concept & Design or acquisition of analysis or interpretation of data:	Muhammad Munir Memon, Faiza Riaz Malik
Drafting or Revising Critically:	Muhammad Munir Memon, Faiza Riaz Malik
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.

Source of Funding: None

Ethical Approval: No. B.T.M.C./13/2023 Dated 15.12.2023

REFERENCES

1. Mithany RH, Daniel N, Shahid MH, Aslam S, Abdelmaseeh M, Gerges F, et al. Revolutionizing Surgical Care: The Power of Enhanced Recovery After Surgery (ERAS). Cureus 2023;15(11): e48795.
2. Gustafsson UO, Rockall TA, Wexner SW, How KY, Emile S, Marchuk A, et al. Guidelines for perioperative care in elective colorectal surgery: Enhanced Recovery After Surgery (ERAS) Society recommendations. Surg 2025;183: 109389.
3. Ceresoli M, Braga M, Zanini N, et al. Implementing enhanced perioperative care in emergency general surgery: a prospective multicenter observational study. World J Surg 2023;47(5):1339–1347.
4. Rodrigues Pessoa R, Urkmez A, Kukreja N, Baack Kukreja J. Enhanced recovery after surgery review and urology applications in 2020. BJUI Compass. 2020;1(1):5-14.
5. Younis Bhat M, Ali S, Gupta S, et al. Feasibility, safety and effectiveness of the enhanced recovery after surgery protocol in patients undergoing liver resection. Ann Hepatobiliary Pancreat Surg 2024;28(3):344–349.
6. Amir AH, Davey MG, Donlon NE. Evaluating the impact of enhanced recovery after surgery protocols following emergency laparotomy: a systematic review and meta-analysis of randomized clinical trials. Am J Surg 2024;236:115857.
7. Peden, C.J., Aggarwal, G., Aitken, R.J. et al. Enhanced Recovery After Surgery (ERAS®) Society Consensus Guidelines for Emergency Laparotomy Part 3: Organizational Aspects and General Considerations for Management of the Emergency Laparotomy Patient. World J Surg 2023;47:1881–1898.
8. Bisagni P, D'Abrosca V, Tripodi V. et al. Cost saving in implementing ERAS protocol in emergency abdominal surgery. BMC Surg 2024;24:70.
9. Kumar V, Kumar A, Yadav SK, et al. Enhanced Recovery After Surgery Protocol in Emergency Laparotomy: A Randomized Control Study. J Gastrointest Surg 2021;25(10):2561–8.
10. Purushothaman V, Priyadarshini P, Bagaria D, et al. Enhanced Recovery After Surgery (ERAS) in Patients Undergoing Emergency Laparotomy After Trauma: A Prospective, Randomized Controlled Trial. Trauma Surg Acute Care Open 2021;6: e000698.
11. Saurabh K, Sureshkumar S, Mohsina S, et al. Adapted ERAS pathway versus standard care in patients undergoing emergency small bowel surgery: a randomized controlled trial. J Gastrointest Surg 2020;24(9):2077–2087.
12. Zhang W, Wang F, Qi S, et al. An evaluation of the effectiveness and safety of the Enhanced Recovery After Surgery (ERAS) program for patients undergoing colorectal surgery: a meta-analysis of randomized controlled trials. Wideochir Inne Tech Maloinwazyjne 2023;18(4):565-577.
13. Moydien M R, Oodit R, Chowdhury S, et al. Enhanced recovery after surgery (ERAS) in penetrating abdominal trauma: A prospective single-center pilot study. S Afr J Surg 2016;54(4): 7-10.
14. Dindo D, Demartines N, Clavien PA. Classification of surgical complications: A new proposal with evaluation in a cohort of 6336 patients and results of a survey. Ann Surg 2004;240(2):205–213.
15. Ljungqvist O, Scott M, Fearon KC. Enhanced Recovery After Surgery: A Review. JAMA Surg 2017;152(3):292–8.

Original Article

Study of Oxidative Stress and Relationship with Se(selenium), cu(copper), cd(cadmium) and pb(lead) levels in Obese Patients with diabetes and Hypertension

Ruaa. K. Abbas and Jamal Harbi Hussein Alsaadi

ABSTRACT

Objective: The current study was aimed at investigating the changes in MDA (Malondialdehyde), some trace elements, and heavy metals in serum of obese patients with Type-2 diabetes and hypertension in Thi-Qar province, Iraq.

Study Design: Observational and Case series study

Place and Duration of Study: This study was conducted at the “Al-Nasiriya Teaching Hospital in Thi-Qar Governorate” and “biochemistry Laboratory” in the “College of science” in the duration between August 2024 to March 2025.

Methods: There are 140 subjects (male and female) in the study, 105 patients diagnosed with obese (BMI ≥30) among them, and 35 as control with (BMI <25) and their ages range from (35–65) years. They divided into four groups as the following: **Cont**. group: included (35) normal healthy, **Obes**. group: Included (35) Just obese patients, **ODM** group: Included (35) obese diabetes patients and **OHTN** group: Included (35) obese hypertensive patients.

Results: The results in this study indicated a significant increase (P≤0.05) in MDA, Cu, Cd and Pb levels and a significant decrease in Se level in all patients’ groups in comparison with the control group, whereas no significant change (p≤0.05). While there was no significant difference in each serum MDA, Se, Cu, Cd, and Pb levels between the obese-DM group and the obese-HTN group compared to the obese group (p ≤0.05).

Conclusion: This study concluded that the obese patients with T2DM and with HTN had high significant level of MDA, Cu and heavy metals (Pb and Cd) and low significant level of Se than control group.

Key Words: Obesity, Oxidative Stress, Trace Elements.

Citation of article: Abbas RK, Alsaadi JHH. Study of Oxidative Stress and Relationship with Se(selenium), cu(copper), cd(cadmium) and pb(lead) levels in Obese Patients with diabetes and Hypertension. Med Forum 2025;36(8):8-12. doi:10.60110/medforum.360802.

INTRODUCTION

Obesity-related oxidative Stress is responsible for the disturbance of internal environment homeostasis, which is characterized by oxidative stress responses. Oxidative stress (OS) is a condition of cellular disparity, “persistent imbalance between the production of oxidizing agents and the antioxidant defense,” in which there is an excessive number of free radicals and reactive oxygen species (ROS). The mechanisms of the metabolic syndrome and their comorbidities help a promote pro-oxidative state, which contributes to cell and tissue damage, and thus metabolic disorders occur[1].

Department of Chemistry, College of Science, University of Thi-Qar, 64001, Iraq.

Correspondence: Jamal Harbi Hussein Alsaadi, Department of Chemistry, College of Science, University of Thi-Qar, 64001, Iraq.
Contact No: +9647801305318
Email: jamal.saadi@sci.utq.edu.iq

Received: April, 2025
Reviewed: May, 2025
Accepted: June, 2025

The obesity-associated fat accumulation leads to inflammation, hypertrophied adipocytes, and hypoxia. Moreover, OS worsens inflammation and alters adipokine secretion. Many of these phenomena activate the monocyte infiltration in adipose tissue that worsens the inflammatory processes [2]. Malondialdehyde. It is the most common marker used to investigate the presence of oxidative stress in a biological system. it’s the end products of polyunsaturated fatty acids after degradation by ROS, indicating the overall lipid peroxidation level in human blood and tissue samples[3].

Trace Elements: are considered pivotal components of redox metabolism and the immune system, obesity and trace elements are related in a complicated, multifaceted manner. The development of obesity is assumed to be influenced by metabolic dysfunction, inflammation, and oxidative stress, which are all thought to be caused by trace element deficits. Additionally, obesity itself may change the metabolism of trace elements, aggravating deficits, Se, Zn and Cu are key components of many antioxidant enzymes.[4] Cu metabolism is changed in diabetic patients and may play particular functions in the progression of diabetes and its complication[5]. Study had shown that the content

of Cu in patients with hyperglycemia, hypertension, and obesity is higher than that in ordinary people. Numerous essential biological functions, including hormone production and the regulation of ROS concentrations, depend on selenium. Maintaining adequate amounts of selenium is crucial since low or high levels can negatively impact cardiovascular health. On the other hand, severe toxicity and deadly cardiac symptoms can result from consuming too much selenium[6]. **Heavy metals,** "non-essential or toxic elements" such as Lead and Cadmium are persistent environmental contaminants as heavy metals cannot be degraded or destroyed, they have been connected to a number of detrimental health consequences, such as a higher risk of stroke and CVDs. According to biological data, Pb and Cd exposure causes oxidative stress, inflammation, and endothelial dysfunction, which eventually results in atherosclerosis, elevated blood pressure.[7]

METHODS

Study was conducted at the "Al-Nasiriya Teaching Hospital in Thi-Qar Governorate" and "biochemistry Laboratory" in the "College of science" in the duration between August (2024) to March (2025). 140 study case were included in this study, 105 patients which divided into three groups (obese, obese diabetic and obese hypertensive patients) each group 35 subjects, with control group of the normal healthy individuals (350),_The overall mean age of study subjects was (48.84 ± 8.50).

Exclusion Criteria: The study excludes any participant taking drugs that cause obesity or an increase in body weight, such as steroids and chemotherapy, and pregnant women. Furthermore, the smokers and patients with other chronic diseases, such as "kidney diseases, liver failure, thyroid disease, and immunological diseases," were excluded.

Blood Samples: About (5 ml) of blood samples were collected from healthy subjects and the patients at the morning, the blood samples were collected in gel tubes, then left for half an hour and centrifuged at 3000 rpm for 15 minutes, the serum samples were separated and stored at (-20ºC)

Statistical Analysis: All statistical analyses were performed using SPSS-23, Windows version 23.0.

RESULTS

1. Clinical and Characteristic Features of the Studies Groups: The mean BMI of case patients was (39.62±4.38 kg/m²) and (23.96 ± 1.21 kg/m²) for the normal healthy individuals.

Table (1) shows characteristics of case and control subjects. There were non-significant comparisons between case and control in each (age and sex) (p value ≤ 0.05), While significant comparisons by BMI. Characteristic information is presented in following Table for all studied groups.

Table No.1: Descriptive data for all studied groups

Groups	No.	Sex (M/F)	Age (years) Mean ± SD	BMI (kg/m²) Mean ± SD
Cont.	35	15/20	48.03 ± 8.01	23.96 ± 1.21
Obes.	35	13/22	47.57 ± 7.84	38.92 ± 4.24
ODM	35	12/23	50.00 ± 9.23	39.33 ± 4.33
OHTN	35	12/23	48.94 ± 8.42	40.60 ± 4.58
			P-value = 0.534 Non. sig	**P-value = 0.000**Sig

*** P-value ≤ 0.05 consider significant.**
*** At the 0.05 level, the mean difference is significant.**

2. Oxidative Stress

2.1 Serum Malondialdehyde Levels: The MDA concentration in the obese-DM and obese-HTN groups where significantly higher than those obese group and control group, as indicated by Table (3) and Figure (1). Additionally, the MDA concentration in the obese group significantly higher than in the control groups (p≤0.05). While there was no significant difference in MDA levels between obese-DM and obese-HTN groups (p≤0.05).

Table No.2: Serum MDA values of studied groups

Groups	No.	MDA (µmol/l) Mean ±SD
Cont.	35	2.34 ± 0.59 c
Obes.	35	3.96 ± 0.55 b
ODM	35	4.47 ± 0.65 a
OHTN	35	4.37 ± 0.64 a
P- value		< 0.001 **
LSD		0.29

*** P-value ≤ 0.05 consider significant.**
*** At the 0.05 level, the mean difference is significant.**
(a, b, c): "indicates having various letters in same column have been significantly differed (P <0.05) The different letters refer to a significant difference. The same letters refer to a non-significant difference".

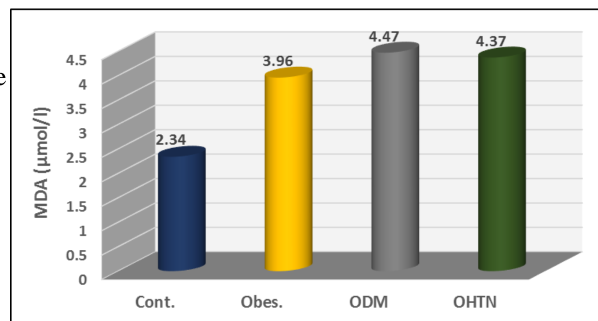


Figure No.1: Serum MDA levels of studied groups

3. Evaluation of Serum Trace Elements Levels: The results of trace elements point to a significant decrease in Se levels in all patients' groups in

comparison with the control group (p≤0.05). While there was a significant increase in the Cu levels between all patients' groups in comparison with the control group (p≤0.05). Table 3 and Figures 2 & 3.

Table No.3: Serum Se and Cu concentrations of studied groups

Groups	No.	Se (ppb) Mean ±SD	Cu (ppm) Mean ±SD
Cont.	35	29.17 ± 5.70 [a]	4.83 ± 2.16 [b]
Obes.	35	18.04 ± 2.63 [b]	7.08 ± 2.32 [a]
ODM	35	17.01 ± 1.89 [b]	6.13 ± 1.81 [a]
OHTN	35	17.68 ± 3.39 [b]	6.25 ± 2.26 [a]
P- value		< 0.001 **	< 0.001 **
LSD		1.75	1.01

*** P-value ≤ 0.05 consider significant.**
*** At the 0.05 level, the mean difference is significant.**

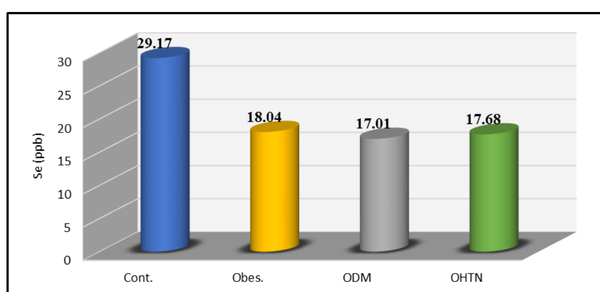


Figure No.2: Serum Se levels of studied groups

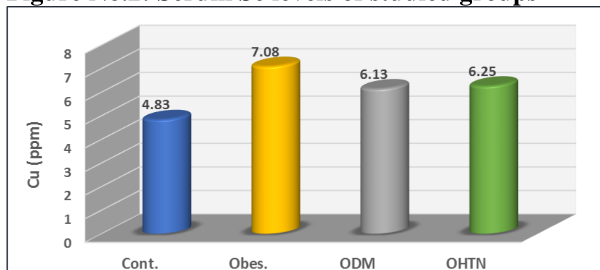


Figure No.3: Serum Cu levels of studied groups

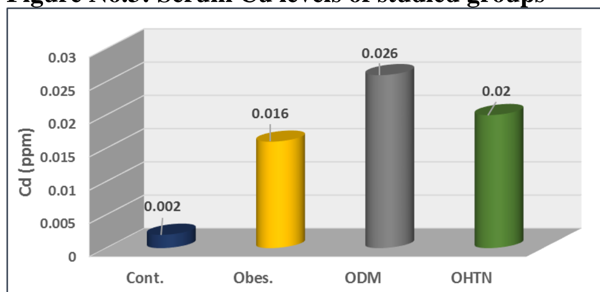


Figure No.4: Serum Cd levels of studied groups

4. Serum Heavy metals Levels: Cd and Pb concentration a significant increase in all patients' groups in comparison with the control group (p ≤ 0.05). While there was no significant difference in each Cd and Pb concentration between the obese-DM group and the obese-HTN group compared with the obese group (p ≤ 0.05). As shown in Table 4 and Figures 4 & 5.

Table No.4: Serum Cd and Pb concentrations of studied groups

Groups	No.	Pb (ppm) Mean ±SD	Cd (ppm) Mean ±SD	
Cont.	35	0.041 ± 0.009 [b]	0.002 ± 0.007 [b]	85% of cases were BDL
Obes.	35	0.048 ± 0.005 [a]	0.016 ± 0.025 [a]	63% of cases were BDL
ODM	35	0.046 ± 0.008 [a]	0.026 ± 0.030 [a]	54% of cases were BDL
OHTN	35	0.047 ± 0.007 [a]	0.020 ± 0.031 [a]	68% of cases were BDL
P- value		0.001 **	0.001 **	
LSD		0.003	0.014	

*** P-value ≤ 0.05 consider significant, BLD: Below detection limit.**
*** At the 0,05 level, the mean difference is significant.**

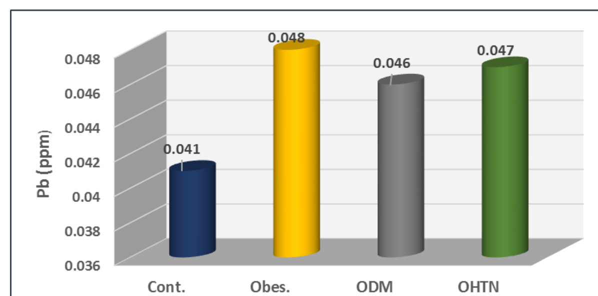


Figure No.5: Serum Pb levels of studied groups

DISCUSSION

Evaluation of Serum Malondialdehyde Levels: The present results showed that the MDA level was increased in all patient groups in comparison with control group, these results agreed with a study by Abu Khadra et al. (2024)[8], Serum MDA levels are significantly connected with obese DM and obese HTN groups, possibly due to the detrimental effect of oxidative stress on vascular endothelial dysfunction, which is strongly linked to elevated blood pressure produced by poor vasodilation[9]. Recent research reveals that oxidative stress plays a critical role in the development of various metabolic disorders including T2DM, have been suggesting several hypothesized mechanisms including oxidative stress[10]. The biomarkers of oxidative damage are higher in individuals with obesity and correlate directly with BMI. Moreover, an increase in the MDA levels in association with increased BMI was obtained indicating that obesity could predispose to free radical-mediated lipid peroxidation [11].

Adipose tissue in obesity builds up and releases adipokines, which in turn trigger the creation of pro-

inflammatory cytokines and, eventually, more reactive oxygen species (ROS), which can harm cellular constituents and cause inflammation and chronic illnesses [12]. Balancing the redox state of adipose tissue may be a feasible treatment target for obesity, as research has demonstrated that elevated oxidative stress in adipose tissue is a precursor to metabolic syndrome [13]. an alternative inflammatory pathway replaces the traditional lipolytic pathway in obesity. ROS and RNS can influence these pathways at different levels. adipose tissue primarily undergoes structural and functional alternations as a result of sever and protected lipolysis, or lipotoxicity. The weakening of insulin sensitivity marks the conclusion of the physio pathogenic cascade, Finelly, we stress how crucial antioxidants are to reestablishing the internal environment balance [14]. Reduced biogenesis, changed membrane potential, because overproduction of free radicals in obesity. In addition to the overabundance of nutrients, the result is the overburdening of the mitochondrial respiratory chain and the Krebs cycle. This is the process that triggers mitochondrial malfunction, which leads to the production of more ROS.[15].

Evaluation of Serum Trace Elements Levels: This study was conducted that a significant increase in Cu levels and significant decrease in Se levels in all patients' groups in comparison with the control group. Our results agree with the Tagar study, which found that Cu is elevated in obese populations [16]. Obese participants' elevated serum Cu levels support the meta-analysis's conclusion that there is a positive correlation between elevated serum Cu and obesity [17]. High serum Cu levels were also found to be associated with increased BP in obese HTN patients, as well as there were positive associations between BMI and Cu ($p<0.05$), according to Darroudi et al [18]. Copper can influence oxidative stress, which is a fundamental mechanism in the development of obesity, "Positive association between Cu status and atherogenic lipid profile and be mediated through the impact of Cu on lipid metabolism." [17]. Similarly, another study has also shown that serum Cu levels were significantly higher in overweight and obese patients than in those of normal weight. Our results corelates with the study by Tinkov et al, suggesting that the obese women Se levels in both serum or hair samples were found to be inversely linked with obesity, obese subjects' serum Se levels were much lower than the normal ranges needed for normal selenium function, while Cu levels positively linked with obesity [18]

Evaluation of Serum Heavy metals Levels: Epidemiologic studies have suggested a role for the toxic metals lead (Pb), cadmium (Cd), and mercury (Hg) in the development of metabolic syndrome. All three elements have been shown to interact with obesity in various ways, like substituting for essential trace elements or increasing the risk for developing DM and HTN. When these elements take the place of vital micronutrients like iron and Zinc, they may catalyze oxidative stress responses and harm cells, enzymes, and genes. Pb leads to oxidative stress, which destroys sections of cell components. On the other hand, metal neurotoxicity on brain function and signaling linked to appetite and satiety may potentially play a role in the development of obesity, since brain development is affected by both Pb and Cd. Additionally, it damages the body by acting as endocrine disruptors which change physiological processes and induce chronic inflammation[19]. By substituting Fe and Cu in cytoplasmic and membrane proteins, Cd may indirectly produce free radicals by raising the concentrations of weakly or unattached Cu and Fe. Additionally, Cd may replace zinc in metalloproteins and enzymes, leading to buildup and dysfunction in soft tissues like the kidney and liver. Pb is associated with higher blood concentrations of soluble adhesion molecules. Changes in contractility, interruption of blood flow, arterial stiffness, and HTN are all consequences of these changes in vascular function· Despite that, published studies on the correlation between BMI and toxic metals have shown ambiguous results. However, found a negative correlation between BMI and 'whole blood and urine Pb and Cd' these inverse relations have been difficult to explain, but seem to bein dependent of age and gender.[19]

Abbreviations:

Symbol	Meaning
AT	Adipose Tissue
BMI	Body Mass Index
BDL	Below detection limit.
BP	Blood Pressure
Cd	Cadmium
Cont.	Normal healthy group
Cu	Copper
CVDs	Cardiovascular diseases
DM	Diabetes Mellitus
F	Female
Hg	mercury
HTN	Hypertension
LSD	least significant difference
M	Male
No.	Number of subjects
Obes.	Just obese patients' group
ODM	Obese diabetes patients' group
OHTN	Obese hypertensive patients' group
OS	Oxidative stress
Pb	lead
Se	Selinum
SD	Standard deviation
SPSS	Statistical Package for the Social Sciences
T2DM	Type 2 Diabetes Mellitus
Zn	Zinc

CONCLUSION

This study concluded that the obese patients with T2DM and with HTN had high significant level of

MDA, Cu and heavy metals (Pb and Cd) and low significant level of Se than control group.

Limitations: The major limitation of this study was in the small sample sizes of the Obese, HTN, T2DM and control groups. In addition, this study was only a one province study. As a next step, we are planning to expand the sample size and conduct multi-provinces research. Additionally, well-designed, each gender-separately specific prospective studies are needed to evaluate the role of trace elements and heavy metals in the development of obese complications.

Author's Contribution:

Concept & Design or acquisition of analysis or interpretation of data:	Ruaa. K. Abbas, Jamal Harbi Hussein Alsaadi
Drafting or Revising Critically:	Ruaa. K. Abbas, Jamal Harbi Hussein Alsaadi
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.

Source of Funding: None

Ethical Approval: No.3/11/938 dated 04.08.2023.

REFERENCES

1. Oke OE, Akosile OA, Oni AI, Opowoye IO, Ishola CA, Adebiyi JO, et al. Oxidative stress in poultry production. Poultry Sc 2024;104003.
2. de Lima EP, Moretti RC, Torres Pomini K, Laurindo LF, Sloan KP, Sloan LA, et al. Glycolipid metabolic disorders, metainflammation, oxidative stress, and cardiovascular diseases: unraveling pathways. Biol 2024;13(7):L519.
3. Cordiano R, DiGioacchino M, Mangifesta R, Panzera C, Gangemi S, Minciullo PL. Malondialdehyde as a potential oxidative stress marker for allergy-oriented diseases: an update. Molecules 2023;28(16):5979.
4. Shaikh TN, Rahu H, Siddiqui K, Saqib A, Tagar M. Association of Trace Elements and Minerals with Obesity: A Comprehensive Study in Women. International Neurourol J 2024;28(1): 70-75.
5. Chasapis CT, Ntoupa PSA, Spiliopoulou CA, Stefanidou ME. Recent aspects of the effects of zinc on human health. Archives Toxicol 2020; 94:1443-1460.
6. Barchielli G, Capperucci A, Tanini D. The role of selenium in pathologies: an updated review. Antioxidants 2022;11(2):251.
7. Swayze S, Rotondi M, Kuk JL. The associations between blood and urinary concentrations of metal metabolites, obesity, hypertension, type 2 diabetes, and dyslipidemia among US adults: NHANES 1999–2016. J Environ Public Health 2021; (1):2358060.
8. Abu Khadra KM, Bataineh MI, Khalil A, Saleh J. Oxidative stress and type 2 diabetes: the development and the pathogenesis, Jordanian cross-sectional study. Eur J Med Res 2024; 29(1):370.
9. Huang CJ, McAllister MJ, Slusher AL, Webb HE, Mock JT, Acevedo EO. Obesity-related oxidative stress: the impact of physical activity and diet manipulation. Sports medicine-open 2015;1:1-12.
10. Li H, Ren J, Li Y, Wu Q, Wei J. Oxidative stress: The nexus of obesity and cognitive dysfunction in diabetes. Frontiers Endocrinol 2023;14:1134025.
11. Gusti AM, Qusti SY, Alshammari EM, Toraih EA, Fawzy MS. Antioxidants-related superoxide dismutase (SOD), catalase (CAT), glutathione peroxidase (GPX), glutathione-S-transferase (GST), and nitric oxide synthase (NOS) gene variants analysis in an obese population: a preliminary case-control study. Antioxidants 2021;10(4):595.
12. Wagner G, Lindroos-Christensen J, Einwallner E, Husa J, Zapf TC, Lipp K, et al. HO-1 inhibits preadipocyte proliferation and differentiation at the onset of obesity via ROS dependent activation of Akt2. Scientific Reports 2017;7(1):40881.
13. Furukawa S, Fujita T, Shimabukuro M, Iwaki M, Yamada Y, Nakajima Y, et al. Increased oxidative stress in obesity and its impact on metabolic syndrome. J Clin Investigation 2017;114(12): 1752-1761.
14. Abou-Rjeileh U, Contreras GA. Redox regulation of lipid mobilization in adipose tissues. Antioxidants 2021;10(7):1090.
15. Andrieux P, Chevillard C, Cunha-Neto E, Nunes JPS. Mitochondria as a cellular hub in infection and inflammation. Int J Molecular Sci 2021;22(21): 11338.
16. Tagar M. Association of Trace Elements and Minerals with Obesity: A Comprehensive Study in Women. Int Neurourol J 2024;28(1).
17. Gu K, Li X, Xiang W, Jiang X. The relationship between serum copper and overweight/obesity: a meta-analysis. Biological Trace Element Res 2020; 194:336-347.
18. Darroudi S, Saberi-Karimian M, Tayefi M, Tayefi B, Khashyarmanesh Z, Fereydouni N, et al. Association between hypertension in healthy participants and zinc and copper status: a population-based study. Biological Trace Element Res 2019;190:38-44.
19. González-Villalva A, Colín-Barenque L, Bizarro-Nevares P, Rojas-Lemus M, Rodríguez-Lara V, García-Pelaez I, et al. Pollution by metals: Is there a relationship in glycemic control? Environmental Toxicol Pharmacol 2016;46:337-343.

Original Article

UTI in Diabetic and Non-Diabetic Identified by Some Biological Factors

Comparison Between Urinary Tract Infection Bacteriuria in Diabetic and Non-Diabetic Patients Identified by VITEK 2 and 16S rRNA Sequencing Against Some Biological Factors

Zainab S. Baqer and Munaff J. Abd Al-Abbas

ABSTRACT

Objective: To investigate the prevalence and characterization of bacterial species associated with urinary tract infections in both diabetic and non-diabetic patients.

Study Design: Comparative study

Place and Duration of Study: This study was conducted at the College of Science, University of Basrah, Iraq from 1st November 2022 to 31st January 2023.

Methods: One hundred and one midstream urine samples from UTI outpatients (61 diabetic, 39 non-diabetic) were collected. Samples cultured on MacConkey, Blood and Nutrient Agar (Accumix, India) at 37°C for 24h. Macroscopic urinalysis with 10 chemical tests (glucose, protein, pH, bilirubin, blood, ketone, leukocyte, nitrite, specific gravity and urobilinogen) done on all samples. Pure colonies obtained by subculturing, maintained on Nutrient Agar slants and Broth. Gram stain used for preliminary isolate classification.

Results: Forty-eight (60.7%) were from diabetic patients compared to 31 (39.2%) from non-diabetics ($P \leq 0.05$). Gram-positive bacteria were the most prevalent in diabetics (58.3%) versus Gram-negative (54.8%) in non-diabetics.16S rRNA sequences in both groups showed Escherichia coli being the most common followed by K. pneumoniae, E. fergusonii , S. hominis, E. Hormaechei, R. Ornithinolytica and S. aureus. While in diabetes were only B. safensis, S. saprophyticus, K. rhizophila, M. vitulinus, S. epidermidis, L. bacterium, C. amalonaticus, M.luteus, P. Gergoviae and P. fragi. Whereas in non-diabetes C. aurimucosum, B. velezensis, E. cloacae, C. Erwinia and E. bugandensis. Importantly, Enterobacter bugandensis was isolated from the urinary tract infection as the first time. VITEK showed only 26.1% of species identifications. Multiple alignment of 16S rRNA showed allelic differences between diabetic and non-diabetic bacteria. Sugar lysis tests showed Gram positive isolates from diabetics had 93 reactions vs. 43 in non-diabetics ($P \leq 0.05$), with no difference in Gram negative species.

Conclusion: The diabetic case influences on the types of bacterial species presents, genetic nucleotide mutations and bacterial enzymes activity either for gram positive or gram negative bacteria

Key Words: Urinary tract infection, Diabetes, VITEK 2, 16S rRNA

Citation of article: Baqer ZS, Al-Abbas MJA. Comparison Between Urinary Tract Infection Bacteriuria in Diabetic and Non-Diabetic Patients Identified by VITEK 2 and 16S rRNA Sequencing Against Some Biological Factors. Med Forum 2025;36(8):13-18. doi:10.60110/medforum.360803.

INTRODUCTION

Diabetes mellitus (DM) is a chronic metabolic disease causing persistent hyperglycemia due to insulin defects. It involves genetic, environmental and epigenetic factors.

Department of Biology, College of Science, University of Basrah, Iraq.

Correspondence: Zainab S. Baqer, Department of Biology, College of Science, University of Basrah, Iraq.
Contact No: +9647755886756
Email: zainabsadeq97@gmail.com

Received: December, 2024
Reviewed: January-February, 2025
Accepted: March, 2025

DM increases susceptibility to urinary tract infections (UTIs) because of immune dysfunction, hyperglycemia, and bladder neuropathy.[1] Urinary tract infection bacteria such as Escherichia coli, Klebsiella pneumoniae, Proteus mirabilis and Enterococcus faecalis grow well in glucose-rich urine enhancing colonization, biofilm formation and antibiotic resistance.[2] Urinary tract infection diagnosis shifted to molecular methods like VITEK 2 which uses metabolic activity cards for fast bacterial identification and susceptibility testing.[3] Bacterial metabolic profiles involving sugar fermentation are important in diabetes.[4] High glucose in diabetic urine boosts bacterial enzyme activity increasing virulence.[5] *16S rRNA* gene sequencing is a key identification method when phenotypic methods fail.[6] This study investigates genetic and enzymatic differences of bacteria from

diabetic and non-diabetic UTI patients, focusing on urine sugar effects.

METHODS

One hundred and one midstream urine samples from UTI outpatients (61 diabetic, 39 non-diabetic) were collected from 1st November 2022 to 31st January 2023. Samples cultured on MacConkey, Blood and Nutrient Agar (Accumix, India) at 37°C for 24h. Macroscopic urinalysis with 10 chemical tests (glucose, protein, pH, bilirubin, blood, ketone, leukocyte, nitrite, specific gravity and urobilinogen) done on all samples. Pure colonies obtained by subculturing, maintained on Nutrient Agar slants and Broth. Gram stain used for preliminary isolate classification.

DNA extraction: Bacterial isolates were grown in 5 mL Nutrient Broth (Accumix, India) at 37 °C for 24 h. Genomic DNA was extracted using Presto™ Mini gDNA Bacteria Kit (Geneaid, Taiwan), eluted in 100 µL buffer, and stored at –20 °C. DNA integrity was checked via 1.5% agarose gel electrophoresis with ethidium bromide under UV light.

Amplification of 16S rDNA: The 16S rDNA of 42 isolates was PCR-amplified using universal primers[7]: forward (27F) 5′-AGAGTTTGATCCTGGCTCAG-3′, reverse (1492R) 5′-GGTTACCTTGTTACGACTT-3′. PCR (50 µl) contained 25 µl GoTaq Master Mix, 2 µl DNA, 2 µl forward primer, 2 µl reverse primer, and 19 µl nuclease-free water. Program: 95 °C 5 min; 35 cycles of 95 °C 30s, 55 °C 30s, 72 °C 1min; final extension 72 °C 5 min. Amplification confirmed by 1.5% agarose gel electrophoresis in 1× TBE buffer; 1 µl PCR product loaded; 100 bp ladder used. Electrophoresis at 70 V for 1h; bands visualized under UV and photographed. Products stored at −20 °C until sequencing.

Bacterial isolates (22) were identified using Basic Local Alignment Search Tool (BLAST) and National Center for Biotechnology Information (NCBI) as in [8]. After proofreading, nucleotide sequences were submitted to BLAST which compared them with GenBank type strains to identify bacterial species.

he phylogenetic tree was constructed using MAFFT (Multiple Alignment Program for Nucleotide Sequences) at http://mafft.cbrc.jp/alignment/server/ after concatenating nucleotide sequences. Sequences were merged using Clustal Omega.[8]

VITEK 2 System: 42 isolates as Gram-positive and Gram-negative were identified by VITEK 2 (BioMérieux, France) and some bacterial susceptibility profile were done such asthe biochemical profiles associated with bacterial capacity to ferment the substrates with a focus on glucose, mannitol and lactose, as well as identification of the enzymes.

RESULTS

There were 61 (60.3%) diabetic patients and 40 (39.6%) non-diabetic patients. Out of 79 bacterial isolates, 48 (60.7%) obtained from diabetes was higher than 31 (39.2%) from non-diabetes (P≤0.05). The isolates were also divided into Gram negative 20 (41.6%) and Gram positive 28(58.3%) versus 17 (54.8%) and 14 (45.1%) respectively (Table 1). The 16S rRNA gene of 42 bacterial isolates was shown as a single band for each isolate on agarose gel electrophoresis at a position 1500 bp in comparison with a standard molecular DNA ladder (Fig. 1).

Twenty two different bacterial species were identified from 42 alignments. However, the bacterial species were 8 of Escherichia coli, 4 for both Klebsiella pneumoniae and Escherichia fergusonii, 3 of Staphylococcus hominis, 2 for both Bacillus safensis, Corynebacterium aurimucosum, Enterobacter hormaechei, Staphylococcus aureus and Raoultella ornithinolytica, and the other remaining species were only one for Pseudomonas fragi, Enterobacter cloacae, Pluralibacter gergoviae, Enterobacter bugandensis, Citrobacter amalonaticus, Kocuria rhizophila, Mammaliicoccus vitulinus, Candidatus Erwinia, Staphylococcus saprophyticus, Staphylococcus epidermidis, Bacillusvelezensis, Micrococcus luteus and lachnospiraceae bacterium. Each isolate sequence was aligned with its type strain in NCBI.

The distribution of bacterial species isolated from diabetic patients was analyzed to determine the prevalence of each bacterial type. Escherichia coli was the most prevalent accounting for 3 (6.2%) of the total isolates. This was followed by Klebsiella pneumoniae, Escherichia fergusonii and Bacillus safensis with a frequency of 2 (4.1%), while only 1(2%) for Staphylococcus hominis, Enterobacter hormaechei, Raoultella ornithinolytica, Kocuria rhizophila, Mammaliicoccus vitulinus, Staphylococcus saprophyticus, Lachnospiraceae bacterium, Staphylococcus epidermidis, Citrobacter amalonaticus, Micrococcus luteus, Pluralibacter gergoviae , Pseudomonas fragi and Staphylococcus aureus (Table 2). The bacterial species isolated from non-diabetic individuals were examined to determine their relative occurrence. The results showed that Escherichia coli was the most frequently detected accounting 5 (16.1%) of the total isolates. This was followed by 2 (6.4%) for Klebsiella pneumoniae, Staphylococcus hominis, Escherichia fergusonii and Corynebacterium aurimucosum, with 1(3.2%) for other species like Enterobacter hormaechei, Raoultella ornithinolytica, Bacillus velezensis, Enterobacter cloacae, Staphylococcus aureus, Candidatus Erwinia and Enterobacter bugandensis (Fig. 2).

Table 3 compares the identification results from the VITEK system and 16S rRNA gene sequencing. The

differences between the two techniques indicate a possibility of misidentification when using VITEK is approximately 73.9% to be identical with 16S rRNA in only 26.1% with no significant difference at ($P \leq 0.05$).

Twelve Gram-positive species were identified, including multiple isolates of Staphylococcus hominis, Bacillus safensis, S. aureus and Corynebacterium aurimucosum while others like Kocuriarhizophila, M. vitulinus, Candidatus Erwinia, S. saprophyticus, S. epidermidis, B. velezensis, M. Luteus Lachnospiraceae bacterium appeared once. Gram-positive isolates showed 93 positive vs. 193 negative biochemical reactions in diabetics and 43 vs. 113 in non-diabetics ($P \leq 0.05$) (Table 4).

Nine Gram-negative species were identified: multiple isolates of E. fergusonii, K. pneumoniae, E. hormaechei and R. ornithinolytica, single isolates of C. amalonaticus, E. bugandensis, P. gergoviae, E. cloacae and P. fragi. Biochemical profiles (17 isolates) showed 98 positive vs. 91 negative reactions in diabetics and 94 vs. 74 in non-diabetics, with no significant difference (Table 5).

Table No.1: Gram-positive and Gram-negative isolates in diabetics and non-diabetics cases

Urinary Tract Infection Samples	Bacterial Isolates	Diabetes		Non-diabetes	
		Gr +ve	Gr-ve	Gr+ve	Gr-ve
101	79	28 (58.3%)	20 (41.6%)	14 (45.1%)	17 (54.8%)
Total		48 (60.7%)*		31 (39.3%)	

*P≤0.05

Table No.2: The distribution of bacterial isolates between diabetics and non-diabetic cases

Bacteria species	No. (%)	Diabetics	Non-diabetics
Escherichia coli	8 (10%)	3 (6.2%)	5(16.1%)
Klebsiella pneumoniae	4 (5%)	2 (4.1%)	2 (6.4%)
Staphylococcus hominis	3 (3.7%)	1 (2%)	2 (6.4%)
Escherichia fergusonii	4 (4%)	2 (4.1%)	2 (6.4%)
Enterobacter hormaechei	2 (2.5%)	1 (2%)	1 (3.2%)
Raoultella ornithinolytica	2 (2.5%)	1 (2%)	1 (3.2%)
Staphylococcus aureus	2 (2.5%)	1 (2%)	1 (3.2%)
Bacillus safensis	2 (2.5%)	2 (4.1%)	-
Kocuria rhizophila	1 (1.2%)	1 (2%)	-
Mammaliicoccus vitulinus	1 (1.2%)	1 (2%)	-
Staphylococcus saprophyticus	1 (1.2%)	1 (2%)	-
Lachnospiraceae bacterium	1 (1.2%)	1 (2%)	-
Staphylococcus epidermidis	1 (1.2%)	1 (2%)	-
*Gr+ve cocci	25 (31.6%)	19 (39.5%)	6 (19.3%)
Citrobacter amalonaticus	1 (1.2%)	1 (2%)	-
Micrococcus luteus	1 (1.2%)	1 (2%)	-
Pluralibacter gergoviae	1 (1.2%)	1 (2%)	-
Pseudomonas fragi	1 (1.2%)	1 (2%)	-
Corynebacterium aurimucosum	2 (2.5%)	-	2 (4.6%)
Bacillus velezensis	1 (1.25)	-	1 (3.2%)
Enterobactercloacae	1 (1.2%)	-	1 (3.2%)
*Gr-ve rode	11 (13.9%)	7 (14.5%)	4 (12.9%)
Candidatus Erwinia	1 (1.2%)	-	1 (3.2%)
Enterobacter bugandensis	1 (1.2%)	-	1 (3.2%)
*Gr+ve rode	1 (1.26%)	-	1 (3.2%)
Total	79	48 (60.7%)*	31 (39.2%)

*P≤0.05

Table No. 3: Evaluation of bacterial identification by 16Sr RNA gene sequencing versus VITEK system

16sr RNA	VITEK	Identical
Corynebacterium aurimucosum	Mammaliicoccus vitulinus	-
Escherichiacoli	Escherichia coli	+
Staphylococcus aureus	Mammaliicoccus vitulinus	-
Staphylococcus hominis	Mammaliicoccus vitulinus	-
Kocuriarhizophila	Mammaliicoccus vitulinus	-
Escherichia fergusonii	Escherichia coli	-
Escherichia coli	Pseudomonas fluorescens	-
Bacillus velezensis	Klebsiella pneumoniae	-
Enterobacter cloacae	Escherichia coli	-
Bacillus safensis	Unidentified Organism	-
Staphylococcus aureus	Staphylococcus haemolyticus	-
Staphylococcus vitulinus	Staphylococcus vitulinus	+
Staphylococcus hominis	Staphylococcus hominis	+
Escherichia fergusonii	Escherichia coli	-
Escherichia coli	Escherichia coli	+
Klebsiella pneumoniae	Klebsiella pneumoniae	+
Candidatus Erwinia	Staphylococcus haemolyticus	-
Klebsiella pneumoniae	Enterobacter aerogenes	-
Escherichia coli	Pasteurella testudinis	-
Enterobacter hormaechei	Pantoea spp.	-

Enterobacter bugandensis	Enterobacter cloacae complex	-
Enterobacter hormaechei	Enterobacter cloacae	-
Escherichia coli	Escherichia coli	+
Raoultella ornithinolytica	Raoultella planticola	-
Raoultella ornithinolytica	Raoultella planticola	-
Escherichia coli	Enterobacter aerogenes	-
Escherichia coli	Escherichia coli	+
Klebsiella pneumoniae	Klebsiella pneumoniae	+
Corynebacterium aurimucosum	Mammaliicoccus vitulinus	-
Escherichia coli	Escherichia coli	+
Staphylococcus saprophyticus	Staphylococcus saprophyticus	+
Lachnospiraceae bacterium	Leuconostoc mesenteroides	-
Staphylococcus epidermidis	Staphylococcus haemolyticus	-
Citrobacter amalonaticus	Unidentified Organism	-
Micrococcus luteus	Kocuria kristinae	-
Bacillus safensis	Escherichia coli	-
Staphylococcus hominis	Mammaliicoccus vitulinus	-
Pluralibacter gergoviae	Unidentified Organism	-
Pseudomonas fragi	Pseudomonas fluorescens	-
Escherichia fergusonii	Klebsiella pneumoniae	-
Klebsiella pneumoniae	Klebsiella pneumoniae	+
Escherichia fergusonii	Rhizobium radiobacter	-
Total	42 (100%)*	31 (26.1%)

*P≤0.05

Table No.4: Biochemical tests for different Gr+ve bacterial species in diabetic and non-diabetic cases

Type of bacteria (No. 17)	Bio-chemical test	Diabetics (No. 11)		Non-diabetics (No. 6)	
		+	-	+	-
Staphylococcus aureus (No. 2)	AMY	1	10	0	6
	PIPLC	1	10	0	6
Staphylococcus hominis (No. 3)	dXYL	4	7	3	3
	ADH1	10	1	5	1
Bacillus safensis (No. 2)	BGAL	2	9	0	6
	AGLU	5	6	3	3
Bacillus velezensis (No. 1)	APPA	1	10	0	6
	CDEX	0	11	0	6
Corynebacterium aurimucosum (No. 2)	AMAN	1	10	0	6
	BGURr	0	11	0	6
Kocuria rhizophila (No. 1)	AGAL	0	11	0	6
	AlaA	2	9	1	5
Mammaliicoccus vitulinus (No.1)	dSOR	2	9	0	6
	URE	1	10	1	5
Staphylococcus saprophyticus (No,1)	POLYB	0	11	0	6
	dGAL	1	10	0	6
Staphylococcus epidermidis(no:1)	dRIB	7	4	3	3
	dMAL	3	8	2	4
Micrococcus luteus (No. 1)	NC6.5	9	2	4	2
	dMAN	7	4	4	2
	dMNE	6	5	4	2
Lachnospiraceae bacterium (No. 1)	MBdG	5	6	4	2
	dRAF	3	8	0	6
Candidatus Erwinia (No. 1)**	SAL	3	8	0	6
	SAC	10	1	5	1
	dTRE	9	2	4	2
Total	26	93*	193	43*	113

*P≤0.05

**Candidatus Erwinia was recorded as Gr+ve

Table No.5: Biochemical tests for different Gram-negative bacterial species in diabetic and non-diabetic cases

Type of bacteria (No. 17)	Biochemical test	Diabetics (No. 11)		Non-diabetics (No. 6)	
		+	-	+	-
Escherichia fergusonii (No. 4)	ADO	5	4	5	3
	IARL	1	8	0	8
Klebsiella pneumoniae(No. 4)	dCEL	7	2	5	3
	BGAL	6	3	8	0
Citrobacter amalonaticus (No. 1)	H2S	0	9	0	8
	AGLU	0	9	0	8
Enterobacter hormaechei (No.2)	BGLU	7	2	3	5
	dMAL	6	3	8	0
	dMAN	7	2	8	0
Enterobacter bugandensis (No.1)	dMNE	8	1	8	0
	BXYL	5	4	4	4
Raoultella ornithinolytica (No.2)	LIP	1	8	0	8
	PLE	5	4	5	3
	URE	2	7	1	7
	dSOR	6	3	8	0
Pluralibacter gergoviae (No. 1)	SAC	7	2	5	3
	dTAG	3	6	1	7
	dTRE	7	2	8	0
Enterobacter cloacae (No. 1)	MNT	3	6	4	4
Pseudomonas fragi (No. 1)	ILATK	6	3	6	2
	AGAL	6	3	7	1
Total	21	98	91	94	74

*P≤0.05

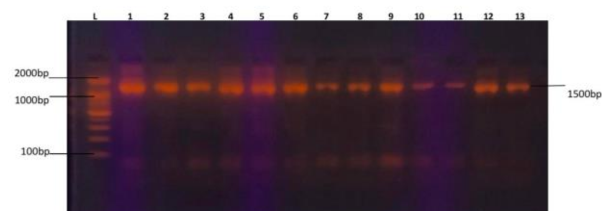


Figure No. 1: A model of agarose gel electrophoresis (1.57%) patterns showing PCR amplified products of 16Sr RNA Lane L: 100 bp DNA ladder, lanes 1-13: 16 Sr RNA bands of bacterial isolates

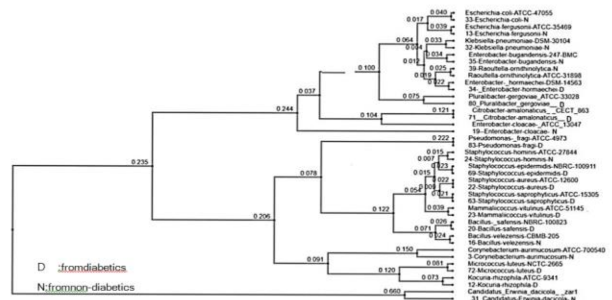


Figure No. 2: Rooted neighbour joining phylogenetic tree constructed sequences derived from an alignment of 16S rRNA sequences 21 different bacterial species from UTI patients (with different concatenation for each species) including diabetic and non-diseased cases isolates with their reference strain

DISCUSSION

In the present study, 79 (78%) bacterial isolates were obtained. This rate may be influenced by factors such as low bacterial concentration, poor storage or prior antibiotic use that inhibited growth. In addition, not all UTIs are caused by bacteria; viral or fungal infections may also occur. From the isolates, 43 predominant strains were selected for further testing. Gram-positive bacteria were more common in diabetic patients (58.3%) than in non-diabetics (45.1%), while Gram-negative were higher in non-diabetics (54.8%). This agrees with previous studies.[9,10] The overall isolation rate was significantly higher in diabetic patients (60.7%) compared to non-diabetics (39.2%) ($P \leq 0.05$), which supports the findings of Utku[11] suggesting that high glucose levels in diabetics may promote bacterial growth. However, one study contradicted this, reporting higher UTI prevalence in non-diabetics.[12]

This study showed that 43 isolates were selected for molecular identification using the conserved 16S rRNA gene, considered the gold standard for bacterial taxonomy. 21 species were confirmed, while 1 isolate with 74.11% similarity to Lachnospiraceae was excluded. A phylogenetic tree confirmed species identification by comparing sequences with GenBank references.[8] Comparison of 7 species,16S rRNA sequences revealed nucleotide differences between diabetic and non-diabetic isolates, notably E. fergusonii (13 differences), R. ornithinolytica (26 differences) and E. hormaechei (9 differences), while S. hominis and S. aureus showed minimal variation.

In the present study, out of 79 isolates, 42 were selected based on dominant colony morphology and sequenced using the conserved 16S rRNA gene, identifying 22 bacterial species. This gene is the gold standard for bacterial taxonomy and phylogeny.[13] Escherichia coli was the most prevalent accounting for 3 (6.2%) of the total isolates. This was followed by Klebsiella pneumoniae, Escherichia fergusonii and Bacillus safensis with a frequency of 2 (4.1%), while only 1 (2%) for Staphylococcus hominis, Enterobacter hormaechei, Raoultella ornithinolytica, Kocuria rhizophila, Mammaliicoccus vitulinus, Staphylococcus saprophyticus, Lachnospiraceae bacterium, Staphylococcus epidermidis, Citrobacter amalonaticus, Micrococcus luteus, Pluralibacter gergoviae, Pseudomonas fragi and Staphylococcus aureus (Table 2) . On the other hand, Escherichia coli was the most frequently 5(16.1%) of the total isolates in the non-diabetes followed by 2 (6.4%) for Klebsiella pneumoniae, Staphylococcus hominis, Escherichia fergusonii and Coryne bacterium aurimucosum, with 1 (3.2%) for other species like Enterobacter hormaechei, Raoultella ornithinolytica, Bacillus velezensis, Enterobacter cloacae, Staphylococcus aureus, Candidatus Erwinia and Enterobacter bugandensis. Bacterial percentage was 60.7% in diabetics and 39.2% in non-diabetics, with a significant difference ($P \leq 0.05$), supporting that high sugar in diabetic UTIs may enhance bacterial growth and diversity.[3]

The identification agreement between VITEK and 16S rRNA sequencing was limited to 26.1%, as shown in Table 3, while 16S rRNA achieved 100% accuracy with significant differences ($P \leq 0.05$). This percentage may not be entirely precise due to some sequences being too short or poorly readable. Despite this, 16S rRNA is considered one of the best techniques for bacterial identification due to its high sensitivity and specificity.[13,14] Unlike biochemical methods like VITEK, which depend on metabolic reactions that may overlap among related species or be affected by environmental factors, 16S rRNA targets conserved genetic regions, allowing more accurate classification at the species level. This is especially helpful in UTI cases, where mixed infections and antibiotic resistance often interfere with biochemical identification. In this study, 16S sequencing not only confirmed dominant culturable bacteria but also detected Enterobacter bugandensis, which would have been missed by automated biochemical methods.

12 Gram-positive species were identified, including multiple isolates of Staphylococcus hominis, Bacillus safensis, S. aureus and Corynebacterium aurimucosum, while others appeared once. Gram-positive isolates exhibited significantly more non-fermenting biochemical reactions in both diabetics (93 positive vs. 193 negative) and non-diabetics (43 positive vs. 113 negative) with $P \leq 0.05$.[15] The prevalence of non-fermenters among Gram-positive bacteria may be attributed to antibiotic use, which suppresses fermentation and metabolic activity in these less adaptable organisms, consistent with their structural vulnerability and metabolic limitations.

A total of 9 Gram-negative species were identified including multiple isolates of Escherichia fergusonii, Klebsiella pneumoniae, Enterobacter hormaechei and

Raoultella ornithinolytica and single isolates of Citrobacter amalonaticus, Enterobacter bugandensis, Pantoea gergoviae, Enterobacter cloacae and Pseudomonas fragi. Biochemical profiling of 17 isolates revealed 98 positive versus 91 negative reactions in diabetic patients and 94 versus 74 in non-diabetic patients, with no statistically significant difference. Fermenting strains were predominantly observed among Gram-negative isolates, indicating a preserved ability for sugar metabolism under stress conditions.E. coli fermentation is regulated by host immunity, microbial competition and antibiotics.[16] Unlike Gram-negatives, Gram-positives lack an outer membrane exposing teichoic acids and allowing β-lactams to inhibit peptidoglycan synthesis causing cell lysis.[17]

CONCLUSION

The diabetic case influences on the which types of bacterial species presents, genetic nucleotide mutationsand bacterial enzymes activity either for gram positive or gram negative bacteria.

Author's Contribution:

Concept & Design or acquisition of analysis or interpretation of data:	Zainab S. Baqer, Munaff J. Abd Al-Abbas
Drafting or Revising Critically:	Zainab S. Baqer, Munaff J. Abd Al-Abbas
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.

Source of Funding: None

Ethical Approval: No.3/6/195 Dated 05.10.2022

REFERENCES

1. Janifer J, Geethalakshmi S, Satyavani K, Viswanathan V. Prevalence of lower urinary tract infection in South Indian type 2 diabetic subjects. Indian J Nephrol 2009;19(4): 169-72.
2. Chiţă T, Timar B, Muntean D, Bădiţoiu L, Horhat FG, Hogea E, et al. Urinary tract infections in Romanian patients withdiabetes: Prevalence, etiology, and risk factors. Therapeu Clin Risk Management 2016; 13: 1-7.
3. Funke G, Funke-Kissling P. Evaluation of the new VITEK 2 card for identification of clinically relevant gram-negative rods. J Clin Microbiol 2004;42(9):4067-71.
4. Paudel S, John PP, Poorbaghi SL, Randis TM, Kulkarni R. Systematic view of literature examining bacterial urinary tract infections in diabetes. J Diabetes Res 2022;2022:1-20.
5. Tomic D, Shaw JE, Magliano DJ. The burden and risks of emerging complications of diabetes mellitus. Nature Rev Endocrinol 2022;18(9): 525-39.
6. Mousa HM, Abd Al-Abbas MJ. Random amplified polymorphic DNA for identical Streptococcus salivarius strains isolated from tongue of peoples before and after Listerine in vivo. J Population Therapeu Clin Pharmacol 2023;30(9):2.
7. Jasim NA, Abd Al-Abbas MJ. Association of Oxalobacterformigenes with the stools of urinary tract stone patients in Basrah province. IJSRST 2016;2(3):113-7.
8. Kerbauy G, Perugini M, Yamauchi LM, Yamada-Ogatta SF. Vancomycin-dependent Enterococcus faecium van A: characterization of the first case isolated in a university hospital in References 141 Brazil. Brazilian J Med Biol Res 2011;44:253-7.
9. Worku S, Derbie A, Sinishaw MA, Adem Y, Biadglegne F. Prevalence of bacteriuria and antimicrobial susceptibility patterns among diabetic and nondiabetic patients attending at Debre Tabor Hospital, Northwest Ethiopia. Int J Microbiol 2017; 2017: 5809494.
10. Al-Tulaibawi NAJ. Prevalence and sensitivity of bacterial urinary tract infection among adult diabetic patients in Misan Province, Iraq. J Pure Appl Microbiol 2019;13(2):847-53.
11. Utku AÇ. Comparison of the frequency of bacteriuria in diabetic and non-diabetic patients without symptoms of urinary tract infection. J Health Sci 2022;12(2):144-49.
12. Yenehun GW, Alamneh YB, Worku AG, et al. Prevalence of bacterial urinary tract infection and antimicrobial susceptibility patterns among diabetes mellitus patients attending Zewditu Memorial Hospital, Addis Ababa, Ethiopia. Infec Drug Resistance 2021;14:1441-54.
13. Chmagh AA, Abd Al-Abbas MJ. Comparison between the coagulase (coa and vwb) genes in Staphylococcus aureus and other staphylococci. Gene Reports 2019;16:100410.
14. Chatzou M, Magis C, Chang JM, Kemena C, Bussotti G, Erb I, et al. Multiple sequence alignment modeling: Methods and applications. Briefings Bioinformatics 2015;17(6): 1009-23.
15. Toller-Kawahisa JE, O'Nell LAJ. How neutrophil metabolism affects bacterial killing. Open Biol 2022;12:220248.
16. Alteri CJ, Smith SN, Mobley HLT. Fitness of Escherichia coli during urinary tract infection requires gluconeogenesis and the TCA cycle. PLoS Pathogens 2009;5(5):e1000448.
17. Foster PL. Stress-induced mutagenesis in bacteria. Crit Rev Biochem Molecular Biol 2007;42(5): 373-97.

Original Article

Postnatal Mothers' Satisfaction Regarding Informational Nursing Care during Labor

Sara Ahmed Rashid and Wafaa Ahmed Ameen

ABSTRACT

Objective: To assess satisfaction of postnatal mother regarding informational nursing care during labor and to determine the relationship between satisfaction on informational nursing care and reproductive history.

Study Design: A descriptive cross sectional study

Place and Duration of Study: This study was conducted at the Bent Al Huda and Al-Haboubi Teaching Hospitals in delivery room at Al-Nasiriya city from 14th July 2024 to 1st October 2024.

Methods: A non-probability sampling method was used. The study included 315 postnatal mothers in recovery room of obstetrics units. The socio-demographic data about the women and includes age, level of education, income reproductive history, including gravida, parity, abortion were recorded. The postnatal mother's satisfaction information regarding nursing care during labor was also noted. Three Likert scale levels (not satisfied, partially satisfied, satisfied) for assessing mothers' satisfaction were noted. The data was entered and analyzed through SPSS-26.

Results: The average age of mother was 20-24 years, (21%) of mothers have educationally, (47.9%) were first-time mothers, (25.7%) had gravida between four or more pregnancies and (81.3%) had never experienced an abortion and (81.9%), (56.2%) of mothers had moderate satisfaction on informational nursing care during labor.

Conclusion: The overall assessment of postnatal mothers' satisfaction with informational of nursing care was moderate, Significant relationship between mother's satisfaction on informational nursing care and reproductive history.

Key Words: Satisfaction, Nursing care, Labor

Citation of article: Rashid SA, Ameen WA. Postnatal Mothers' Satisfaction Regarding Informational Nursing Care during Labor. Med Forum 2025;36(8):19-22. doi:10.60110/medforum.360804.

INTRODUCTION

Women satisfaction with informational nursing care during labor can be measured by how well the health care provider and/or meets the client's intended expectations, goals, and/or preferences and show how clients feel about the service's advantages and disadvantages, respectively in order to improve health care services.[1]

The concept of women's satisfaction during labor is wide-ranging and complex, encompassing both the birth experience and the postpartum period. It is advised that a woman be supported during labor to have a positive experience.[2,3]

Women who are dissatisfied leads to a loss of health care system and avoid returning to the hospital again. The mortality rate rises annually for a number of causes, but the issue of lack of accountability is not very significant. Monitoring and evaluation of women satisfaction in public health care sectors is considered to improve the quality and efficiency of health care during childbirth and puerperal period.[4]

College of Nursing, University of Babylon.

Correspondence: Sara Ahmed Rashid, PhD Scholar, Maternity and Neonate Nursing, College of Nursing, University of Babylon.
Contact No: 07804903491
Email: sarah.mohamed.nurh112@student.uobabylon.edu.iq

Received: February, 2025
Reviewed: March-April, 2025
Accepted: May, 2025

METHODS

A descriptive cross-sectional study method was designed in al Nasiriya City, Iraq, from 14th July 2024 to 1st October 2024 vide letter No.31 dated 27th May 2024. A non-probability sampling method was used. The study included 315 postnatal mothers in recovery room of obstetrics units.

The socio-demographic data about the women and includes age, level of education, income reproductive history, including gravida, parity, abortion were recorded. The postnatal mother's satisfaction information regarding nursing care during labor was also noted. Three Likert scale levels (not satisfied, partially satisfied, satisfied) for assessing mothers' satisfaction were noted. The data was entered and analyzed through SPSS-26.

RESULTS

The highest proportion (39.7%) being between the ages of 20 and 24 with mean age was 24±5 years; (25.7%) of mothers were graduated from primary schools and (72.7%) had barely sufficient income (Table 1).

42.9% were primigravida and 25.7% between four or more pregnancies, Parity, shows that nearly half (47.9%) were first-time mothers, (81.3%) had never experienced an abortion (Table 2).

Table 3 reflect a generally moderate level of satisfaction with the informational aspects of nursing care. While some areas, such as communication about diet and labor processes, were reasonably well-received, there is significant room for improvement, particularly in providing comprehensive information about newborn care and post-natal follow-up.

56.2% of mothers show moderate satisfaction. The mean satisfaction score of 42.49, with a standard deviation of 10.006, highlights an overall moderate level of satisfaction (Table 4).

Table 5 showed that a significant positive relationship with gravida (p = 0.001) and parity (p = 0.001). No significant relationship was discovered with abortion history (p = 0.740).

Table No.1: Distribution of mothers according to their socio-demographic characteristics (N=315)

Characteristic	No.	%
Age (years)		
15 – 19	69	21.9
20 – 24	125	39.7
25 – 29	60	19.0
30 – 34	46	14.6
35 – 40	15	4.8
Level of education		
Doesn't read and write	51	16.0
Read and write	66	21.0
Primary school	66	21.0
Secondary school	66	21.0
Diploma/Bachelor	66	21.0
Perceived monthly income		
Sufficient	35	11.1
Barely sufficient	229	72.7
Insufficient	51	16.2

Table No.2: Distribution of mothers according to their reproductive history characteristics (N=315).

Characteristic	No.	%
Gravida		
1	135	42.9
2	55	17.5
3	44	14.0
4^{+}	81	25.7
Parity		
1	151	47.9
2	52	16.5
3	50	15.9
4^{+}	62	19.7
Abortion		
None	256	81.3
One	45	14.3
Two +	14	4.4

Table No. 3: Assessment of postnatal mother satisfaction on informational nursing care during labor (N=315).

Informative aspects of nursing care	Scale	Frequency	M	Assess
Information about period of hospital stay	Unsatisfied	21 (6.7%)	2.32	Moderate
	Partially S.	173 (54.9%)		
	Satisfied	121 (38.4%)		
Information about the benefits of diet	Unsatisfied	39 (12.4%)	2.20	Moderate
	Partially S.	173 (54.9%)		
	Satisfied	103 (32.7%)		
Information about breathing exercise during labour	Unsatisfied	27(8.6)	2.28	Moderate
	Partially S.	172(54.6)		
	Satisfied	116(36.8)		
Information about breast feeding	Unsatisfied	23(7.3)	2.30	Moderate
	Partially S.	175(55.6)		
	Satisfied	117(37.1)		
Information regarding baby care	Unsatisfied	28(8.9)	2.24	Moderate
	Partially S.	183(58.1)		
	Satisfied	104(33)		
Information about post-natal follow up visit	Unsatisfied	45(14.3)	2.17	Moderate
	Partially S.	173(54.9)		
	Satisfied	97(30.8)		

Table No.4: The overall assessment of postnatal mother satisfaction on informational nursing care during labor (N=315)

Maternal Satisfaction	f	%	M	SD	Ass.
Low	27	8.6	42.49	10.006	Moderate
Moderate	177	56.2			
High	111	35.2			

Table No.5: Relationship between postnatal mother satisfaction on informational nursing care and reproductive history (N=315)

Variables		Overall Satisfaction				Relationship
		Low	Moderate	High	Total	
Gravida	1st	17	75	43	135	rs = .185 P = .001 Sig.= H.S
	2nd	1	28	26	55	
	3rd	5	23	16	44	
	4th +	3	42	36	81	
Parity	1st	17	87	47	151	rs = .200 P = .001 Sig.= H.S
	2nd	2	21	29	52	
	3rd	5	27	18	50	
	4th +	2	33	27	62	
Abortion	None	24	134	98	256	rs = .019 P = .740 Sig. = N.S
	One	1	27	17	45	
	Two +	1	7	6	14	

DISCUSSION

The two-fifths of the group (20-24) years were old (Table 1). The findings of this study are consistent with those of Atiya[5] done in Iraq, which found that two-fifths of the women were between the ages of 20 and 24. The impression that the majority of mothers is younger. This is to be expected given that it is the average childbearing age.

Regarding the level of education, the highest percentage of mothers was graduated from primary. This result supportive with Panth & Kafle[6] in Nepal, demonstrates that the majority of postnatal mothers were in primary school. The study's participants found that less than three-quarters of mothers reported their income as "barely sufficient," The findings of the study are inconsistent with Asif[7] in Nepal, who discovered that the vast majority of women live in homes with barely enough money to cover the average household income.

Less than half of mothers were first-time pregnant (primigravida) [Table 2]. The result of this study is consistence with Akhtarkia et al[8] who found less than half of mothers was primigravid and inconsistence with Hajimam et al[9] who found Most were multigravida. In related to parity, shows that nearly half were first-time mothers.The finding inconsistence with Ali et al[10] who found more than one third were primiparous.

According to abortion reveals that the majority of mothers had never experienced an abortion. The result of the study consistency with Mukerenge et al[11] who found the majority of women hadn't had previous abortion.

A generally moderate level of satisfaction with the informational aspects of nursing care was recorded (Table 3). The result of this study inconsistence with Panth & Kafle[6] who found only less than half were satisfied with information about information regarding baby care and benefits of diet, state of newborn, breast-feeding. It could indicate that some interactions were positive, but there were also instances where patients felt their needs were not fully met.

In Table 4 indicated that more than half of mothers show moderate satisfaction. The result of study inconsistence with Hepsiba & Singh[12] in India, who found the majority of women show moderate satisfied and less one third show high satisfied with information aspects of nursing care received. Due to positive behavior of caregivers and the professionalism and high experience in giving care and information about nursing care during labor.

There is significant positive relationship between gravida (p=0.001) and parity (p=0.001) [Table 5]. This study's findings are similar to those of Elgazzar et al[13] in Egypt, who discovered There was also a positive statistically relationship between satisfaction level and number of gravidities and parity (P=0.001) and disagree with Albert et al[14] and Eziawdres et al[15] who discovered a negative correlation between multiparous women and satisfaction.

Recommendations: Continuous development programs should be for nursing staff focusing on labor and delivery care. Nurses need to educate women about labor phases, potential interventions, and available options during intranatal care. Women can be assisted in making informed decisions by explaining why certain medical interventions or procedures are necessary.

CONCLUSION

The overall assessment of postnatal mother's satisfaction on informational nursing care during labor was moderate, that significant positive relationship with gravida (p=0.001) and parity (p=0.001) and no significant relationship are found with abortion history.

Author's Contribution:

Concept & Design or acquisition of analysis or interpretation of data:	Sara Ahmed Rashid, Wafaa Ahmed Ameen
Drafting or Revising Critically:	Sara Ahmed Rashid, Wafaa Ahmed Ameen
Final Approval of version:	All the above authors
Agreement to accountable	All the above authors

for all aspects of work:	

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

Source of Funding: None

Ethical Approval: No. 31 dated 27th May 2024.

REFERENCES

1. Asamrew N, Endris AA, Tadesse M. Level of patient satisfaction with inpatient services and its determinants: a study of a specialized hospital in Ethiopia. J Environ Public Health 2020;2020: 2473469.
2. World Health Organization. Companion of choice during labour and childbirth for improved quality of care: evidence-to-action. Geneva: WHO 2020; 10-15.
3. Birhanu S, Demena M, Baye Y, Desalew A, Dawud B, Egata G. Pregnant women's satisfaction with antenatal care services and its associated factors at public health facilities in the Harari region, Eastern Ethiopia. SAGE Open Med 2020;8:2050312120973480.
4. Ope BW, Wasan T, Hirst JE, Mullins E, Norton R, Peden M. Measurement, determinants and outcomes of maternal care satisfaction in Nigeria: a systematic review. BMJ Public Health 2025;3(1):e001278.
5. Atiya KM. Maternal satisfaction regarding quality of nursing care during labor and delivery in Sulaimani teaching hospital. Int J Nursing Midwifery 2016;8(3):18-27.
6. Panth A, Kafle P. Maternal satisfaction on delivery service among postnatal mothers in a Government Hospital, Mid-Western Nepal. Obstet Gynecol Int 2018;2018:4530161.
7. Asif A. Maternal satisfaction and recommendation of perinatal health facility: A cross sectional study measuring perceptions of mothers experiences of maternity care at tertiary care hospitals in Nepal. Obstet Gynecol Int 2019;10: 45-9.
8. Akhtarkia Z, Kamrani MA, Farid M, Dana HF. Relationship among maternal perception of childbirth experience, spiritual health and maternal-infant relationship in the postpartum women: a cross-sectional study. Iran J Nurs Midwifery Res 2023;28(3):332-8.
9. Hajimam AF, Ahmed HM, Mishkin K. Women's expectations of health care providers in the labor and delivery room in the Kurdistan Region of Iraq. Zanco J Med Sci 2023;27(1):42-52.
10. Ali MJ, Ocheke AN, Egbodo CO, Tsoho FM. Maternal satisfaction with intrapartum care at the Jos University Teaching Hospital. Highland Med Res J 2022; 22(1): 51-5.
11. Mukerenge NF, Kafene P, Nakakuwa FN. An assessment of women's satisfaction with maternity care during labour and birth in a referral hospital in Namibia. Heliyon 2025;11(4):e42644.
12. Hepsiba RP, Singh M. A study to evaluate quality of nursing care practices and patient satisfaction among parturient admitted in obstetric units of a selected tertiary care hospital at Lucknow. J Positive School Psychol 2022;10:4559-67.
13. Elgazzar HM, Hashem SAR, Heeba MF. Factors affecting women's satisfaction during labor experience. Port Said Sci J Nurs 2018;5(2): 220-36.
14. Albert A, Khalfan SS, Urassa DP. Women's satisfaction with maternal delivery care at health facilities. Res J Pharmacy Med Sci 2023;6(6): 21-6.
15. Eziawdres D, Worku W, Taye M. Maternal satisfaction with delivery services and its associated factors among mothers who gave birth at public health centers in Yeka Sub City, Addis Ababa, Ethiopia. Health Services Insights 2021; 14:11786329211050722.

Original Article

Effect of ASXL1 Mutation on BCR-ABL Transcript Types with Chronic Myeloid Leukemia

The Predicting Effect of ASXL1 Mutation on BCR-ABL Transcript Types and Responses to Tyrosine Kinase Inhibitors in Patients with Chronic Myeloid Leukemia

Rabab Ajmi Askar, Bassim I. Mohammad and Hussein. A Sahib

ABSTRACT

Objective: In order to support clinical management, we sought to show how ASXL1 mutations affect prognosis as a bio-marker for various management responses and illness progress.

Study Design: Cross-sectional study

Place and Duration of Study: This study was conducted at the Al-Diwaniyah Teaching Hospital and the Department of Pharmacology & Therapeutics, College of Medicine, University of Al-Qadisiyah, Iraq from 1st July 2024 to 31st January 2025.

Methods: A total of 51 patients with CML were enrolled. DNA was extracted from all patients for amplification of theASXL1 gene using specific primers and detection of the 1934 (c.1934dupG) mutation by sequencing.

Result: Only 2 were found to have this type of mutation, as revealed by sequencing of the amplified gene.

Conclusion: ASXL1 mutations might be promising prognostic bio-markers to regulate each patient's finest TKIs and avoid CML progression.

Key Words: Leukemia, ASXL1 gene mutation, PCR, Sequencing, TKIs, Resistance

Citation of article: Askar RA, Mohammad BI, Sahib HA. The Predicting Effect of ASXL1 Mutation on BCR-ABL Transcript Types and Responses to Tyrosine Kinase Inhibitors in Patients with Chronic Myeloid Leukemia. Med Forum 2025;36(8):23-26. doi:10.60110/medforum.360805.

INTRODUCTION

Leukemia is a cancer of blood cells, considered via the abnormal proliferation of abnormal white blood cells. It is the greatest mutual blood cancer kind in the United States. There are four main types of leukemia based on cell lineage: B-ALL, T-ALL, AML and CML.[1] The Philadelphia (Ph) chromosome (derivative chromosome 22), The first disease-specific chromosomal abnormality linked to a cancer, chronic myeloid leukemia, was caused by a translocation between chromosomes 9 and 22[2] and this translocation functions as a target for the tyrosine kinase inhibitors (TKIs).[3] Typically, the ABL1 gene's breakpoint lies between exons a1 and a2. The most frequent BCR-ABL rearrangements caused by these breakpoints are e14a2 (b3a2) and e13a2 (b2a2), which code for the 210-kDa protein p210.

Department of Clinical Pharmacology, University of Al-Qadissiyah, College of Medicine, Iraq.

Correspondence: Rabab Ajmi Askar, Department of Pharmacy, Al-Qadisiya University College, Iraq.
Contact No: 07803781893
Email: rabab74.ra@gmail.com

Received: March, 2025
Reviewed: April-May, 2025
Accepted: June, 2025

Together transcripts may coexpress in certain patients.[4] Multiple hematological neoplasms have mutations in the ASXL1 (further sex combs-like 1) gene. The most prevalent genetic modification is c. 1934dupG, p. gly646fs. We looked into how various people's proofreading skills affected things.

Polymerase DNA on ASXL1, another popular technique for ASXL1 genotyping is conventional Sanger sequencing, which is used to identify the 1934dupG somatic mutation.[5] When ASXL1 mutations are found during the chronic phase of CML, they are linked to worse outcomes.[6] For newly diagnosed CML, imatinib has been approved by the Food and Drug Administration as a first-line treatment. After 21 years of clinical use, imatinib, the first inhibitor of the BCR-ABL1 tyrosine kinase, has shown a better safety profile than anticipated.[7] A variety of mechanisms of resistance to TKI treatment have been documented, including kinase-domain mutations, BCR-ABL over expression and abnormal drug transporter expression, as well as some that are BCR-ABL-independent, like mutations in the ASXL1 gene.[8] ASXL1 productions a character in epigenetic regulation in the body. Concluded unknown resistance mechanisms, the ASXL1 mutation in the CML-CP sick in this case statement provided resistance to TKI. Despite the lack of a clear molecular mechanism for TKI resistance in ASXL1 mutations in CML, epigenetic modulation is a likely way for the disease to progress.[9]

METHODS

This cross-sectional study was conducted at Department of Pharmacology and Therapeutics, College of Medicine, University of Al-Qadisiyah, Iraq, and Al-Diwaniyah Teaching Hospital both, for the period from 1st July 2024 to 31st January 2025. A total of 51 sick with CML were enrolled. A specialist care giving physician/hematologist diagnosed and recruited all candidates' patients. The study involved a total of 51 patients, comprising 28 men and 23 women, whose ages extended as of 20 to 70 years. Each individual was facing the challenges posed by chronic myeloid leukemia and was actively receiving treatment with tyrosine kinase inhibitors. These patients represented a diverse group, each with their unique journey through the complexities of their illness, united by their battle against this persistent form of cancer.

The Philadelphia chromosome has a long-established presence, definitively indicates chronic myeloid leukemia in individuals aged 12 and older, underscoring the necessity for prompt diagnosis and intervention and every patient with CML on TKI therapy were included. Pregnancy and TKI contraindication were excluded. Completely sick comprised in the research stood taking oral TKI. Two ml of blood samples were collected using EDTA tubes, transported cooled to the laboratory, and subjected directly to molecular processing.

Conventional PCR was used to amplify the genome using a particular program that was optimized following the completion of a gradient for the gene. Next, we ran the PCR result on a 1 percent agarose gel to confirm it. An automated Sanger sequencing (SeqStudio) analyzer was then used to sequence the samples, and the results were examined for discrepancies.

Rendering to the manufacturers' instructions for the DNA extraction kit (Geneaid, Taiwan), DNA stayed removed as of blood testers, and the purification and concentration were examined using the Nanodrop System (Thermo Scientific, UK). Targeting the ASXL1 gene, a set of primers [(F: F:5́-GGACCCTCGCAGACATTAAA-3́) and R:(5́CACCACCATCACCACTGCT-3́)] stayed intended for the current research founded on NCBI-GenBank. Prepare the PCR reaction tubes to a ending size of 50 µl by the GoTaq Green Master Mixture Kit (Promega, USA). For the PCR reaction, the following circumstances of the Thermal Cycler system (BioRad, USA) were observed: 1 cycle for early denaturation (95°C/5 minutes); 35 cycles for denaturation (95°C/30 seconds), annealing (60°C / 30 seconds), and extension (72°C/30 seconds); and 1 cycle for final extension (72°C/7 minutes). The PCR yields stood electrophoresed in a 2% agarose gel marked with ethidium bromide at 120V for 45 minutes, and the outcomes stood examined by the gel documentation system (Syngene, Thailand) at approximately 174 bp. The primers were conducted by conventional PCR technique (means using primers specific for the ASXL1 gene (partial region) that appeared with the band with size= 174 bp), then conducting Sanger sequencing technique by Macrogen, South Korea. The data was entered and analyzed through SPSS-26.

Primer	5'-----3'
Forward	GGACCCTCGCAGACATTAAA
Reverse	CACCACCATCACCACTGCT

RESULTS

In the study, added sex combs-like 1 (ASXL-1) gene mutation rate in patients with CML was evaluated and the rate was 2 cases out of 51 cases, i.e. it accounted to approximately 3.9%. Also transcript types of BCR-ABL1 were also evaluated and the rates were as following: b2a2 (11.8 %), b2a3 (21.6 %), b3a3 (78.4 %), b3a2 (23.5 %) and e1a2 (17.6%) [Table 1].

Table No.1: Rate of ASXL-1 mutations in patients with CML

Mutation	Positive		Negative	
	No.	%	No.	%
ASXL-1	2	3.9	49	96.1

Table No.2: The associations of ASXL-1 to BCR-ABL1 transcript types

Transcript type		Positive (2 cases)		Negative (49 cases)		P value	Interpretation
		No.	%	No.	%		
b2a2	Positive	0	0.0	6	12.2	1.000	Not significant
	Negative	2	100.0	43	87.8		
b2a3	Positive	1	50.0	10	20.4	0.388	Not significant
	Negative	1	50.0	39	79.6		
b3a3	Positive	1	50.0	39	79.6	0.388	Not significant
	Negative	1	50.0	10	20.4		
b3a2	Positive	0	0.0	12	24.5	1.000	Not significant
	Negative	2	100.0	37	75.5		
e1a2	Positive	1	50.0	8	16.3	0.325	Not significant
	Negative	1	50.0	41	83.7		

Evaluation of ASXL-1 mutations has been carried out, and results were not significant (p> 0.05) [Table 2].

The effect of ASXL-1 mutation on the response of CML patients to TKI was not significant (p> 0.05), as shown in Table 3.8. Effects of b2a2, b2a3, b3a3, b3a2, and e1a2 transcripts on the response of CML patients to TKI were not significant (p>0.05) [Table 3].

Table No.3: Effect of ASXL-1 mutation on response of CML patients to TKI

Parameter	ASXL-1		P value
	Positive	Negative	
WBC	12.25	8.54 (5.00)	0.173
HB	11.95	12.00 (2.00)	0.696
PLT	229.50	220.00 (103.00)	0.734
Molecular	3.81	0.05 (4.54)	0.593

DISCUSSION

Numerous myeloid malignancies, comprising 11 percent of MDS, 43 percent of CMML, 8 percent of MPN, 20 percent of AML, and 12 to 5 percent of CML, have been linked to mutations distressing exon 12 of the ASXL1 gene. Boultwood et al were the first to describe ASXL1 mutations. and found to be a novel molecular occurrence in CML. A more comprehensive document is required to elucidate the correlation between these mutations and their predictive properties in hematological tumors, as there are differing views on the subject.[10] Sick with ASXL1 mutations differed significantly from those without mutations in terms of the risk link of ASXL1 mutations with illnessprogress (P<0.007). Numerous studies also indicate that patients with CML who have ASXL1 mutations have a poorer prognosis and worse outcomes.[11]

The most prevalent change in CP-CML was found to be an ASXL1 mutation, which was found in 12% of patients tested at diagnosis and 14% of all evaluable patients. Significantly lower EFS and FFS were linked to these mutations.[4] Previously, ASXL1 mutations were found to be the sole gene mutated in both adult and pediatric CML, suggesting that these mutations may occasionally play a significant role. Since a poorer reaction to nilotinib management was linked to the existence of an ASXL1 mutation at analysis, the training existing here offers new indication for an opposing reaction to TKI management in CML sick transport mutant ASXL1.[5]

In the present study, peripheral blood testers stayed composed as of 51 patients analyzed with chronic myeloid leukemia. The samples were transported to the laboratory under refrigerated conditions to preserve their integrity. Genomic DNA stayed first extracted from the blood samples, followed by amplification using the polymerase chain reaction (PCR) technique. The amplified DNA products were then subjected to agarose gel electrophoresis to assess the quality and integrity of the PCR products. Subsequently, DNA sequencing was performed by Sanger sequencing of ASXL1 to identify potential genetic mutations. Sequencing analysis revealed that among the 51 CML patients, only two individuals harbored a mutation in the ASXL1 gene (c.1934dupG), resulting in a Frame shift. One of the mutations was identified as a result of a deletion, and the other as a result of a TG substitution. Even though the distressed sick from whom follow-up testers stayed examined had their mutations cleared, CML sick with an ASXL1 mutation at analysis experience slower treatment responses. This implies that leukemic cells' susceptibility to TKIs and, in turn, their response to therapy are influenced by clonal progress with ASXL1 mutations in addition to BCR-ABL1. More research is needed to determine the molecular mechanism underlying this phenomenon.[12,13] Neutrophilic dysplasia brought on by mutant asxl1 may increase the risk of myeloid cancer progression and cause chronic inflammation.[14,15] The study found an ASXL-1 gene mutation rate of 3.9% (2 out of 51 cases) in CML patients. This rate is on the lower end compared to other studies, which report rates from 7.6% to 24% at diagnosis. The variation in reported rates could be due to several factors, including differences in patient groups, geographic locations, disease stages at diagnosis, and the sensitivity of the detection methods used. Although the frequency observed in this study is relatively low, ASXL-1 mutations are generally considered important in CML because they are linked to disease progression and prognosis. The study found that the influence of ASXL-1 mutation on CML patients' response to TKI stayed not statistically important (p>0.05). Similarly, the effects of b2a2, b2a3, b3a3, b3a2, and e1a2 transcripts on TKI response also showed no significance (p > 0.05). These outcomes designate that, in this study, neither ASXL-1 mutation status nor BCR-ABL1 transcript type alone could predict TKI response. This lack of significance, especially regarding ASXL-1 mutations, contrasts with a growing body of research linking ASXL-1 to poor prognosis and TKI resistance in CML. Other studies consistently report worse molecular responses, higher progression risk, and TKI resistance in CML patients with ASXL-1 mutations, which suggests that the small number of ASXL-1 positive cases in this study (n=2) may be a major limitation.

CONCLUSION

Small fraction of CML patients carries the ASXL-1 mutation which has no impact on response to TKI. Significant proportion of CML patients carries single or multiple BCR-ABL transcript types that have been proved to have no significant impact of on response to TKI.

Author's Contribution:

Concept & Design or acquisition of analysis or interpretation of data:	Rabab Ajmi Askar, Bassim I. Mohammad
Drafting or Revising Critically:	Rabab Ajmi Askar, Hussein. A Sahib
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.

Source of Funding: None

Ethical Approval: No. 30/1192 dated 25th May 2024.

REFERENCES

1. Gasic V, Karan-Djurasevic T, Pavlovic D, Zukic B, Pavlovic S, Tosic N. Diagnostic and therapeutic implications of long non-coding RNAs in leukemia. Life (Basel) 2022;12(11):1770.
2. Farhat-Maghribi S, Habbal W, Monem F. Frequency of BCR-ABL transcript types in Syrian CML patients. J Oncol 2016;2016:8420853.
3. Ercaliskan A, Eskazan AE. The impact of BCR-ABL1 transcript type on tyrosine kinase inhibitor responses and outcomes in patients with chronic myeloid leukemia. Philadelphia: John Wiley; 2018.p. 525-45.
4. Jain P, Kantarjian H, Patel KP, Gonzalez GN, Luthra R, Kanagal Shamanna R, et al. Impact of BCR-ABL transcript type on outcome in patients with chronic-phase CML treated with tyrosine kinase inhibitors. Blood 2016;127(10):1269-75.
5. Montes-Moreno S, Routbort MJ, Lohman EJ, Barkoh BA, Kanagal-Shamanna R, Bueso-Ramos CE, et al. Clinical molecular testing for ASXL1 c.1934dupG p.Gly646fs mutation in hematologic neoplasms in the NGS era. PLoS One 2018; 13(9):e0204218.
6. Bidikian A, Kantarjian H, Jabbour E, Short NJ, Patel K, Ravandi F, et al. Prognostic impact of ASXL1 mutations in chronic phase chronic myeloid leukemia. Blood Cancer J 2022; 12(10):144.
7. Hamid M, Mohammed A, Mohamad D. ASXL1 mutation analysis in chronic myeloid leukaemia patients. J Sulaimani Med Coll 2023; 13(3): 6-9.
8. Stuckey R, Sánchez-Sosa S, Estupiñan Cabrera P, Cruz Rodríguez C, Segura-Díaz A, et al. Biological factors associated with treatment-free remission in clinical practice: data from the Canarian registry of CML. Blood 2023; 142(Supplement 1): 6362.
9. Imataki O, Ishida T, Kubo H, Uemura M, Nanya Y, Kawakami K, et al. A case of tyrosine kinase inhibitor-resistant chronic myeloid leukemia, chronic phase with ASXL1 mutation. Case Rep Oncol 2020;13(1):449-55.
10. Mohammed AR, Assad D, Rostami G, Hamid M. Frequency and prognostic influence of ASXL1 mutations and its potential association with BCR-ABL1 transcript type and smoke in chronic myeloid leukemia patients. Gene 2023; 886:147776.
11. Kim T, Tyndel MS, Zhang Z, Ahn J, Choi S, Szardenings M, et al. Exome sequencing reveals DNMT3A and ASXL1 variants associate with progression of chronic myeloid leukemia after tyrosine kinase inhibitor therapy. Leuk Res 2017;59:142-8.
12. Schönfeld L, Rinke J, Hinze A, Nagel SN, Schäfer V, Schenk T, et al. ASXL1 mutations predict inferior molecular response to nilotinib treatment in chronic myeloid leukemia. Leukemia 2022; 36(9): 2242-9.
13. Soverini S, de Benedittis C, Mancini M, Martinelli G. Mutations in the BCR-ABL1 Kinase Domain and Elsewhere in Chronic Myeloid Leukemia. Clin Lymphoma Myeloma Leuk 2015;15 Suppl:S120-8.
14. Jabbour E, Kantarjian H. Chronic myeloid leukemia: a review. JAMA 2025; 333(18):1618-29.
15. Kantarjian H, Breccia M, Haddad FG, Hehlmann R, Issa GC, Malhotra H, et al. Management of chronic myeloid leukemia in 2025. Cancer 2025; 131(14): e35953.

Original Article

Role of Nurses in Nutritional Assessment of Patients with Cancer

Nutritional Assessment of Patients with Cancer

Noor Ali Abdul Hussein[1] and Sahar Adham Ali[2]

ABSTRACT

Objective: To assess role of nurses in nutritional assessment of patient with cancer.
Study Design: Descriptive cross-sectional study
Place and Duration of Study: This study was conducted at the Oncology Center, Middle Euphrates Oncology Teaching Hospital, Iraq from 12th March 2025 to 31st May 2025.
Methods: Non-probability- convenience sampling method used; the sample consist of 170 nurses who work in the oncology units were selected and number of the sample determined by using Richard Geiger's equation. A specific questionnaire was prepared after an extensive review of related literature in the topic of interest phenomena. The questionnaire was divided into three parts. Content validity of the instrument is obtained by panel of 10 experts from multidisciplinary field, who have not less than 7 years of experience in their specialty. Self-report method used to collect the data by nurses in different shifts (morning and evening). The participants need about 15 to 20 minutes to complete the questionnaire. Kaiser-Meyer-Olkin (KMO) test factors analysis was used to determine the validity which recorded (0.7) which is statistically expected.
Results: Majority of females between 20-30 years, Bachelor's holders and live in urban area, regarding overall general information about nutritional assessment results recorded a fair level of knowledge, no significant association between nurse's role and their demographical characteristics.
Conclusions: The overall general information about nutritional assessment results recorded a fair level of knowledge.

Key Word: Cancer, Role, Nurses, Nutritional assessment

Citation of article: Hussein NAA, Ali SA. Role of Nurses in Nutritional Assessment of Patients with Cancer. Med Forum 2025;36(8):27-32. doi:10.60110/medforum.360806.

INTRODUCTION

Patients at risk of malnutrition can be identified through early nutritional risk screening. It is recommended to conduct screenings at the time of diagnosis or hospital admission, as suggested by recent literature. Screenings should be repeated during therapy to refer patients for evaluations if necessary. Incorporating screening for malnutrition into the care of cancer patients is supported by evidence. The ideal under nutrition screening instrument would be quickly and easily filled out, cost effective, very sensitive, and have great specificity.[1] Among the most popular screening methods, you might find the Malnutrition Screening Tool (MST), Nutritional Risk Screening (NRS-2002) method, Malnutrition Universal Screening Tool (MUST) and Mini-Nutritional Assessment (MNA) method.[2]

1. Babylon Health Directorate, Babylon, Iraq.
2. College of Nursing, University of Babylon, Iraq.

Correspondence: Noor Ali Abdulhussein, Babylon Health Directorate, Babylon Iraq.
Contact No: 07830856981
Email: nur809.nour.ali@student.uobabylon.edu.iq

Received: June, 2025
Reviewed: July, 2025
Accepted: July, 2025

In order to determine the severity and root causes of malnutrition, a personalized nutritional assessment is required. Additionally, nutritional assessment is a multi-step procedure that requires more information in order to draw conclusions about nutritional status. Medical professionals should be familiar with the benefits and drawbacks of each nutritional evaluation instrument. Subjective global assessment (SGA) and objective data assessment (ODA) are the two main types of nutritional screening and evaluation procedures.[3]

Subjective global assessment is fast, reproducible, and has little inter-observer variation when done by qualified staff. It needs: Medical history: In addition to medical history, document changes in body weight, compare current food consumption to normal, record digestive symptoms over the past two weeks, and assess functional capacity and metabolic requirements. Also, Physical examination, including manual subcutaneous fat and muscle loss investigation and oedema and ascites testing.[2]

Global assessment was either obtained directly from the patients themselves or, in cases where this was not feasible, from their accompanying family members and patients were categorized as well-nourished, moderately malnourished, or severely malnourished. Objective information gathered from anthropometric, laboratory, and bioelectrical impedance analysis (BIA) measurements.[4,5]

A method for analyzing bioelectric impedance vectors (BIVA) Applied to the evaluation of total body fat. Actually, it permits a more precise comprehension of hydration status and cell mass, which can be altered by disease states. Finding the phase angle also appears to be a criterion for predicting the outcome in cancer patients. Another option for determining lean mass is dual-energy X-ray absorptiometry (DXA), a radiation-safe method that directly measures different body parts. The two most reliable methods for determining a person's body composition are magnetic resonance imaging (MRI) and computed tomography (CT). In order to get a good idea of how much muscle there is in the skeleton, most people use tomography images of the third lumbar vertebra, or L3. Total skeletal muscle and fat tissue have been shown to correlate with a single abdomen slice (L3) on MRI. Yet, large-scale implementation of either method is now impossible.[6]

Anthropometric measurements including weight, height, body mass index (BMI), triceps fold thickness (TSF), mid-arm circumference (MAC), arm muscle circumference (MAMC) and calf circumference (CC).[5]

Adult men and women alike can benefit from using the body mass index (BMI), a well-liked and accurate anthropometric measure of obesity and nutritional and health status. Additionally, it is a solid predictor of the onset of many diseases associated with excess body fat uses a person's weight and height to calculate their body fat percentage.[7]

As a straightforward indicator of muscular strength, grip strength is suggested to be a strong indicator of sarcopenia. In indirect calorimetry, the creation of carbon dioxide and the consumption of oxygen are used to determine the amount of energy expended. The amounts of carbs, proteins, and lipids that are oxidized determine the energy equivalent of carbon dioxide production and oxygen intake. Utilisation of nitrogen in urine allows for the calculation of protein oxidation. Because swallowing is associated with obtaining food and protecting the respiratory tract, its loss leads to starvation and aspiration pneumonitis. the most reliable methods for assessing swallowing function include video fluorography and video endoscopic assessment of swallowing.[3]

Nurses help identify nutritionally at-risk individuals. Nurses usually undertake the first analysis upon admission to identify patients who need nutrition assessment and assistance. Nurses' nutrition evaluation in the initial few hours of hospitalization lays the scene for quality care. The nurse usually uses proven nutrition screening methods to reliably identify and refer patients to the registered dietitian nutritionist (RDN).[8]

When dieticians aren't present, as in the evenings, on weekends, or during discharge instruction, nurses are more likely to interact with patients and their families and can serve as a resource for nutrition. Dieticians may only be available for consultations in home care and wellness settings. Hospitalized patients with minimal to moderate nutritional risk may receive basic nutrition education from their nurses, who may also supplement the dietician's counselling on the subject. When it comes to nutritional care, nurses are heavily involved in every step.[9]

When chemotherapy patients experience difficulties swallowing, the nurse takes on a crucial role in their care. When planning interventions, it's important to think about the patient's prognosis, treatment, gastrointestinal system function, eating abilities, and preferences. To maximize their effectiveness, nutritional interventions should be initiated right once and integrated into the care plan. To do this, it is necessary to regularly evaluate all patients for dietary issues and weight loss both before and after treatment.[10]

METHODS

This descriptive cross-sectional study was conducted at Oncology Center, teaching hospitals in the Middle Euphrates Oncology Teaching Hospital (Al-Imam Al-Sadiq, Marjan Medical City /Babylon Oncology Center, Al-Hussane /Imam Hussein Center for Cancer and Hematology Treatment and National Hospital for Oncology and Hematology) from 12th March 2025 to 31st May 2025. Non-probability- convenience sampling method used; the sample consist of 170 nurses who work in the oncology units were selected and number of the sample determined by using Richard Geiger's equation. A specific questionnaire was prepared after an extensive review of related literature in the topic of interest phenomena. The questionnaire was divided into three parts: Part one: Demographical characteristics consist of four items. Part two: This part consist one scale: nurses' role in nutritional assessment includes 15 items, adapted from Miriam-Theilla et al[11], translated to Arabic language to facilities data collection. Part three: This part consists 16 questions to assess the knowledge of nurses working in oncology centers about nutritional assessment, these questions adapted from sources online, translated to Arabic language to facilities data collection. Content validity of the instrument is obtained by panel of 10 experts from multidisciplinary field, who have not less than 7 years of experience in their specialty. Alteration and modification carried out in compliance to advise and opinion of the expert in order to reach the proper degree of understanding, clearness and relevance of the questionnaire to obtained. Nurses who participated in the pilot study were excluded from the original sample. Self-report method used to collect the data by nurses in different shifts (morning and evening). The participants need about 15 to 20 minutes to complete the questionnaire. Kaiser-Meyer-Olkin (KMO) test factors analysis was used to determine the validity which recorded (0.7) which is statistically expected.

RESULTS

There were 98 (57.6%) females while 72 (42.4%) males. Majority of participants 129 (75.9%) between 20-30 years old, followed by 30 (17.6%) between 31-40 years and only 11 (6.5%) between 41-50 years. More than half of the participants 89 (52.4%) held bachelor's degree in nursing, 67 (39.4%) had diploma, 13 (7.6%) had completed secondary school nursing, and 1 (0.6%) held postgraduate degree. One 163 ((95.9%) resided in urban areas and 7 (4.1%) coming from rural locations (Table 1).

The results show the level of nurses' roles in nutritional assessment was high, with a mean of 2.58 and the high level in items number 1 with a mean of 2.91, while the lowest level in item number 14 with a mean of 2.16 (Table 2).

Table 3 showed the level of general information about nutritional assessment based on participants' responses to 16 questions, assessing knowledge and understanding of key nutritional assessment principles was fair, with a mean of 1.37 and the high level in items number 5 with a mean of 1.76, while the lowest level in item number 16 with a mean of 1.16. Overall general information regarding nutritional assessment reveals that a majority of nurses 55.9% were assessed at a fair nutritional level, with a mean of 21.94 (Table 4).

The data reveals that related to sex, variable the statistical is 38.937 at 44 degrees of freedom, yielding P-value 0.688, these results indicating no significant association (NS). Similarly, for the variable age, the result is 71.696 at 88 degrees of freedom, with P-value 0.897, no significant association (NS) recorded. However, for the variable education qualification, the test statistic is 71.705 with 44 degrees of freedom, yielding p-value of 0.015, which is statistically significant (S), implying that the nurses' role is significantly associated with their education qualification (Table 5).

Table No.1: Demographical characteristics of the nurses (N=170)

Categories		No.	%
Gender	Male	98	57.6
	Female	72	42.4
Age (years)	20-30	129	75.9
	31-40	30	17.6
	41-50	11	6.5
Educational qualification	Secondary School Nursing	13	7.6
	Diploma	67	39.4
	Bachelor	89	52.4
	Postgraduate	1	.6
Residents	Urban	163	95.9
	Rural	7	4.1

Table No.2: Response of nurses related to their role in nutritional assessment

Questions	Disagree		Neutral		Agree		Mean	St.d	Level
	No.	%	No.	%	No.	%			
Nutritional assessment is important to determine the nutritional needs of the patient	1	.6	14	8.2	155	91.2	2.91	.312	High
Ongoing assessment of the patient's nutritional status is important to identify nutrient deficiencies	4	2.4	26	15.3	140	82.4	2.80	.456	High
Nurses are responsible for notifying the physician if a patient does not eat a severed meal	21	12.4	65	38.2	84	49.4	2.37	.695	Moderate
It is important to weight patients upon admission/visit	6	3.5	29	17.1	135	79.4	2.76	.505	High
Nutritional assessment should be repeated at each visit	8	4.7	40	23.5	122	71.8	2.67	.563	High
To ensure that the patient is receiving adequate nutrition ongoing assessment should take place	13	7.6	50	29.4	107	62.9	2.55	.634	High
Nutritional status effected by nursing care	7	4.1	41	24.1	122	71.8	2.68	.550	High
Patients receive complete nutritional care	17	10.0	45	26.5	108	63.5	2.54	.672	High

from dietician									
Our nursing staff monitors patients' nutritional status	19	11.2	57	33.5	94	55.3	2.44	.688	High
The nutritional assessment is performed methodically and professionally	11	6.5	49	28.8	110	64.7	2.58	.612	High
Patient require a dietician's care receive a consultation with minimal delay	11	6.5	45	26.5	114	67.1	2.61	.609	High
Nutritionists address nutritional aspect of patient care	11	6.5	43	25.3	116	68.2	2.62	.606	High
Patients receive their meals in appropriate manner as per regulations	16	9.4	53	31.2	101	59.4	2.50	.664	High
Nurses are aware whether or not a patient has completed his meal	34	20.0	74	43.5	62	36.5	2.16	.735	Moderate
Information on patient's nutritional state is effectively transmitted among health care staff	17	10.0	50	29.4	103	60.6	2.51	.673	High
General mean and standard deviation							2.58	0.598	High

High = 2.4-3, Moderate = 1.7-2.39, Low = 1-1.69

Table No.3: Response of the nurses' knowledge related to nutritional assessment for patients with cancer

Questions	False		True		Mean	St.d	Level
	No.	%	No.	%			
When assessing a patient's nutritional status, the nurse recalls that the best definition of optimal nutritional status is sufficient nutrients that?	100	58.8	70	41.2	1.41	.494	Fair
For the first time, the nurse is seeing a patient who has no history of nutrition -related problems the initial nutritional screening should include which activity?	119	70.0	51	30.0	1.30	.460	Poor
During a nutritional assessment, why is it important for the nurse to ask a patient what medications he or she is taking?	96	56.5	74	43.5	1.44	.497	Fair
When a patient tells the nurse that his food simply does not have any taste anymore. The nurse's best response?	81	47.6	89	52.4	1.52	.501	Fair
The nurses are aware that the most common anthropometric measurement include?	41	24.1	129	75.9	1.76	.429	Good
Nurses perform a triceps skinfold assessment as	139	81.8	31	18.2	1.18	.387	Poor
To determine total body fat at home, the nurse instruction the patient to obtain measurements of?	97	57.1	73	42.9	1.43	.496	Fair
assessment on 49-year-old women who has imbalanced nutrition as a result of dysphagia, which data would be expect to fined	97	57.1	73	42.9	1.43	.496	Fair
nutritional assessment on an 80yearold patient. physiologic changes can directly affect the nutritional status as	102	60.0	68	40.0	1.40	.491	Fair
A tool to rapidly and simply evaluate whether the patient is at risk to be or to become malnourished?	70	41.2	100	58.8	1.59	.494	Fair
Adequate nutritional state is determinant by?	133	78.2	37	21.8	1.22	.414	Poor
Skin fold measurements for an estimation of body fat content are usually performed by testiry?	91	53.5	79	46.5	1.46	.500	Fair
The most proper way to detect malnutrition is?	136	80.0	34	20.0	1.20	.401	Poor
a good parameter for assessment of malnutrition because it has a short half live time and it is not affected by hydration status and is independent of liver function?	130	76.5	40	23.5	1.24	.425	Poor
Renal and hepatic functions is directly influenced on the?	135	79.4	35	20.6	1.21	.406	Poor
Nitrogen balance can be used for estimation of the adequacy of.	143	84.1	27	15.9	1.16	.367	Poor
General mean and standard deviation					1.37	.453	Fair

Good =1.67-2, Fair= 1.34- 1.66 and Poor =1-1.33

Table No.4: Overall nurses' knowledge about nutritional assessment (n=170)

Level	Frequency	Percent	Mean	Std. Deviation
Poor level (16-21.33)	72	42.4	21.9412	2.23926
Fair level (21.34-26.67)	95	55.9		
Good level (26.68-32)	3	1.8		

Table No. 5: The association between nurses' role and their demographical characteristics

Nurses Role	Value	Df	P. Value	Significance
Gender	38.937	44	.688	NS
Age	71.696	88	.897	NS
Education	71.705	44	.015	S

DISCUSSION

In this study 75.9% nurses were between 20-30 years. This finding supported by study carried out by El-Khawaga[12] demonstrated that (53.3%) of the nurses age was ≤30 years. As the point view, the most of participating nurses were young, because these vital places require physical effort, in addition to being more receptive to participation and more capable of handling research tools such as questionnaires. In the present study, 57.6% were females, these finding are agreed with the study was performed by Miriam-Theilla et al[11], that demonstrate the majority of the nurses were female (86%). The logical interpretation of this point goes under that female participated more than males this is due to the fact that women constitute the majority in the nursing profession in many health institutions, which increases the likelihood of their greater representation in the study sample.

This study showed that 52.4% were bachelor degree. This result is similar with the findings of Döngel et al[13], who found that 70.3% of nurses were bachelor holder. The results of the study showed a greater number of bachelor's degree holders due to the recent years witnessing an expansion in the opening of private colleges alongside government colleges. In addition, graduates of nursing secondary school nursing and diploma have become more willing to complete their studies to obtain a higher degree and to increase their scientific and practical knowledge and experience.

In the current study, 95.9% of nurses lived in urban areas. This finding supported by study carried out in Iraq by Armeh[14], showed the most nurses in each group study-control 76.7% and 60% respectively lived in urban areas. Due to the increase in the number of rural residents moving towards cities on the one hand, and on the other hand, large areas are transforming from their rural nature to urban nature due to the increase in construction and development. According to the results of the study related to nurse's role in nutritional assessment recorded a high level. This is disagreed with a study conducted in Jorden by Al Kalaldeh & Shahein[15], found that nurses demonstrate a moderate level of knowledge about their role in nutritional assessment, despite their knowledge of the importance of nutritional assessment from a theoretical perspective, but their practical practices were below the required level.

The overall role of nurses in nutritional assessment, 73.5% demonstrated a high level with scoring between 36-45 points. These results in the same line with study carried out by Söderhamn[16], who found the nurses have a lot of knowledge about their responsibility towards nutritional assessment. The results of the study, nutritional assessment may be due to several reasons, the most important of which is that nurses in these departments may be aware of the complications of malnutrition, which may be dangerous and affect all body systems. Therefore, they have an interest in nutritional assessment issues and because they have acquired practical experience as a result of their continuous dealing with cancer patients who suffer from malnutrition, which requires nutritional intervention to improve their health condition.

Regarding to the nurse's knowledge about nutritional assessment among nurses recorded a fair level of knowledge, these finding disagree with the study carried out in Iraq by Abdulhassan[17] found that nurse's knowledge about nutritional assessment was at a good level.

The results of the study showed a fair level of knowledge. These results are disagreed with study carried out by Gaber & AI-Ashour[18] found a poor level of knowledge. The results showed an acceptable level of knowledge due to the clinical experience gained during work, as well as the tendency of some nurses to self-educate through available scientific sources to increase their knowledge, especially among nurses interested in improving nutritional status for patients.

There is no significant (P>0.05) association between nurse's role and their demographical characteristics related to (sex, age) in. indicating that these factors do not significantly influence knowledge regarding nutrition, while significant founded between nurse's role and their education qualification. These results go along with study carried out by Abdullhussan[17] who find statistically significant association between nurses' knowledge and education qualification.

CONCLUSION

The nurses' role toward nutritional assessment statistical results recorded a high level. Overall general information about nutritional assessment results recorded a fair level of knowledge.

Author's Contribution:

Concept & Design or acquisition of analysis or interpretation of data:	Noor Ali Abdul Hussein, Sahar Adham Ali
Drafting or Revising Critically:	Noor Ali Abdul Hussein, Sahar Adham Ali
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.

Source of Funding: None

Ethical Approval: No.329 Dated 07.03.2025

REFERENCES

1. Ravasco P. Nutrition in cancer patients. J Clin Med 2019; 8(8): 1211.
2. del Portillo RC, MiIla SP, Váquez NG, López BP, López LB, Serván PR, et al. Assessment of nutritional status in the healthcare setting in Spain. Nutr Hospitalaria 2015;31(3): 196-207.
3. Hamada Y. Objective Data Assessment (ODA) methods as nutritional assessment tools. J Med Invest 2015; 62(3): 119-22.
4. Fontes D, de Vasconcelos Generoso S, Correia MITD. Subjective global assessment: a reliable nutritional assessment tool to predict outcomes in critically ill patients. Clin Nutr 2014;33(2):291-5.
5. Wang WJ, Li TT, Wang X, Li W, Cui JW. Combining the Patient-Generated Subjective Global Assessment (PG-SGA) and objective nutrition assessment parameters better predicts malnutrition in elderly patients with colorectal cancer. J Nutr Oncol 2020;5(1):22-30.
6. Bossi P, Delrio P, Mascheroni A, Zanetti M. The spectrum of malnutrition/cachexia/sarcopenia in oncology according to different cancer types and settings: a narrative review. Nutrients 2021; 13(6): 1980.
7. Mohajan D, Mohajan HK. Body mass index (BMI) is a popular anthropometric tool to measure obesity among adults. J Innova Med Res 2023; 2(4): 25-33.
8. Sauer AC, Alish CJ, Strausbaugh K, West K, Quatrara B. Nurses needed: identifying malnutrition in hospitalized older adults. Nurs Plus Open 2016;2:21-5.
9. Dudek SG, Rd C, Dudek SG. Nutrition essentials for nursing practice. Lippincott Williams & Wilkins 2013;15-20.
10. Lavdaniti M. A nursing perspective of nutrition in cancer patients undergoing chemotherapy. Progress Health Sci 2014; 4(2): 131-4.
11. Miriam-Theilla RN, Cohen J, Singer P, Liebman C, Kagan I. The assessment, knowledge and perceived quality of nutrition care amongst nurses. J Nutri Med Diet Care 2016; 2(1): 1-5.
12. El-Khawaga GO, El-Gilany AH, Mohamed HAH. Assessing work-related fatigue and burden among Egyptian oncology nurses: a cross-sectional study. BMC Public Health 2025;25(1):2169.
13. Döngel HE, Kol EÖ, Gönderen K. Attitudes, knowledge, and evaluations of nurses working in training and research hospital regarding nutritional care. Clin Sci Nutr 2022; 4(3): 80-87.
14. Armeh WA. Effectiveness of nutritional educational program on nurses' knowledge for patients with cancer at oncology center in al-Diwaniyah Governorate (Dissertation) University of Babylon 2022;48-90.
15. Al Kalaldeh M, Shahein M. Nurses' knowledge and responsibility toward nutritional assessment for patients in intensive care units. J Health Sci 2014; 4(2): 90-6.
16. Söderhamn U, Söderhamn O. A successful way for performing nutritional nursing assessment in older patients. J Clin Nurs 2009; 18(3): 431-9.
17. Abdullhassan AF. Nurses knowledge and practices regarding enteral and parenteral nutritional therapy for unconscious patients. (Dissertation) University of Babylon 2024, 43-70.
18. Gaber AH, AI-Ashour IA. Nurses' Knowledge regarding biochemical parameter & dietary assessment for patient undergoing hemodialysis. J Positive School Psychol 2022; 6(8): 2738-54.

Original Article

Real-World Treatment Outcomes and Safety Profiles of Tyrosine Kinase Inhibitors in Iraqi Patients with Chronic Myeloid Leukemia

Treatment of Tyrosine Kinase Inhibitors in Iraqi with Chronic Myeloid Leukemia

Mohammed Jafar Al-Kabi[1], Doaa Husam Abdulqader[2] and Bassim I. Mohammad[1]

ABSTRACT

Objective: To investigates the safety profile and efficacy of tyrosine kinase inhibitors in chronic myeloid leukemia patients in Al-Diwaniyah, with a particular focus on how pre-existing disease history influences adverse events and treatment outcomes.

Study Design: Descriptive study

Place and Duration of Study: This study was conducted at the Hematology Center, Diwaniyah Teaching Hospital, Iraq from 1st February 2025 to 30th May 2025.

Methods: Fifty-one adult patients with Philadelphia chromosome-positive chronic myeloid leukemia, receiving Imatinib, Nilotinib, or Bosutinib were assessed. Clinical response was categorized based on recent BCR-ABL1 transcript levels into complete, major, deep, loss of major, or relapse response. Safety profiles and disease history were evaluated through documented adverse drug reactions and laboratory findings.

Results: The mean age was 49.5 years with 56.9% males. Imatinib was the most used tyrosine kinase inhibitors (52.9%), followed by Nilotinib and Bosutinib (23.5% each). Imatinib showed the best efficacy with the highest complete and major molecular response rates and the lowest relapse incidence (29.4%). Nilotinib had similar efficacy and side effects, while Bosutinib showed lower responses and higher hematological toxicity. Most 41 patients reported no adverse effects; 9 experienced toxicities like diarrhea, abdominal pain, joint pain, and hair loss. While 31 had no prior medical history, others had conditions such as diabetes, hypertension, or hypothyroidism.

Conclusion: The significant differences in tyrosine kinase inhibitors response and safety among Iraqi chronic myeloid leukemia patients, emphasizing the importance of personalized treatment strategies. The findings underscore the need to consider individual patient disease history when selecting tyrosine kinase inhibitors to optimize outcomes and effectively manage adverse events.

Key Words: Chronic myeloid leukemia, Tyrosine kinase inhibitors, Safety profile, Efficacy, Adverse events, Treatment outcomes

Citation of article: Al-Kabi MJ, Abdulqader DH, Mohammad BI. Real-World Treatment Outcomes and Safety Profiles of Tyrosine Kinase Inhibitors in Iraqi Patients with Chronic Myeloid Leukemia. Med Forum 2025;36(8):33-37. doi:10.60110/medforum.360807.

INTRODUCTION

Chronic myeloid leukemia (CML) stands as a paradigm of successful targeted therapy in oncology, primarily due to the transformative impact of tyrosine kinase inhibitors (TKIs).

This myeloproliferative neoplasm, characterized by the pathognomonic Philadelphia chromosome and the resultant BCR-ABL1 fusion gene, once carried a grim prognosis, with median survival in the chronic phase rarely exceeding 3-5 years. The advent of TKIs fundamentally altered this landscape, converting CML into a manageable chronic condition for a significant proportion of patients.[1]

Imatinibmesylate, the pioneering first-generation TKI, revolutionized CML management by demonstrating unprecedented efficacy in inducing hematologic and cytogenetic responses.[2] Its success paved the way for the development of second-generation TKIs, including Nilotinib, Dasatinib, and Bosutinib, designed to offer increased potency and overcome resistance or intolerance to imatinib.[3] These advancements have led to remarkable improvements in patient outcomes globally, with 5-year overall survival rates exceeding 90% in many studys.[4] Despite the remarkable success of TKIs, their long-term use is associated with various adverse events (AEs) that can significantly impact patient quality of life and adherence to treatment.[5] The

1. College of Medicine, University of Al-Qadisiyah Iraq.
2. Aldiwanyia Teaching Hospital, Iraq

Correspondence: Mohammed Jafar Al-Kabi, Department of Pharmacology, College of Medicine, University of Al-Qadisiyah Iraq.
Contact No: 07831477826
Email: mohammedjafaralkabi@gmail.com

Received: June, 2025
Reviewed: July, 2025
Accepted: July, 2025

safety profiles of different TKIs vary, and understanding these differences in real-world settings is crucial for optimizing patient management. Furthermore, patient-specific factors, including pre-existing medical conditions and disease history, can influence both the efficacy and safety of TKI therap.[6]

This study addresses a crucial aspect of CML management in Iraq by meticulously evaluating the real-world clinical efficacy and safety profiles of various TKIs (Imatinib, Nilotinib, and Bosutinib) of Iraqi CML patients from Diwaniya. Unlike some prior investigations that focused on molecular resistance mechanisms, this research specifically aims to provide a broader understanding of real-world treatment effectiveness, patient response rates, and associated adverse events. By leveraging detailed patient data, this paper seeks to contribute valuable localized insights into the practical application and outcomes of TKI therapy in a specific regional setting, thereby informing clinical practice and future research directions in CML management within Iraq and similar healthcare environments.

METHODS

The study was conducted at Diwaniya Teaching Hospital in Diwaniya, Iraq from 1st February 2025 to 30th May 2025 and consisted of 51 individuals diagnosed with Philadelphia chromosome-positive CML, aged 12 years or older, who were actively receiving at least one form of TKI therapy. Patients with documented TKI contraindications, pregnancy, or breastfeeding were excluded from the original data collection. Data collection included Demographic and disease, treatment, and Laboratory information, with clinical outcome documentation for each enrolled patient being meticulously collected. The data was entered and analyzed through SPSS-26.

RESULTS

The distribution of current Tyrosine Kinase Inhibitors (TKIs) being administered to these patients was as follows: Imatinib was the most frequently used TKI 27 patients (52.9%), followed by Bosutinib 12 patients (23.5%) and Nilotinib 12 patients (23.5%) [Table 1].

Table No.1: Demographic and clinical characteristics of patients (n=51)

Characteristic	No.	%
Age (years)	49.5±16.3	
Gender		
Male	29	57.0
Female	22	43.
Disease phase at diagnosis – chronic	49	96.0
Disease phase at diagnosis – blast	2	4.0
Imatinib treating patients	27	53.0
Nilotinib treating patients	12	23.5
Bosutinib treating patients	12	23.5

Table No.2: Distribution of response by tyrosine kinase inhibitors (TKIs)

TKIs	Loss major response	Deep response	Complete response	Major response	Relapse
Bosutinib	2 (16.7%)	1 (8.3%)	1 (8.3%)	-	8 (66.7%)
Imatinib	3 (11.1%)	6 (22.2%)	9 (33.3%)	7 (25.9%)	2 (7.4%)
Nilotinib	1 (8.3%)	1 (8.3%)	1 (8.3%)	4 (33.3%)	5 (41.7%)

Table No. 3: Toxicity profile counts and distribution by current tyrosine kinase inhibitors (TKIs)

	Imatinib	Nilotinib	Bosutinib
No adverse effect reported	24	9	8
Diarrhoea	-	1	-
Eye bleeding	-	1	-
Cramps	-	1	-
Osteopenia	-	1	-
Hair loss	1	1	1
Skin problem	-	1	-
Abdominal pain	-	-	1
Joint pain	2	1	1
Fever for 1 week	1	-	-
Git upset	-	-	1
Eye inflammation	1	-	-
Lung inflammation	-	1	-
Nasal congestion	-	1	-

Table No.4: Distribution of disease history type by current tyrosine kinase inhibitors (TKIs)

Disease History Type	No.	%
No disease history	31	62
DM+HT	6	12
Diabetic millets	1	2
Hypertension	3	6
Benign prostate hyperplasia	2	4
Hypothyroidism	1	2
Hemorrhoid	1	2
Asthma	1	2
Bechet disease	1	2
Osteoporosis	1	2
Cerebral edma	1	2
Valve replacement	1	2

The distribution of responses (complete response, major response, deep response, loss of major response, and relapse) for each TKI is summarized in Table 2. A Chi-square test of independence confirmed statistically significant association between the type of current TKI and the patient's response ($Chi^2 = 19.94$, p-value = 0.0106). Imatinib demonstrated a notably higher proportion of favourable responses, with the majority of patients achieving either a major or complete response. In contrast, Bosutinib was associated with a higher incidence of relapse. Nilotinib showed an intermediate profile, with a good proportion of major responses but also some instances of relapse. The overall toxicity profile of the patient indicated that a significant portion of patients had no recorded adverse events. Among those with reported toxicities, a range of side effects was observed. Nilotinib was associated with a broader spectrum of adverse events, including gastrointestinal issues (diarrhea), joint pain, eye inflammation, and hair loss. Bosutinib was linked to abdominal pain, while Imatinib was associated with hypertension (HT) (Table 3)

Analysis of patient disease history revealed comorbidities in a significant portion of the patients, highlighting the importance of assessing baseline health.6 of the patients presented with both HT and DM (Table 4, Figs. 1-2).

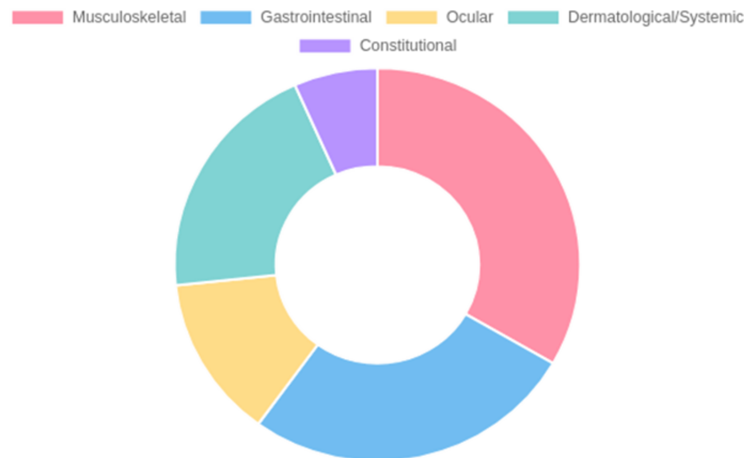


Figure No. 1: Frequency of reported adverse event types

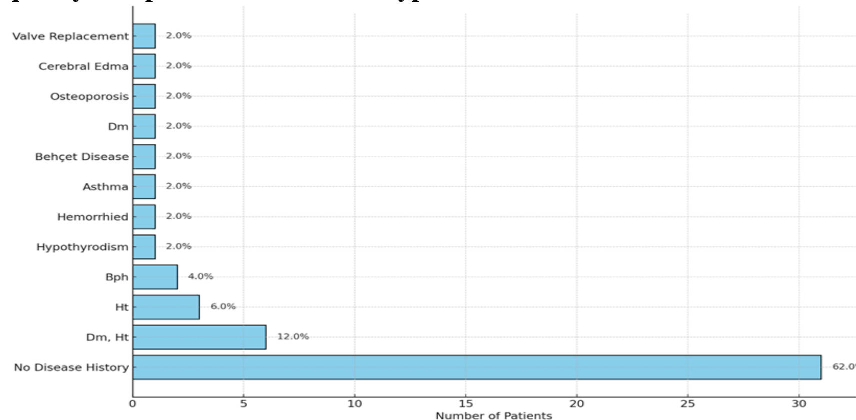


Figure No. 2: Prevalence of comorbidities among CML patients recruited. Most patients had no comorbidities, while diabetes mellitus (DM) and hypertension (HT) were the most common among those with comorbid conditions

DISCUSSION

Our findings demonstrate a clear differential in treatment outcomes among the various TKIs, particularly highlighting the superior performance of Imatinib in achieving favourable responses and maintaining remission, as evidenced by its high rates of complete and major responses and significantly lower relapse rates. Conversely, Bosutinib was associated with a higher incidence of poor responses and relapse, suggesting that its efficacy in this specific patient population, or as a treatment in the context of this study's prior therapies, may be limited.

The observed efficacy of Imatinib aligns with its established role as the first-line standard of care for CML globally.[7] Its consistent performance in this Iraqi study, despite potential differences in patient characteristics or healthcare infrastructure compared to Western populations, underscores its robust therapeutic benefits. The lower relapse rate associated with Imatinib is particularly encouraging, as sustained remission is a primary goal in CML management. This finding reinforces the importance of optimizing initial TKI selection to maximize long-term treatment success and minimize the burden of disease progression.

The less favourable outcomes observed with Bosutinib in this study warrant further investigation. While Bosutinib is a potent second-generation TKI often used in cases of resistance or intolerance to other TKIs[8], its association with higher relapse rates and poor responses in this study suggests that its application might need careful consideration and requires a kinase domain mutations screen that resistance to bosutinib. Factors such as patient selection, prior treatment history, and the specific clinical scenarios in which Bosutinib was administered could influence these outcomes. It is plausible that patients receiving Bosutinib in this study may have had BCR-ABL kinase domain mutations that are resistant to Bosutinib.

The analysis of toxicity profiles indicates that different TKIs are associated with distinct adverse event patterns. Nilotinib, for instance, appeared to be linked to a broader range of reported toxicities, including gastrointestinal and musculoskeletal issues. This is consistent with known side effect profiles of Nilotinib, which can include fluid retention, rash, and gastrointestinal disturbances.[9] Imatinib's association with hypertension is also a recognized side effect[10], though generally manageable. The impact of pre-existing disease history on TKI outcomes reveals that the high proportion of patients with no reported prior medical history (62%) might reflect a relatively healthy baseline population or limitations in historical data collection. However, the presence of common co-morbidities such as diabetes mellitus and hypertension in a significant subset of patients is clinically relevant. These conditions can influence TKI selection and management. For example, Nilotinib has been associated with an increased risk of cardiovascular events, making it a less favourable option for patients with pre-existing cardiovascular disease or risk factors.[11] Similarly, patients with pre-existing liver conditions might be more susceptible to TKI-induced hepatotoxicity.

Future research should prioritize comprehensive and standardized reporting of adverse events to better characterize the safety landscape of TKIs in this region. This study contributes to bridging the information gap regarding CML treatment outcomes inal -Al-Diwaniya, Iraq. The findings emphasize the importance of localized data to inform clinical decision-making and resource allocation. While the study's cross-sectional nature and limited sample size for certain analyses are acknowledged limitations, the results underscore the need for continued research, potentially through prospective studies with larger study and more detailed clinical and molecular data, to further refine treatment guidelines and improve patient outcomes in Iraq.

CONCLUSION

Imatinib was associated with superior response rates and lower relapse incidence, reinforcing its role as a highly effective treatment option. Conversely, Bosutinib was linked to less favourable responses and higher relapse rates within this study. While the overall toxicity data was limited, distinct patterns of adverse events were observed across different TKIs. These findings highlight the critical need for tailored treatment strategies based on local patient characteristics and available resources. The study contributes to the growing body of real- world evidence for CML management in underrepresented regions and emphasizes the importance of continued research to optimize therapeutic approaches and improve patient prognosis in Iraq.

Author's Contribution:

Concept & Design or acquisition of analysis or interpretation of data:	Mohammed Jafar Al-Kabi, Doaa Husam Abdulqader
Drafting or Revising Critically:	Mohammed Jafar Al-Kabi, Bassim I. Mohammad
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.

Source of Funding: None

Ethical Approval: No.4725 dated 20.01.2025

REFERENCES

1. Druker BJ, Guilhot F, O'Brien SG, Gathmann I, Kantarjian H, Gattermann N, et al. Five-year follow-up of patients receiving imatinib for chronic myeloid leukemia. N Engl J Med 2006;355(23): 2408-17.
2. O'Brien SG, Guilhot F, Larson RA, Gathmann I, Baccarani M, Cervantes F, et al. Imatinib compared with interferon and low-dose cytarabine for newly diagnosed chronic-phase chronic myeloid leukemia. N Engl J Med 2003;348(11):994-1004.
3. Ferdinand R, Mitchell SA, Batson S, Tumur I. Treatments for chronic myeloid leukemia: a qualitative systematic review. J Blood Med 2012;3: 51-76.
4. Held N, Atallah EL. Real-world management of CML: Outcomes and treatment patterns. Curr Hematol Malig Rep 2023;18(5):167-75.
5. Zhang JJ, Qian YL, Wu ZY, Li Y, Guan YJ, Sun C, et al. Comparative efficacy and safety of first-line tyrosine kinase inhibitors in chronic myeloid leukemia: a systematic review and network meta-analysis. Transl Cancer Res 2024; 13(7):3783-97.
6. Shyam Sunder S, Sharma UC, Pokharel S. Adverse effects of tyrosine kinase inhibitors in cancer therapy: pathophysiology, mechanisms and clinical management. Signal Transduct Target Ther 2023; 8(1):262.
7. Hochhaus A, Baccarani M, Silver RT, Schiffer C, Apperley JF, Cervantes F, et al. European LeukemiaNet 2020 recommendations for treating chronic myeloid leukemia. Leukemia 2020; 34(4):966-84.
8. Ochrem B, Sacha T. Efficacy and safety of bosutinib in the second and third line of treatment in chronic myeloid leukemia. Acta Haematol Pol 2017; 48(4):274-81.
9. Wang Z, Jiang L, Yan H, Xu Z, Luo P. Adverse events associated with nilotinib in chronic myeloid leukemia: mechanisms and management strategies. Expert Rev Clin Pharmacol 2021; 14(4):445-56.
10. Mughal TI, Schrieber A. Principal long-term adverse effects of imatinib in patients with chronic myeloid leukemia in chronic phase. Biologics 2010; 4: 315-23.
11. Huang CE, Lee KD, Chang JJ, Tzeng HE, Huang SH, Yu LHL, et al. Association of nilotinib with cardiovascular diseases in patients with chronic myelogenous leukemia: a national population-based study study. Oncologist 2024;29(1):e81-9.

Original Article

DEXA Scan and Evaluation of Bone Mineral Density in Thalassemia

Dual-Energy X-Ray Absorptiometry (DEXA) Scan and Biochemical Evaluation of Bone Mineral Density in Beta-Thalassemia Major

Huda Diaa Hussain and Affan E. Hasan

ABSTRACT

Objective: To assess whether or not BMD Z-score differs between children and older beta- thalassemia major patients as well as the relationship of serum ferritin, serum calcium, and vitamin D with bone mineral density.

Study Design: Cross sectional study

Place and Duration of Study: This study was conducted at the Al-Karama Teaching Hospitals Thalassemia Care Center Baghdad between 1st October 2024 to 31st May 2025.

Methods: This study was comprised 50 beta-thalassemia major patients equal or less than 15 years old, and 50 beta-thalassemia major patients over 15 years' old were enrolled. All patients underwent a medical examination, assessment of bone mineral density of lumbar spine by DEXA scan and a blood test to determine serum ferritin, serum calcium, and vitamin D levels.

Results: There were 24 (48%) patients normal, 18 (36%) patients had osteoporosis, and 8 (16%) patients had osteopenia in those under the age of 15 years while there were 22 (44%) patients with osteopenia followed by 14 (28%) patients with osteoporosis and 14 (28%) patients normal in patients over 15 years bone mineral density (BTM). The mean osteopathy score in those patients were 16.63, 24.43 and 16.97 as normal, osteopenia, and osteoporosis, respectively with significant difference between the two groups. There is no significant association between serum ferritin and BMD Z-score. Vitamin D levels exhibited substantial variations with BMD Z-score.

Conclusion: Osteopathy was prevalent among beta-thalassemia major patients. In this study, the most common causes of osteoporosis and osteopenia were ageing, poor nutrition, calcium and vitamin D inadequacy.

Key Words: Thalassemia**,** Dual energy x-ray absorptiometry, Bone mineral density, Lumber spine, Serum ferritin, Serum calcium ,Vitamin D

Citation of article: Hussain HD, Hasan AE. Dual-Energy X-Ray Absorptiometry (DEXA) Scan and Biochemical Evaluation of Bone Mineral Density in Beta-Thalassemia Major. Med Forum 2025;36(8):38-42. doi:10.60110/medforum.360808.

INTRODUCTION

The name thalassemia comes from the Greek words thalassa (ocean) and haima (blood)]. Thalassemia is one of the most widespread hereditary disorders in the world.[1] The syndrome was originally detected in children of Mediterranean ethnicity, and it is most common in people from Mediterranean coastal area, Africa, Middle East, and South-East Asia.[2]

Thalassemias are autosomal recessive disorders characterized by diminished or absente formation of one or two polypeptide chains α or β in the adult human hemoglobin molecule (hemoglobin A, α_2/β_2]. This lead to low hemoglobin levels in red blood cells and anemia. Thalassemia syndromes are [classified depending on the globin chain affected or the abnormal hemoglobin involved; β-thalassemia is caused by β-globin gene abnormalities, whereas, α-thalassemia is caused by α-globin gene alterations.[3,4] Osteoporosis is [a major source cause of morbidity in these people, increasing the risk of fracture due to reduced bone density and decreased bone strength]. Currently, dual-energy X-ray absorptiometry (DEXA) is a common non-invasive and safe approach for evaluating bone density and assessing the severity of osteoporosis and osteopenia.[5]

Bone mineral density (BMD) is a critical component in assessing bone quality. Bone changes in thalassemia patients are largely caused by increased marrow erythropoiesis and considerable iron deposition, which causes bone marrow cavity expansion and reduced trabecular bone volume, resulting in reduced bone tissue and osteoporosis. Chelation and endocrinopathies, such as hypothyroidism,

Department of Physiology Department, College of Medicine, University of Baghdad.

Correspondence: Huda Diaa Hussain, Physiology Department, College of Medicine, University of Baghdad.
Contact No: 07740590171
Email: hudadhiaa11@gmail.com

Received: June, 2025
Reviewed: July, 2025
Accepted: July, 2025

hypoparathyroidism, diabetes mellitus, and hypogonadism, all increase the risk of bone disease.[6,7]

According to the World Health Organization, osteoporosis is characterized by decreasing bone mass and microarchitectural degradation of bone tissue, resulting in greater bone fragility and a higher risk of fracture]. In osteoporosis, bone mineral density reduced, and bone microarchitecture is disrupted.[6]

Calcium is one of the most plentiful elements in the human body, and is mostly found in mineralized tissue (bone), which contains more than 99% of total body calcium in the form of calcium-phosphate complexes. It plays a key role in skeleton mineralization and is necessary for appropriate growth, development, and bone strength. Furthermore, it has a role in wide range of biological functions, including muscular contraction and nerve impulse transmission. In healthy individuals, calciotropic hormones such as parathyroid hormone (PTH), 1,25 dihydroxy vitamin D (1,25 OH-D), fibroblast growth factor 23 (FGF 23), and calcitonin keep serum ionized calcium levels within the physiological range of 1.10 to 1.35 mm.[8,9]

Vitamin D is critical for maintenance of bone mass through its act on multiple mechanisms. First, it promotes calcium absorption in the gut. Second, it promotes bone mineralization, by enhancing osteoblast differentiation and increasing phosphates absorption. Third, the action form of vitamin D (1,25 dihydroxy vitamin D) is required for both osteoblast and osteoclast activities. The traditional activities of vitamin D are caused by the active metabolite, calcitriol, that regulate serum calcium and phosphate homeostasis and, in turn, the development and maintenance of bone health.[10]

METHODS

This is a cross sectional study, that took place at the Thalassemia Care Center of Al-Karama Teaching Hospital from 1st October 2024 to 31st May 2025 vide letter No. 671 dated 7th May 2024. Patients aged 9 years and above were simply enrolled in this study while visiting the care facility. Verbal consent was obtained from the included patients or their guardians, and the study was approved by the ethical committee of Baghdad Medical University. A total 100 patients of both genders, split into two groups; 50 beta-thalassemia major patients with aged equal or less than 15 years and 50 beta-thalassemia major patients aged older than 15 years to compare them with the first group. Bone mineral density was measured for all participant at the area of lumbar spine using dual energy X-ray absorptiometry. All patients with thalassemia major, beta thalassemia, on iron lowering drugs (deferoxamine (desferal) or deferasirox (exjade), undergo splenectomy or not, patients aged 9 years and above and don't complain from other hematological disorders were included. All patients with alpha thalassemia, sickle cell anemia, beta thalassemia minor, beta thalassemia intermedia, pregnant women, age below 9 years, undergo bone marrow transplantation, receiving drug can affect BMD, such as antiepileptic drugs, or corticosteroids, fracture deformity in the measurement area, forging material or device in the measurement area and mental illness were excluded.

Sociodemographic and clinical data were collected during the patient's routine visits to the care center. All patients had a complete history taking, physical examination, and measurement of weight and height to determine body mass index (BMI) using Quetelets index.

Bone mineral density (BMD) was calculated as weight in kilograms divided by height in meters squared.[11]

Radiological and biochemical study: To assessed BMD of lumbar spine Hologic QRD DEXA scan system (OsteoSys SMART FAN-BEAM, OsteoSys Co. Ltd in South Korea) was used, which evaluated the results in form of T-score or Z-score. DXA scan was done. The patient's weight and height should measure in every scan. In our study the site for DXA measurements is the spine which was sensitive to early changes in bone density (mostly constituted of trabecular bone which has greater metabolic rate than cortical bone).[12]

T-score represents the standard deviation of BMD according to a person's young age group. While Z-score is the standard deviation of BMD according to the individuals age group, and use in diagnosis of secondary osteoporosis.

Z-score is recommended to be used for adult, in our study majority of the enrolled were children and adolescents; therefore, we adopted the BMD Z-score as the main parameter of bone density.[13,14]

WHO guidelines for diagnosing osteoporosis, a BMD Z-score of ≥1 was regarded normal, a Z-score between -1 and -2.5 was labeled osteopenia, and a Z-score of ≤-2.5 was considered osteoporosis.[14-16]

After taking aseptic precautions, total amount of 5-10ml of blood was obtained by venipuncture to ensure adequate serum is available for all tests and promptly submitted to the laboratory for estimation of serum ferritin, serum calcium, and vitamin D levels.

Statistical analysis was carried out using the SPSS-26. Independent sample t-test was used to compare variables between groups, and ANOVA was employed to evaluate differences between the means of three or more independent groups. Pearson's correlation was utilized to determine correlations between the Z-score of bone density with other factors. Statistical relationship or differences were considered significant if the P<0.05.

RESULTS

The mean age of patients was 19.08±9.564 years and the range was between 9-38 years. The mean, standard error of mean and standard deviation values were 44.04,

1.961 and 19.610 of weight factor, 144.52, 1.854 and 18.540 of height factor as well as 19.4219, 0.32961 and 3.29608 of BMI factor (Table 1)

One-way ANOVA test was used to divide 100 beta-thalassemia major patients in to three groups (normal, osteopenia, and osteoporosis). When assessing the statistical difference, there was a highly significant difference (P<0.001) between the osteoporosis and age (Table 2).

The diagnosis of osteoporosis is classified into three categories: normal, osteopenia and osteoporosis. The highest value 24 (48%) patients had normal, followed by 18 (36%) patients had osteoporosis, and 8 (16%) patients had osteopenia of G1 group while, the largest value 22 (44%) patients had osteopenia followed by 14 (28%) patients had normal and osteoporosis respectively in G2 group (Table 3).

Table No.1: The general demographic factors (n=100)

	Weight	Height	BMI
Mean	44.04	144.52	19.4219
Std. Error of Mean	1.961	1.854	.32961
Std. Deviation	19.610	18.540	3.29608

Table No. 2: General categorization of osteopathy (n=100)

Diagnosis of osteoporosis	N	Mean	Std. Deviation	Std. Error	P-value
Normal	38	16.63	9.054	1.469	0.001
Osteopenia	30	24.43	9.655	1.763	
Osteoporosis	32	16.97	8.209	1.451	
Total	100	19.08	9.564	.956	

Table No. 3: The diagnosis of osteoporosis distribution by age group

Age group		No.	%
≤ 15 years (n=50)	Normal	24	48.0
	Osteopenia	8	16.0
	Osteoporosis	18	36.0
15 years (n=50)	Normal	14	28.0
	Osteopenia	22	44.0
	Osteoporosis	14	28.0

The relationship between Z-score and S. ferritin: There was no significant difference (P-value=0.182) between Z-score and S. ferritin, however, there was a slight positive correlation (r= 0.135). This indicated that there is a modest and statistically insignificant positive correlation between Z-score and S. ferritin (Fig. 1).

The relationship between Z-score and vitamin D: Z-score and vitamin D showed a significant difference (P-value =0.019) and there was a strong positive connection(r=0.851). As the value close to +1 indicates that as the Z-score increases, vitamin D levels also tend to increase (Fig. 2).

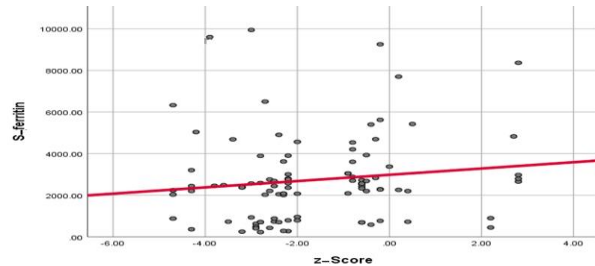


Figure No. 1: The correlation between Z-score and serum ferritin (P-value=0.182 r=0.135

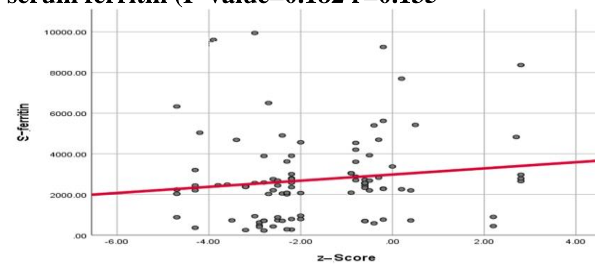


Figure No. 2: The scatter plot between Z-score and vitamin D (p-value=0.019 r=0.851)

DISCUSSION

In thalassemia, osteoporosis and osteopenia were known complication and can occur even in well-treated individuals. Bone pathology in thalassemia involves complex interactions of various factors affecting the bone growth.[17]

During the last decade, osteopenia and osteoporosis have been documented in around 30-50% of well treated thalassemia major patients and is a major source of morbidity in these individuals.[18]

In the present study, measuring BMD at lumbar spine with a DEXA scan, we discovered that 62 (62.00%) of 100 beta thalassemia major patients had low BMD. We found osteoporosis in thirty-two patients of the beta-thalassemia cases, osteopenia in thirty patients of the cases and normal BMD in thirty-eight of the cases. Mahmoodi and Farahanian obtained similar results in 2016[19], the finding reveled that BMD at LS was: 17.1% normal, 48.6% osteoporosis, and 34.3%osteopenia. Abbasi et al[20], observed that 82% of beta-thalassemia major patients had reduced BMD (osteoporosis and osteopenia), whereas 18% had normal BMD, which contradicted our findings. The discrepancies in the prevalence might be explained by diverse population surveyed, as well as the genotype of thalassemia differs internationally. Other possible factors included a small sample size of beta thalassemia major, random sampling of patients under the age of 15 years, with the

majority of participant aged 9-12 years, and increased awareness among most of their families about the importance of preventing or delaying the occurrence of bone changes in early age.

This study showed that there was a strong correlation between age and BMD Z-score, suggesting that low bone mineral density was more prevalent in younger patients. These findings matched to those reported by Ansaf et al.[21] The study discovered a constant decline in BMD as patients aged, with greatest substantial reduction occurring in those over 30 years old. This decrease in BMD with ageing caused by many factors: ineffective erythropoiesis leads to bone marrow expansion which causes bone deformities and cortical bone thinning which weakens the bone structure over the time; frequent blood transfusions cause iron deposition in bone, endocrine glands, and liver leading to disruption in bone metabolism; iron overload in endocrine glands particularly the pituitary gland (causing growth hormone deficiency), gonads (leading to hypogonadism), thyroid and parathyroid glands; vitamin D insufficiency, which is required for calcium absorption and bone strength.

Since patients with TM are dependent on transfusion, elevated ferritin levels promote iron deposition in several organs, most notably the bones. increased iron accumulation impairs bone mineralization and causes osteoporosis. In our study there was no association between BMD Z-score and S. ferritin. El-Nashar et al[22], found no association between S. ferritin and osteoporosis in patients with thalassemia. This finding was in consistent with our results.

This study found a high positive association between BMD Z-score and vitamin D, which was consistent with prior studies. Pirinççioğlu et al[23] found a positive association between vitamin D levels and BMD Z-score for lumbar spine while Wong et al[24], found no association between BMD and vitamin D levels.

CONCLUSION

Osteopathy (osteopenia and osteoporosis) has a high prevalence in patients with beta thalassemia major. The risk of osteopathy increases by increasing age, so regular monitoring of BMD by DEXA scan is essential to prevent the morbidity of osteoporosis in patients with beta thalassemia major. Ageing, poor nutrition, calcium, and vitamin D deficiency are the leading cause of osteopathy in this study sample.

Author's Contribution:

Concept & Design or acquisition of analysis or interpretation of data:	Huda Diaa Hussain, Affan E. Hasan
Drafting or Revising Critically:	Huda Diaa Hussain, Affan E. Hasan
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.

Source of Funding: None

Ethical Approval: No. 671 dated 7th May 2024

REFERENCES

1. De Sanctis V, Kattamis C, Canatan D, Soliman AT, Elsedfy H, Karimi M, et al. β-Thalassemia distribution in the old world: An ancient disease seen from a historical standpoint. Mediterranean J Hematol Infec Dis 2017; 9: e2007018.
2. Jalil T, Yousafzai YM, Rashid I, Ahmed S, Ali A, Fatima S, Ahmed J. Mutational Analysis of Beta Thalassemia by Multiplex Arms-Pcr in Khyber Pakhtunkhwa, Pakistan. J Ayub Med Coll Abbottabad 2019; 31(1):98-103.
3. Weatherall DJ. The evolving spectrum of the epidemiology of thalassenia. Hematol Oncol Clin North Am 2018; 32(2): 4331-6.
4. Kadhim AJ, El-Yaseen HD, Jawad AM. Association between Alpha-Klotho protein, calcium, and phosphate concentrations in adult Iraqi patients with beta-thalassemia major. J Faculty Med Baghdad 2024; 66(4): 43-5
5. Voskaridou E, Ntanasis-Stathopoulos I, Papaefstathiou A, Christoulas D, et al. Denosumab in transfusion-dependent thalassemia osteoporosis: a randomized, placebo-controlled, double-bind phase 2b clinical trial. Blood Advan 2018; 2(21: 2837-47.
6. Bhardwaj A, Swe KMM, Sinha NK, Osunkwo l. Treatment for osteoporosis in people with β-thalassemia. Cochrane Database System Rev 2016; 3: CD010429.
7. Abdel Aziz ZA, Dawood NS, Al-Khalisy MH. Evaluation of type II diabetis mellitus on bone mineral density of upper and lower limbs by dual-energy x-ray absorptiometry. J Faculty Med Baghdad 2023; 65(1): 19-23.
8. Goldberg EK, Neogi S, Lal A, Higa A, et al. Nutritional deficiencies are common in patients with transfusion-dependent thalassemia and associated with iron overload. J Food Nutr Res (Newark, Del) 2018; 6(10): 674-81.
9. Surriah MH, Hassan AN, & Bakkour AM. Study of hypocalcemia and its risk factors in post thyroidectomy in Al-Karama Teaching Hospital. J Faculty Med Baghdad 2018; 60(4): 25-8.
10. Carmeliet G, Dermauw V, Bouillon R Vitamin D signaling in calcium and bone homeostasis: A delicate balance. Best Pract Res Clin Endocrinol Metable 2015; 29: 621-31.

11. Eknoyan G. Adolphe Quetelet (1796-1874) The average man and indices of obesity. Nephrol Dialysis Transplant 2007; 23(1): 47-51
12. Lewiecki EM, Binkley N, Morgan SL, Shuhart CR, Camar gos BM, Carey JJ, et al. Best practices for dual-energy x-ray absorptiometry measurement and reporting: international society for clinical densitometry guidance. J Clin Densitom 2016; 19(2): 127–40.
13. Gaudio A, Morabito N, Catalano A, Rapisarda R, Xourafa A, Lasco A. A pathogenesis of thalassemia major-associated osteoporosis: review of the literature and our experience. J Clin Res Pediatr Endocrinol 2019; 11(2): 110-17.
14. Hassan ZS, Farhan LO. Evaluation of human β-defensin -3diagnostic role in a group of Iraqi patients with osteoporosis. J Faculty Med Bagdad 2024; 66(4): 27-32.
15. Ahmed HS. Correlations between serum interleukins -2, -4 levels and some biochemical parameters in Iraqi patients with osteoporosis. J Faculty Med Baghdad 2017; 59(3): 19-23.
16. Sezer A, Altan L, Özdemir Ö. Multiple comparison of age groups in bone mineral density under heteroscedasticity. BioMed Res Int 2015; 2015(1): 426847.
17. De Sanctis V. β-Thalassemia distribution in the old world: an ancient disease seen from a historical standpoint. Mediterr J Hematol Infect Dis 2017; 9: e2017018.
18. Chahkandi T, Norouziasl S, Farzad M, Ghanad F. Endocrine disorders in beta thalassemia major patients. Int J Pediatr 2017; 5: 5531-8.
19. Mahmoodi Nesheli H, Farahanian E. Relation between bone mineral density and serum ferritin levels in patients with thalassemia major. Casp J Pediatr 2016; 2:158-63.
20. Abbasi S, Asl JF, Zadeh LM, Mirdoraghi M. Measurement of bone mineral density (BMI) of patients with beta thalassemia. Dat Brief 2018; 19:1021-4.
21. Ansaf AI, Faraj SA, Mohammed RA. Bone mineral density in patients with thalassemia major, the experience of a single institute. Int J Res Pharm Sci 2021;12:676-82.
22. El-Nashar M, Mortagy AK, El-Beblawy NM et al. Para thyroid hormone in pediatric patients with β-thalassemia major and its relation to bone mineral density; a case control study. Egypt J Med Hum Genet 2017;18:75-8.
23. Pirinççioğlu AG, Gökalp D, Söker M. Parathyroid functions in thalassemia major patients. Ann Clin Endocrinol Metabol 2017;1:15-9.
24. Wong P, Fuller PJ, Gillespie MT, Milat F. Bone disease in thalassemia: a molecular and clinical overview. Endocr Rev 2016;37:320-46.

Original Article

The Impact of Alpha Lipoic Acid Supplementation on Women with Polycystic Ovarian Syndrome who are Being Treated with Metformin

Alpha Lipoic Acid Supplementation on Women with Polycystic Ovarian Syndrome

Fatima Ali Hussein, Sinaa Abdul Amir Kadhim and Asma Abdul Jaleel Swadi

ABSTRACT

Objective: To assess the impact of the simultaneous use of metformin and alpha lipoic acid on metabolic and fertility parameters in individuals with polycystic ovarian syndromes.

Study Design: Randomized, single-blind clinical trial study

Place and Duration of Study: This study was conducted at the Department of Clinical Pharmacology, University of Al-Qadisiyah, College of Medicine, Iraq from September 2024 and March 2025.

Methods: Ninety women were assigned randomly in two groups. Patients in the metformin group received glucophage, while those in the metformin plus alpha lipoic acid group were administered metformin as in the first group along with alpha lipoic acid. All treatments were administered over a period of 12 weeks.

Results: Both management methods exhibited a notable reduction in average levels of free testosterone, luteinizing hormone:follicular stimulating hormone ratio, gonadotropin-releasing hormone antibodies, and ovarian volume ($p<0.001$); the impact of metformin combined with ALA was significantly greater in comparison to the other treatment method ($p<0.05$). Nevertheless, none of the treatment strategies had a significant. Therefore, the concurrent administration of metformin and alpha lipoic acid supplements is linked to the most favorable hormonal and ultrasound features in women with polycystic ovarian syndrome by diminishing the harmful influence of anti gonadotropin-releasing hormone antibody levels.

Conclusion: The combined use of metformin therapy and alpha lipoic acid supplements is associated with the most optimum hormonal and ultrasound characteristic in polycystic ovarian syndromes women by reducing the pathogenic effect of anti gonadotropin-releasing hormone antibody level.

Key Words: Polycystic ovary syndrome, Alpha lipoic acid, Metformin

Citation of article: Hussein FA, Kadhim SAA, Swadi AAJ. The Impact of Alpha Lipoic Acid Supplementation on Women with Polycystic Ovarian Syndrome who are Being Treated with Metformin. Med Forum 2025;36(8):43-48. doi:10.60110/medforum.360809.

INTRODUCTION

One of the most common hormonal disorders affecting women today is polycystic ovary syndrome (PCOS). A significant number of women around the world are affected by PCOS.[1] It impacts metabolism and reproductive well-being, making daily life more challenging.[2] Hormonal abnormalities that disrupt ovulation and cause irregular menstrual cycles are the hallmark of PCOS.

Department of Clinical Pharmacology, University of Al-Qadisiyah, College of Medicine, Iraq.

Correspondence: Fatima Ali Hussein, Department of Clinical Pharmacology, University of Al-Qadisiyah, College of Medicine, Iraq.
Contact No: 07825680688
Email: med.post24.32@qu.edu.iq

Received: April, 2025
Reviewed: May-June, 2025
Accepted: July, 2025

Weight gain, particularly around the abdomen, oily skin, acne, thinning hair on the scalp, irregular or nonexistent periods, and excessive facial or body hair growth are all linked to the condition. PCOS can result in long-term health problems if it is not properly managed.[3] Among women, insulin resistance is common. Increased fat accumulation, particularly around the waist, and elevated blood sugar levels are the results of this condition. Fertility may be impacted by hormonal imbalances that interfere with ovulation. Insulin resistance is a primary contributor to the symptoms of PCOS.[4]

When the body has a poor response to insulin, the ovaries produce higher amounts of androgens. This surge disrupts ovulation and intensifies symptoms such as acne and excess hair growth and insulin resistance affects up to 70% of women with PCOS.[5] Restoring hormonal balance, reducing symptoms, and improving treatment efficacy can all be achieved by addressing this problem.[6] Metformin is a drug that is mainly used to treat type 2 diabetes, but it also works well to treat PCOS. It helps to lower blood sugar levels and stabilize hormonal balances by boosting the body's insulin

sensitivity. As a result of improved insulin function, the ovaries can restore regular ovulation, leading to more consistent menstrual cycles. Metformin can enhance blood sugar regulation, facilitate weight loss or make weight management easier, lower androgen levels to help with acne and excessive hair growth, increase the likelihood of ovulation, and improve menstrual regularity.[7] Metformin may, however, have adverse effects, just like any other medication. Nausea, upset stomach, and diarrhea are the most frequent side effects, particularly in the early stages of treatment. Starting with a lower dosage and increasing it gradually is crucial.[8]

Supplementing with alpha lipoic acid may help reduce the severity and frequency of metformin side effects, possibly reducing the need for higher dosages of the drug.[9-11] Supplements like alpha lipoic acid are becoming more and more popular as more women seek out natural solutions or medical treatments to control their symptoms.[11] When these supplements are paired with a tailored health plan, they can contribute to improved health results and enhanced quality of life.[9-11] According to research, ALA enhances insulin sensitivity, reduces inflammation-induced oxidative stress, balances hormones, enhances lipid profiles, lowers blood sugar, and promotes metabolic health.[12,13]

We propose that the integration of these therapies addresses various facets of PCOS. Alpha lipoic acid combats oxidative stress, while metformin enhances insulin sensitivity and promotes fertility. Consequently, the objective of this research project is to assess the impact of the combined use of metformin and ALA on metabolic and fertility measures associated with PCOS.

METHODS

This randomly single-blind, and actively controlled, was conducted in Babylon, Iraq, from September 2024 until March 2025. The research followed the guidelines set forth in the Declaration of Helsinki and received ethical approval from the committee at the College of Medicine/Al-Qadisiyah University before starting. All participants provided informed consent. The sample size was calculated using a formula with significance level lower than 0.05 and a statistical power greater than 80% based on a prior trial[14], we established 4.4 μIU/ml as the standard deviation and 3.5 μIU/ml as the average change (D) in insulin, which was the main outcome measure. The calculation indicated that 12 participants were needed for each group; however, considering an estimated 3 dropouts per group, the final count was adjusted to 15 subjects for each group.

The diagnosis of PCOS was determined using the Rotterdam criteria.[15] The inclusion criteria were women between the ages of 20 and 39 with PCOS and a body mass index below 30 were included. Women who were menopausal, pregnant, or breastfeeding; those with diabetes; individuals with liver, kidney, thyroid, or heart conditions; and those with elevated prolactin levels were excluded. Participants who had used antioxidant supplements within the past three months, as well as those taking ovulation-inducing medications or drugs affecting hormonal levels, such as oral contraceptives, were not considered for enrollment. We also excluded participants who had engaged in a specific diet or exercise program and those who consume tobacco or alcohol.

Participants were assigned to two distinct groups through a process of randomization. This random selection was performed using random numbers generated by a computer. Individuals in Met. group received Glucophage (500 mg; Merck, West Drayton, UK) administered once daily for 2 weeks hen 2 times a day for the rest of the study; those in the Met.+ALA group were given the same metformin treatment along with ALA (600 mg, Batch no. 53642; neutec, Turkey) once/ day. All treatments were carried out over a 12-week period.

Serum samples were stored at -80°C until the time of analysis. The concentrations of insulin, follicle-stimulating hormone (FSH), luteinizing hormone (LH), testosterone, prolactin, and thyroid-stimulating hormone in the serum were quantified using ELISA (Bioassay Technology Laboratory, Shanghai Korean Biotech, Shanghai City, China) according to the manufacturer's protocol. The samples were evaluated for GnRHR-AAbs employing a synthetic 28-mer peptide (LifeTein, Somerset, NJ) derived from the ECL2 region of the human GnRHR as the coating antigen. Optical density (OD) measurements were recorded at 405 nm following a 60-minute incubation period.

A transvaginal ultrasound examination was conducted using a Voluson 730 pro at a frequency of 50/60 HZ with a transvaginal probe operating at 6 MHz. The volume of the ovaries was evaluated, typically located near the iliac vessels at their junction. The greatest dimensions of both ovaries were noted. Measurements of length and height were taken in centimeters, after which the probe was turned 90 degrees to assess the width in centimeters. The ovarian volume was then calculated using the prolate ellipsoid formula (Length × Width × Height × 0.523).[16] The Mean Ovarian Volume (MOV) was calculated when ultrasonography allowed for both ovaries to be measured. If only one ovary could be measured, that single measurement was used as the ovarian volume.

All statistical evaluations were analyzed by SPSS-26. To compare quantitative variables across groups, a student t-test was performed and $P<0.05$ was considered as significant.

RESULTS

The average of age was 31.73 and 32.11 years in Met. and Met. plus ALA. The difference in the average of

age between cohorts of study exhibited no significance (p=0.537) [Table 1]. Prior to treatment course, the averages of free Testosterone, FSH, LH, prolactin and TSH were comparable between Met., and Met. plus ALA groups. Post-treatment, all three forms of management showed significant decline in average free Testosterone, LH and LH:FSH ratio (p<0.001); the effect of Met. plus ALA was significantly more profound when contrasted to other mode of therapy (p< 0.05). However, none of these treatment approaches was able to affect serum levels of FSH, prolactin and TSH significantly (p>0.05) [Table 2].

Prior to treatment course, the average of GnRHR anti-body levels of Met. group, and Met. plus ALA group were 10.20, and 10.14 mg/dl, in that order. Statistically speaking, no significant variance existed between cohorts of the investigation (p=0.291). Post-treatment, all three forms of management showed significant (p<0.001) decline in average GnRH anti-body concentration of PCOS women; however, the amount of decline using Met. plus ALA is the most fruitful, with significant (p<0.001) differences when groups were contrasted to each other (Table 3).

Prior to treatment course on ultrasound, average ovary volume of Met. group, and Met. plus ALA group was 14.19, and 13.95 cm, in that order. Statistically speaking, there was no significant variance in average ovary volume between cohorts of the investigation (p=0.610). Post-treatment, the two forms of management showed significant decline in average ovary volume of PCOS women (p = 0.001); however, the amount of decline using Met. plus ALAis the most fruitful, with significant differences (p<0.001) when groups were contrasted to each other (Table 4).

Table No. 1: Descriptive statistics of age in PCOS patients (n=90)

Age (years)	Met. Group	Met.+ALA Group	p-value
	31.73 ±2.77	32.11 ±3.01	0.537

Table No. 2: Effect of different treatment approaches on serum hormonal levels (n=90)

Hormone	Met. Group	Met.+ ALA Group
Free testosterone (ng/dl)		
Prior to therapy	21.10±7.24	20.58±6.07
Post-therapy	16.59±7.04*b	18.42±5.63*a
FSH (mIU/ml)		
Prior to therapy	5.35±0.41	5.42±0.45
Post-therapy	5.39±0.43	5.46±0.53
LH (mIU/ml)		
Prior to therapy	16.49±2.66	16.78±4.34
Post-therapy	14.41±2.31*b	15.01 ±3.95*a
LH:FSH ratio		
Prior to therapy	3.08±0.06	3.10±0.10
Post-therapy	2.67±0.05*b	2.75±0.07*a
Prolactin (ng/ml)		
Prior to therapy	21.03±3.70	20.93±6.56
Post-therapy	20.99±3.82	20.14±7.27
TSH (mIU/ml		
Prior to therapy	2.31±0.78	2.36±0.58
Post-therapy	2.35±0.76	2.30±0.47

*Significant paired t-test (before treatment vs. after treatment)

Table No. 3: GnRH receptor auto-antibody level of enrolled PCOS patients according to group pre- and post-treatment

GnRH antibody	Met. Group	Met.+ ALA Group
Prior to therapy	10.20±3.93	10.14±2.90
Post-therapy	8.31±3.92*b	8.75±2.65*a

*Significant paired t-test (before treatment vs. after treatment)

Table No. 4: Ovary volume of enrolled PCOS patients according to group pre- and post-treatment

Ovary volume (cm)	Met. Group	Met.+ ALA Group
Prior to therapy	14.19±1.95	13.95±2.47
Post-therapy	12.14±1.91*b	13.31±1.84*a

*Significant paired t-test (before treatment vs. after treatment)

DISCUSSION

After completing treatment course, the two modalities showed significant reduction in mean free testosterone concentration of PCOS women; however, the amount of reduction using metformin+ALA was the greatest with significant difference when contrasted to other group in the present study. Thus, addition of ALA improved the effect of metformin optimizing serum free testosterone in women with PCOS. Jannatifar et al[17] evaluated the combination of metformin and ALA against metformin alone in women with PCOS; they reported reduction in mean total testosterone in both groups, but, unfortunately, the magnitude of reduction did not reach statistical significance. Therefore, our results are in disagreement with that of Jannatifar et al[17], however, in our study we estimated free testosterone rather than total testosterone level.

In the current study, the two modalities showed no significant change in mean FSH concentration of PCOS women. By enrolling 32 obese PCOS patients who received 400 mg ALA per day for three months, Genazzani et al[13] assessed the effects of ALA administration on the hormonal and metabolic parameters of these patients. They found no discernible change in the mean blood FSH level. Genazzani et al[13] also supports the findings of the current investigation. This result is consistent with our observation. Vincenzo et al[18] and De Leo et al[19] reported a small but non-significant increase in FSH levels.

In this study, the two modalities showed significant reduction in mean LH concentration of PCOS women; however, the amount of reduction using metformin+ALA was the greatest with significant difference when contrasted to other group. To be clear, an essential pathogenic disturbance in hormonal milieu observed in PCOS is the high serum LH accompanied by increasing ratio of LH/FSH[20], so lowering of LH concentration and related LH:FSH ratio is an essential result in our study in which we have demonstrated that using combination of ALA and metformin is better than using metformin alone in achieving this therapeutic goal.

In one study 34 individuals received 400-mg-ALA for 12 weeks, a substantial decrease in amounts of LH was observed.[21] Estradiol significantly improved and LH and testosterone significantly decreased. By lowering LH and raising estradiol levels, the research appeared to indicate that ALA can enhance function that are ovarian and egg features; conversely, ALA may also lessen hyperandrogenism by lowering testosterone. A recent meta-analysis study concluded that ALA treatment can cause significant reduction in LH level 22[34], thus supporting our findings.

The idea that insulin secretion and metabolic patterns impact the signaling system involved in hyperandrogenism and ovulation regulation explains the impact of ALA.[12] ALA is well-known for its antioxidant qualities and capacity to lessen oxidative stress, which has been linked to insulin, testosterone, and LH levels and is a contributing factor in the development of numerous disorders, including PCOS. A helpful supplement that efficiently fights reactive oxidative species (ROS) and replenishes antioxidant molecules, ALA is a strong antioxidant that has been demonstrated to lower oxidative stress and insulin resistance. ALA can improve insulin production, lower testosterone levels, and control menstrual cycles, although there have been relatively few studies on inflammation and reproductive hormones in PCOS.[23]

In this study and after completing treatment course, the two modalities showed significant reduction in mean GnRH Ab concentration of PCOS women and the amount of reduction using metformin +ALA was the greatest. In fact, a new research and treatment focus for PCOS is the recently discovered agonistic autoantibodies (AAb) against the GnRHR.[24] Immune and inflammatory abnormalities may affect receptors and functions of GnRH by impairing the axis linking the hypothalamus, pituitary gland and ovary and this may affect fertility characteristics of patients.[24] A retrospective investigation by Kem et al[25] showed that PCOS patients had AAb against the GnRHR extracellular loop-2 (ECL2), which may be pathophysiologically significant due to their capacity to chronically activate GnRHR.

Regarding effect of metformin, researchers have evaluated its therapeutic role concerning AAb against the GnRHR. The latter investigation was published by Mahdi and Kadim[26] and it has been shown by hem that the drug therapy may diminish the amount the autoantibody in a significance way in P-COS-women, therefore, giving support to our results. The actual mechanistic effect via which this drug resulted in such decline is not clear completely, nonetheless, one may suppose that the capacity of anti-inflammation by metformin may resulted in alterations in levels of cytokine that eventually impeded the synthesis of these agonistic antibodies. As a matter of fact, articles have shown that the drug metformin possess inflammatory suppression effect and illness-protective acts. Metformin drug has been shown to impede cytokines with pro-inflammatory potential, set into action process of apoptosis, and diminish proliferation of cells in arthritis and cancer.[27]

It is worth to highlight, the lack of previous studies evaluating the pharmacological acts of ALA on AAb against GrHR- in P-COS-women. Therefore, it is an originality point in the present academic work. The mechanistic contribution of action of ALA in lowering levels of these autoantibodies in PCOS- women is possibly the result of its oxidation-preventive acts, therefore, lowering response of inflammation in those patients and by this way declining synthesis of cytokines that are pro-inflammatory and have the capacity to induce increment in the antibody concentration.

In the present study and after completing treatment course, the two modalities showed significant reduction in mean ovary volume and mean AFC of PCOS women and the amount of reduction using metformin +ALA was the greatest. Metformin reduces the total count of antral follicles and this reduction will directly lead to overall decrement in size of ovary[28]; this effect is due probably to improved insulin senility with eventual decline in androgen level and hence improvement in ovulatory function resulting in less number of ovarian follicles. Secondly, previous observation concluded a direct relationship between weight and ovary volume[29], therefore, metformin ability in weight reduction is going to reduce overall ovary volume in addition; nevertheless, the true effect connecting high weight to greater ovary volume is still enigmatic. Thirdly, the hormonal optimization concerning (free testosterone, hormone LH, and ratio of LH:FSH), losing excess body weight and enhancement of physiological functions related to ovulation are going to interact as a whole to normalize volume of ovary and counts of follicles in women with PCOS treated by metformin.

Previously it has been shown that ALA via its anti-oxidant capacity can improve fertility characteristics, ovarian physiology and oocyte features.[12] For that reason, one may suppose that optimization of volume of

ovary after ALA supplements in our research is the result of enhancement of ovulation in PCOS women, and hence resulting in decrement of counts of antral follicles and eventually, there will be decrement in size of ovary. The optimization of ovarian physiology in current research is most probably attributed to anti-oxidation effect of ALA.

CONCLUSION

The combined use of metformin therapy, and ALA supplements is associated with the most optimum hormonal and ultrasound characteristic in PCOS women by reducing the pathogenic effect of anti GnRHR antibody level.

Author's Contribution:

Concept & Design or acquisition of analysis or interpretation of data:	Fatima Ali Hussein, Sinaa Abdul Amir Kadhim
Drafting or Revising Critically:	Fatima Ali Hussein, Sinaa Abdul Amir Kadhim
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.

Source of Funding: None

Ethical Approval: No. 2720 dated 29th June 2024

REFERENCES

1. Salari N, Nankali A, Ghanbari A, Jafarpour S, Ghasemi H, Dokaneheifard S, et al. Global prevalence of polycystic ovary syndrome in women worldwide: a comprehensive systematic review and meta-analysis. Arch Gynecol Obstet 2024;310(3):1303-14.
2. Ligocka N, Chmaj-Wierzchowska K, Wszołek K, Wilczak M, Tomczyk K. Quality of life of women with polycystic ovary syndrome. Medicina (Kaunas) 2024;60(2):294.
3. Lentscher JA, Decherney AH. Clinical presentation and diagnosis of polycystic ovarian syndrome. Clin Obstet Gynecol 2021;64(1):3-11.
4. Purwar A, Nagpure S. Insulin Resistance in Polycystic Ovarian Syndrome. Cureus 2022;14(10):e30351.
5. Calcaterra V, Verduci E, Cena H, Magenes VC, Todisco CF, Tenuta E, et al. Polycystic ovary syndrome in insulin-resistant adolescents with obesity: the role of nutrition therapy and food supplements as a strategy to protect fertility. Nutrients 2021;13(6):1848.
6. Dason ES, Koshkina O, Chan C, Sobel M. Diagnosis and management of polycystic ovarian syndrome. CMAJ 2024;196(3):E85-94.
7. Attia GM, Almouteri MM, Alnakhli FT. Role of metformin in polycystic ovary syndrome (PCOS)-related infertility. Cureus 2023; 15(8):e44493.
8. Notaro ALG, Neto FTL. The use of metformin in women with polycystic ovary syndrome: an updated review. J Assist Reprod Genet 2022; 39(3):573-9.
9. Alesi S, Ee C, Moran LJ, Rao V, Mousa A. Nutritional supplements and complementary therapies in polycystic ovary syndrome. Adv Nutr 2022;13(4):1243-66.
10. Cheng X, He B. Clinical and biochemical potential of antioxidants in treating polycystic ovary syndrome. Int J Womens Health 2022;14:467-79.
11. Kiani AK, Donato K, Dhuli K, Stuppia L, Bertelli M. Dietary supplements for polycystic ovary syndrome. J Prev Med Hyg 2022;63 (2 Suppl 3):E206-13.
12. Guarano A, Capozzi A, Cristodoro M, Di Simone N, Lello S. Alpha lipoic acid efficacy in PCOS treatment: what is the truth? Nutrients 2023;15(14):3209.
13. Genazzani AD, Shefer K, Della Casa D, Prati A, Napolitano A, Manzo A, et al. Modulatory effects of alpha-lipoic acid (ALA) administration on insulin sensitivity in obese PCOS patients. J Endocrinol Invest 2018;41(5):583-90.
14. Nasiri M, Monazzami A, Alavimilani S, Asemi Z. Modulation of hormonal, metabolic, inflammatory and oxidative stress biomarkers in women with polycystic ovary syndrome following combined (resistant and endurance) training: a randomized controlled trail. BMC Endocr Disord 2025;25(1):1.
15. Rotterdam ESHRE/ASRM-Sponsored PCOS consensus workshop group. Revised 2003 consensus on diagnostic criteria and long-term health risks related to polycystic ovary syndrome (PCOS). Hum Reprod 2004;19(1):41-7.
16. Lima ML, Martins WP, Coelho Neto MA, Nastri CO, Ferriani RA, Navarro PA. Assessment of ovarian reserve by antral follicle count in ovaries with endometrioma. Ultrasound Obstet Gynecol 2015;46(2):239-42.
17. Jannatifar R, Piroozmanesh H, Sahraei SS, Asa E. Combination of alpha lipoic acid and metformin supplement improve assisted reproductive technologies outcomes in polycystic ovary syndrome patients. Anat Cell Biol 2022; 55(2): 239-46.
18. Vincenzo DL, Musacchio MC, Morgante G, Piomboni P, Petraglia F. Metformin treatment is

effective in obese teenage girls with PCOS. Human Reproduction 2006; 21(9):2252-6.

19. De Leo V, Marca AL, Orvieto R, Morgante G. Effect of metformin on insulin-like growth factor (IGF) I and IGF-binding protein I in polycystic ovary syndrome. J Clin Endocrinol Metab 2000; 85(4): 1598-1600.
20. Pratama G, Wiweko B, Asmarinah, Widyahening IS, Andraini T, Bayuaji H, et al. Mechanism of elevated LH/FSH ratio in lean PCOS revisited: a path analysis. Scientific Reports 2024;14(1): 8229.
21. Genazzani A, Despini G, Santagni S, Prati A, Rattighieri E, Chierchia E, et al. Effects of a combination of alpha lipoic acid and myo-inositol on insulin dynamics in overweight/obese patients with PCOS. Endocrinol Metabol Syndrome 2014; 3(3): 1-7.
22. Abu-Zaid A, Baradwan S, Bukhari IA, Alyousef A, Abuzaid M, Saleh SAK, et al. The effect of alpha-lipoic acid supplementation on anthropometric, glycemic, lipid, oxidative stress, and hormonal parameters in individuals with polycystic ovary syndrome: a systematic review and meta-analysis of randomized clinical trials. Obstet Gynecol Sci 2024; 67(1): 17-29.
23. Femi-Olabisi FJ, Oyerinde OR, Faokunla OO, Omar SA, Igene PE, Asaluwala OE, et al. Alpha-lipoic acid regulates pro-inflammatory cytokines and hormones in letrozole-induced polycystic ovary syndrome in rats. Endocrine Metabol Sci 2025; 18: 100245.
24. Li H, Guo Y, Deng J, Fischer H, Weedin EA, Burks HR, et al. Increased testosterone and proinflammatory cytokines in patients with polycystic ovary syndrome correlate with elevated GnRH receptor autoantibody activity assessed by a fluorescence resonance energy transfer-based bioassay. Endocrine 2021;74(1): 163-71.
25. Kem DC, Li H, Yu X, Weedin E, Reynolds AC, Forsythe E, et al. The role of GnRH receptor autoantibodies in polycystic ovary syndrome. J Endocrine Soc 2020;4(8): bvaa078.
26. Mahdi SS, Kadhim SAA. Effects of letrozole and metformin versus metformin alone on incretin in Iraqi patients with PCOS. J Public Health Comm Med 2024;4(2): 48-52.
27. Petrasca A, Hambly R, Kearney N, Smith CM, Pender EK, Mac Mahon J, et al. Metformin has anti-inflammatory effects and induces immunometabolic reprogramming via multiple mechanisms in hidradenitis suppurativa. Br J Dermatol 2023;189(6):730-40.
28. Ria HFA, Mohammed HAEM, Hemida HIS. Effect of metformin and myo-inositol in patients with polycystic ovary syndrome. Al-Azhar Int Med J 2023;4(11): 37.
29. FarimaniSanoee M, Neghab N, Rabiee S, Amiri I. Metformin therapy decreases hyper-androgenism and ovarian volume in women with polycystic ovary syndrome. Iranian J Med Sci 2021;6(2):90-5.

Original Article

Effects of Socratic Questioning on Academic Performance and Critical Thinking Dispositions among Nursing Students

Imran Masih, Madiha Mukhtar and Azeem Kaleem

ABSTRACT

Objective: To assess the effects of Socratic questioning on critical thinking disposition among nursing students and to assess the effects of Socratic questioning on academic performance among nursing students.

Study Design: A Quasi-Experimental Study

Place and Duration of Study: This study was conducted at the School of Nursing Pakistan Institute of Medical Sciences, affiliated with Shaheed Zulfiqar Ali Bhutto medical University Islamabad from March 2024 to Nov. 2024.

Methods: In this investigation, a quasi-experimental study design was employed. A universal census sampling strategy was used to select 40 nursing students from semester 7 School of Nursing Pakistan Institute of Medical Sciences. Critical thinking disposition was evaluated using a validated method, while academic achievement was evaluated using written assignments and quizzes. After a pre-assessment to gather baseline data, the participants received instruction using the Socratic questioning style. Data was gathered following the intervention in order to see the impact of the intervention in the post-assessment.

Results: Following the intervention, there was a noticeable difference between the two scores of critical thinking before and after the intervention. The post assessment of critical thinking had a significantly higher mean score of 167.20 with a standard deviation of 7.528 than the pre assessment 125.40 with a standard deviation (SD) of 7.472 ($p<.001$). Similarly the pre intervention mean academic performance score was 69.69 with a standard deviation of 3.279, which was increased to 89.44 with standard deviation of 3.074 ($p<.001$).

Conclusion: This study appears to have had a significant positive impact on both critical thinking skills and academic performance among nursing students. These results suggest that the intervention effectively enhanced both critical thinking and academic performance, highlighting the potential benefits of targeted interventions in nursing education.

Key Words: Socratic Questioning Method, Critical Thinking, Academic Performance, Nursing students

Citation of article: Masih I, Mukhtar M, Kaleem A. Effects of Socratic Questioning on Academic Performance and Critical Thinking Dispositions among Nursing Students. Med Forum 2025;36(8):49-53. doi:10.60110/medforum.360810.

INTRODUCTION

The evolving landscape of nursing education aims to address the complex demands of healthcare[1]. A significant part of this transformation involves adopting teaching strategies that promote deep learning and critical thinking. One such strategy is Socratic questioning, rooted in the teachings of Socrates. This method encourages students to critically analyze and reflect on questions, enhancing their problem-solving abilities, which are essential in nursing, where quick, sound decisions are necessary under pressure. Socrates believed that traditional lecturing was ineffective for all students, which led to the development of the Socratic method[2]. Socrates valued the existing knowledge of individuals, believing it could be leveraged to cultivate wisdom and awareness[3]. Despite its potential, there is limited evidence on how Socratic questioning impacts nursing students' academic achievement and critical thinking. The technique, with its roots in ancient Athens, has evolved over centuries and is applied across various fields like law, philosophy, and sciences[4]. In nursing education, traditional methods favor rote memorization, but these are no longer sufficient in a rapidly changing healthcare environment[5]. Over the last century, nursing instruction has moved from lecture-based to more interactive and active learning methods[6]. Influenced by educational philosophies such as radical constructivism and social learning theory, nursing educators are increasingly encouraged to adopt these methods to foster reflection

Lahore School of Nursing, The University of Lahore..

Correspondence: Imran Masih, MSN Student, Lahore School of Nursing, The University of Lahore.
Contact No: 0305 5209944
Email: imranashraf7856@gmail.com

Received: February, 2025
Reviewed: March-April, 2025
Accepted: May, 2025

and analytical thinking. Research supports the efficacy of Socratic questioning in improving students' critical thinking and academic performance, which are vital for clinical practice in healthcare[7]. Critical thinking (CT) is an essential skill in nursing, allowing practitioners to assess information and make informed decisions[8]. Critical Thinking Disposition (CTD) enhances decision-making and problem-solving abilities, making it a crucial aspect of nursing education[9]. In healthcare, CTD is especially important for nurses making decisions that impact patient outcomes. Understanding CTD can significantly improve nursing practice and patient care[10]. The Socratic method is recognized as an effective way to develop CTD[11], with research showing its impact on academic performance[12]. Academic performance encompasses various factors, including cognitive abilities, skills, and external influences, which are significantly impacted by instructional methods[13]. In nursing, adopting the Socratic method can enhance academic success and critical thinking, preparing students for real-world healthcare challenges[14]. This study aims to explore the role of Socratic questioning in improving nursing education. By addressing this gap, the research aims to enhance nursing education in Pakistan, ensuring that future nurses are better prepared to deliver high-quality patient care. The findings could inform educational interventions that both improve academic outcomes and foster critical thinking, preparing nursing students for the challenges of modern healthcare.

METHODS

Quasi experimental pre-post study design was used to assess the effects of Socratic questioning on critical thinking disposition and academic performance among nursing students. This study was conducted at School of Nursing Pakistan Institute of Medical Sciences, affiliated with Shaheed Zulfiqar Ali Bhutto medical University Islamabad from March 2024 to Nov. 2024. The study participants were the nursing students of seventh semester. A universal sample of n=40 participants was recruited through consensus method.

Ethical Approval Statement:

Inclusion criteria:

1. Both male and female students who were enrolled in Critical care course were recruited
2. Students having 80% attendance were recruited
3. Those who participated in two quizzes and two assignments were recruited.

Exclusion criteria

1. Those students were being excluded which are repeater and retake of classes of same semester
2. Those who did not to participate in quizzes and assignments.

RESULTS

The results indicate significant improvements in both critical thinking and academic performance following the intervention. The post-assessment mean score for critical thinking was 167.20 (SD = 7.528), showing a marked increase from the pre-assessment score of 125.40 (SD = 7.472), with a statistically significant t-test result (p = 0.000). Similarly, academic performance improved notably, with a mean score increase from 69.63 (SD = 3.279) pre-assessment to 89.44 (SD = 3.074) post-assessment, confirmed by a significant Wilcoxon signed-rank test (p = 0.000).

Table No. 1: Demographic Findings (n=40)

S. No	Demographic characteristics	Frequency	Percentage
1	**Age**		
	15-20 years	0	0.00%
	21-25 years	35	87.5%
	26 -30years S	5	12.5%
	30 years and above	0	0.00%
2	**Gender**		
	Male	4	10%
	Female	36	90%
3	**Academic Year**		
	Third Year	0	0.00%
	Fourth Year	40	100%
4	**Academic semester**		
	7th semester	40	100%

DESCREPTIVE STATISTICS

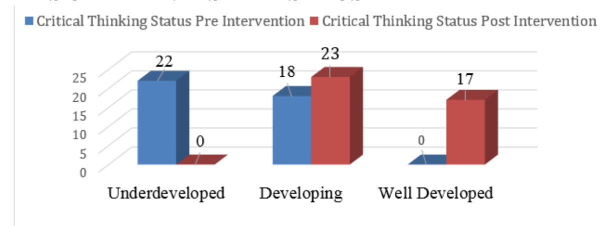


Figure No. 1: Critical Thinking Status Pre and Post Intervention n=40

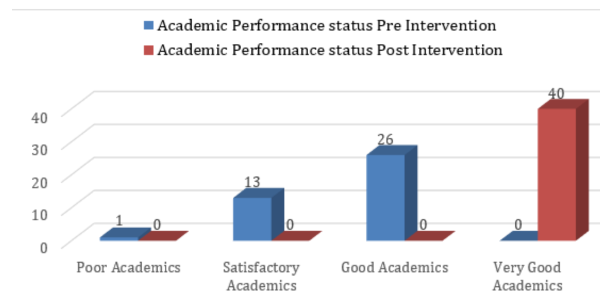


Figure No.2: Academic Performance Pre and Post Intervention (n=40)

According to the demographic profile of the study in Table 1, the bulk of the interventional group (35 participants, 87.5%) were between the ages of 21 and 25, while just a minor percentage (5 participants, 12.5%) were 26 years of age or older. No participants found in the age group 16 to 20 years or age above 30 years. The participant's group was made up of female participants (36 participants, 90%), whereas the male individuals (4 participants, 10%). All participants in the group were fourth-year students, guaranteeing uniformity in terms of educational advancement. Every participant was enrolled exclusively in their seventh semester, suggesting that they were all at a similar academic point in their nursing program.

Table No.2: Comparison of Critical Thinking score Pre-post intervention score (n=40)

Value	Pre Assessment **(Mean±SD)**	Post Assessment **(Mean ±SD)**	**t- test**	**P-value**
Critical Thinking	125.40± 7.472	167.20± 7.528	- 511.943	.000

Paired t- test with p<.05 value as significant

Table No.3: Comparison of Academic Performance score Pre-post intervention score (n=40)

Value	Pre Assessment (Mean ±SD)	Post Assessment (Mean ±SD)	Z	P-value
Academic performance	69.63±3.279	89.44±3.074	-5.543^{b}	.000

Wilcoxon Signed rank test with p<.05 value as significant

Wilcoxon signed rank test was used to evaluate the effect of Socratic questioning method on academic performance among nursing students. The comparison of academic performance scores between the pre and post intervention shows clear disparities after the intervention. There was a statistically significant difference between the academic performance before and after the intervention. The mean academic performance at the start was 69.69 with a standard deviation of 3.279, and it increased to 89.44 with a standard deviation of 3.074 with a p-value of 0.000 and a Z value of -5.543b.

DISCUSSION

The study demonstrated significant improvements in nursing students' critical thinking and academic performance after an intervention. Participants' assessments of their critical thinking skills showed noticeable progress, with the post-assessment mean score significantly higher at 167.20 (SD = 7.528), and a p-value of .000, indicating statistical significance. The results reflect the effectiveness of the intervention, as no participants were classified as "Under Developed" in critical thinking, and the majority showed "Developed" critical thinking abilities. These findings align with earlier studies that reported improvements in critical thinking following educational interventions[14,15]. In a similar context, studies involving flipped classrooms and problem-based learning have also yielded positive results. These active learning strategies not only enhanced critical thinking skills but also led to better academic performance. For instance, a study by Kousar and Afzal[16] highlighted improvements in critical thinking scores following a problem-based learning intervention, with statistical evidence showing significant gains. The flipped classroom approach was found to improve students' originality and intellectual integrity, reinforcing the idea that active, student-centered learning fosters critical thinking[15]. Moreover, a previous study by López et al[17] found that educational interventions can significantly enhance critical thinking skills in nursing students, emphasizing the importance of such initiatives for better decision-making in healthcare. This aligns with findings from Kazemi et al[18], who noted significant improvements in multiple dimensions of critical thinking, such as analysis, criticism, and self-confidence, after an intervention. In contrast, one study by Gonzalez et al[19] showed no significant change in critical thinking scores after a skills fair intervention. This suggests that not all educational interventions lead to improvements, underscoring the importance of choosing the right method for specific educational goals. Therefore, the design and content of the intervention must align with the desired learning outcomes. The current study also found a remarkable improvement in academic performance. All 40 participants in the intervention group achieved "Very Good" academic performance, moving beyond the "Satisfactory" and "Good" categories. The Wilcoxon signed-rank test revealed a significant increase in the intervention group's post-assessment ranks (Z = -5.543, p = 0.000), indicating a substantial improvement in academic achievement. Similar findings were reported in other studies, such as by Sert, Topçu, and Temel[20], who found that nursing students in an experimental group had significantly higher GPAs than those in a control group after an intervention. Additionally, a study by Kim et al[21] demonstrated that peer tutoring programs improved academic performance, further supporting the importance of interactive learning strategies. Overall, these studies consistently highlight the effectiveness of active learning approaches, such as flipped classrooms and problem-based learning, in enhancing critical thinking and academic performance in nursing students. However, some studies also suggest that not all interventions yield positive outcomes, indicating that future research should focus on refining intervention designs to maximize their impact. Active, student-centered methods like Socratic questioning can thus play a crucial role in preparing nursing students for the complex demands of healthcare, improving both their critical thinking abilities and academic performance.

CONCLUSION

The effectiveness of Socratic questioning in promoting higher-order thinking skills is demonstrated by the large rise in critical thinking and academic performance scores among the study participants. Based on the study's findings, nursing students' academic performance and critical thinking skills are significantly improved by Socratic questioning. Academic performance and critical thinking scores did increased with statistically significance during the post-assessment period. The method's impact on academic results was further demonstrated by the fact that the study participant's academic performance scores were much higher than those of the pre assessment. These findings imply that incorporating Socratic questioning into nursing school might improve students' academic performance and critical thinking skills, giving them the tools they need to make clinical decisions and advance their careers.

Author's Contribution:

Concept & Design or acquisition of analysis or interpretation of data:	Imran Masih, Madiha Mukhtar
Drafting or Revising Critically:	Imran Masih, Azeem Kaleem
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.

Source of Funding: None

Ethical Approval: No. REC-UOL-/170/08/24 dated 14-06-2024

REFERENCES

1. Aloufi MA, Jarden RJ, Gerdtz MF, Kapp S. Reducing stress, anxiety and depression in undergraduate nursing students: Systematic review. Nurse Educ Today 2021;102:104877.
2. Berdida DJE, Grande RAN. Nursing students' nomophobia, social media use, attention, motivation, and academic performance: A structural equation modeling approach. Nurse education in practice 2023;70:103645.
3. Bosun-Arije SF, Dolan J. The relevance of engagement, attendance, academic performance, and progression to the professionalisation of nursing students. Nurse Educ Prac 2024;77: 103966.
4. Brown J, McDonald M, Besse C, Manson P, McDonald R, Rohatinsky N, et al. Nursing Students' Academic Success Factors: A Quantitative Cross-sectional Study. Nurse Educ 2021;46(2):E23-e7.
5. Emory J, Teal T, Holloway G. Electronic note taking technology and academic performance in nursing students. Contemporary Nurse 2021;57 (3-4):235-44.
6. Fooladi E, Karim MN, Vance S, Walker L, Zanjani ME, Ilic D, et al. Factors Associated With Undergraduate Nursing Students' Academic and Clinical Performance: A Mixed-Methods Study. Frontiers Med 2022;9:793591.
7. Freitas EO, Silva NRD, Silva RMD, Souto VT, Pinno C, Siqueira DF. Self-evaluation of nursing students about their academic performance during the COVID-19 pandemic. Revista gaucha de enfermagem 2022;43:e20210088.
8. Gallego-Gómez JI, Balanza S, Leal-Llopis J, García-Méndez JA, Oliva-Pérez J, Doménech-Tortosa J, et al. Effectiveness of music therapy and progressive muscle relaxation in reducing stress before exams and improving academic performance in Nursing students: A randomized trial. Nurse Educ today 2020;84:104217.
9. Gallego-Gómez JI, González-Moro MTR, González-Moro JMR, Vera-Catalán T, Balanza S, Simonelli-Muñoz AJ, et al. Relationship between sleep habits and academic performance in university Nursing students. BMC Nursing 2021; 20(1):100.
10. Irvine S, Williams B, Smallridge A, Solomonides I, Gong YH, Andrew S. The self-regulated learner, entry characteristics and academic performance of undergraduate nursing students transitioning to University. Nurse Educ today 2021;105:105041.
11. Kaur Khaira M, Raja Gopal RL, Mohamed Saini S, Md Isa Z. Interventional Strategies to Reduce Test Anxiety among Nursing Students: A Systematic Review. Int J Environ Res Public Health 2023;20(2).
12. Lavoie-Tremblay M, Sanzone L, Aubé T, Paquet M. Sources of Stress and Coping Strategies Among Undergraduate Nursing Students Across All Years. The Canadian journal of nursing research = Revue canadienne de recherche en sciences infirmieres 2022;54(3):261-71.
13. March-Amengual JM, Cambra Badii I, Casas-Baroy JC, Altarriba C, Comella Company A, Pujol-Farriols R, et al. Psychological Distress, Burnout, and Academic Performance in First Year College Students. Int J Environ Res Public Health 2022;19(6).
14. Merino-Soto C, Angulo-Ramos M, Llaja-Rojas V, Chans GM. Academic performance, emotional intelligence, and academic burnout: A cross-sectional study of a mediational effect in nursing students. Nurse Educ Today 2024;139:106221.
15. Oliveira Silva G, Aredes NDA, Galdino-Júnior H. Academic performance, adaptation and mental

health of nursing students: A cross-sectional study. Nurse education in practice. 2021;55: 103145.
16. Oliveira Silva G, Games AKF, Cabral GSL, Siqueira KM, Aredes NDA, Júnior HG. Academic performance beyond the metrics: A qualitative content analysis of nursing students' perceptions. Nurse Educ Today 2023;131:105995.
17. Singh N, Kulkarni S, Gupta R. Is emotional intelligence related to objective parameters of academic performance in medical, dental, and nursing students: A systematic review. Education for health (Abingdon, England) 2020;33(1):8-12.
18. Tanji F, Nanbu H, Ono M, Abe N, Nitta J. The association between resilience and academic performance among nursing students: a cross-sectional study in Japan. J Rural Med : JRM 2021;16(4):206-13.
19. Tavares N. The use and impact of game-based learning on the learning experience and knowledge retention of nursing undergraduate students: A systematic literature review. Nurse Educ Today 2022;117:105484.
20. Terry D, Peck B. Academic and clinical performance among nursing students: What's grit go to do with it? Nurse Educ today 2020;88:104371.
21. Wei H, Dorn A, Hutto H, Webb Corbett R, Haberstroh A, Larson K. Impacts of Nursing Student Burnout on Psychological Well-Being and Academic Achievement. J Nursing Educ 2021;60(7):369-76.

Original Article

Job Satisfaction of Female Nursing Staff

Work Family Conflict and Their Outcome Regarding Job Satisfaction of Female Nursing Staff

Zumirah Atiq, Aniba Zahid, Athar Maqbool, M. Sohaib Siddiq, Azmat Ali Rawn and Humna Akhtar Ali

ABSTRACT

Objective: This study aimed to examine the relationship between work-family conflict, job satisfaction, and job performance among female nurses, focusing on how work-family conflict affects job satisfaction and performance in a high-stress healthcare environment.

Study Design: Quantitative cross-sectional study

Place and Duration of Study: This study was conducted at the Department of Anatomy, M. Islam Medical College, Gujranwala from January to December 2024.

Methods: This quantitative cross-sectional study was conducted from January to December 2024, including 139 female nurses selected through non-probability sampling. Data were collected using structured questionnaires incorporating the Netemeyer Work-Family Conflict Scale and the Minnesota Satisfaction Questionnaire. Female nurses aged 20–60 years were included, while paramedics, house officers, and doctors were excluded. Data analysis was performed using regression techniques in IBM SPSS.

Results: The study revealed a weak positive correlation between work-family conflict (WFC) and job satisfaction ($r = 0.211$, $p = 0.013$), with mean scores of 14.02±2.31 and 69.64±10.29, respectively. Marital status, salary, and education showed no significant impact on either variable. Most participants were unmarried (94.2%) and earned ≤50,000 rupees (89.9%). These results differ from global findings, indicating that cultural and contextual factors in Pakistan may shape nurses' experiences of WFC.

Conclusion: This study reveals a complex link between work-family conflict (WFC) and job satisfaction among female nurses in Pakistan, highlighting the need for tailored interventions to improve work-life balance. The unexpected weak positive correlation calls for policies like flexible scheduling and stress management. Future research with larger, more diverse samples and longitudinal approaches is recommended to guide strategies for enhancing nursing performance and patient care.

Key Words: Work-family conflict (WFC), Job satisfaction, Female nursing staff, Healthcare setting.

Citation of article: Atiq Z, Zahid A, Maqbool A, Siddiq MS, Rawn AA, Ali HA. Work Family Conflict and Their Outcome Regarding Job Satisfaction of Female Nursing Staff. Med Forum 2025;36(8):54-58. doi:10.60110/medforum.360811.

INTRODUCTION

In demanding work environments like Healthcare Services, ensuring employee performance is crucial. Various factors influence employee performance, including work-family conflict (WFC), job satisfaction, work environment, and compensation policies, among others.

Department of Anatomy, M. Islam Medical College, Gujranwala.

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

Received: March, 2025
Reviewed: April-May, 2025
Accepted: June, 2025

This is because performance is strongly connected to effectiveness, knowledge management, and quality on one hand, and to organizational management, funding, and growth on the other.

Multiple studies carried out worldwide have consistently identified work-family conflict (WFC) as a negative predictor of job satisfaction, with its presence contributing to decreased levels of overall job satisfaction.[1-5]

The bulk of research has indeed concentrated on correlating job satisfaction with work-family conflicts, rather than exploring the relationship with the job performance of nurses, which crucially impacts their mental health and turnover.

There is a lack of published studies examining the incidence of work-family conflict (WFC) among Pakistani nurses and its impact on job satisfaction levels. In Pakistan, there's a pressing need for more research on nurses because of the high nurse-to-patient ratio and the exceptionally stressful nature of the nursing profession. According to the Pakistan Nursing

Council, in Punjab, there are 57,271 registered nurses, with females comprising the overwhelming majority at 53,721, outnumbering male nurses by a considerable margin. As highlighted earlier, global organizations recognize the importance of comprehending the differences in work-family dynamics across various countries or regions and identifying the key factors driving these variations.[6]

It is emphasized that nursing, being predominantly female and characterized by demanding work conditions, underscores the significance of examining work-family conflict, job satisfaction, and job performance within the nursing context. In this research, female nurses were chosen as the focus due to issues concerning performance variables, work-life balance, and job satisfaction, compounded by the dual responsibilities of employment and homemaking that women typically contend with. To optimize work-life balance and achieve strong performance, it's essential for a female nurse to possess a heightened sense of job satisfaction. Female nurses' performance levels are positively correlated with their satisfaction levels regarding their work; the higher the satisfaction, the better the performance.[2]

METHODS

This study was conducted on female nursing staff at M. Islam Teaching Hospital Gujranwala from January 2024 to December 2024. It is a quantitative, cross sectional descriptive study. Study sample consists of 139 female nurses from M. Islam Teaching Hospital Gujranwala after taking ethical approval from the Ethical Review Committee. Non probability selection technique is applied. The target population consisted of nurses in a tertiary care hospital. A sample of 139 female nurses were selected for this study. Nursing staff was given a survey questionnaire and data was collected by hand regarding their work-family conflicts and job satisfaction. Work-family conflicts were evaluated using the questionnaire from the paper by Netemeyer.[8] Job satisfaction among nursing staff was measured using the Minnesota Satisfaction Questionnaire, developed at the university of Minnesota and data was collected by hand.

Criteria for inclusion: Female nursing staff working at M. Islam Teaching Hospital Gujranwala between ages of 20 to 60.

Exclusion criteria: Paramedic staff, House officers, Doctors of M. Islam Teaching Hospital Gujranwala. The collected data was analyzed using the regression technique by utilizing IBM SPSS software.

The following variables were considered while designing the questionnaire:

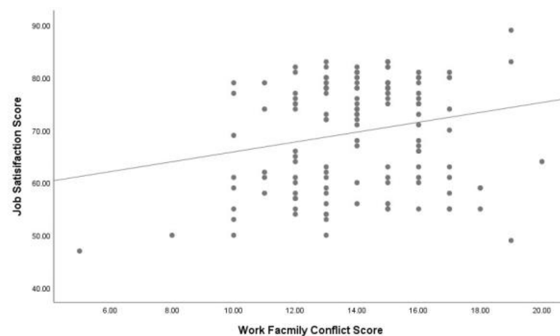
Work Family Conflict: the conflict that arises when fulfilling work responsibilities clashes with meeting family demands, impacting an individual's ability to balance both roles effectively.

Job Satisfaction: the employees' positive attitudes toward work encompass their outlook and approach to tasks, challenges, and overall work environment.

Employee Performance: the extent to which an employee successfully completes their tasks with both satisfactory quality and quantity, in accordance with their designated responsibilities.

RESULTS

Mean age of study participants was 30.79±4.80. Minimum and maximum age of study participants was 23 and 45 years. Among study participants only 8 (5.8%) were married and 131 (94.2%) were unmarried. Educational status shows that 123 (88.5%) participants were matric pass and the remaining 16 (11.5%) had BSc nursing degree. Salary status showed that 125 (89.9%) had salary up to 50,000 and 14 (10.1%) salary was >50,000 rupees. Table-1 shows mean score for each question of job satisfaction. Higher score shows higher satisfaction and lower score lower satisfaction. Table-2 presents Job satisfaction score and work family conflict score in comparison to marital status, salary and educational status of study participants. No significant difference was seen in job satisfaction score and work family conflict score in relation to marital status, salary and education.



Correlation Coefficient (r) = 0.211, p-value=0.013

Figure No.1: Scatter plot for Work family conflict score and Job satisfaction score

Weak positive correlation can be seen work family conflict score and job satisfaction score

Table No.1: Job satisfaction of Study Participants (n=139)

Sr. No.	Work Family Conflict	Mean	SD
1	The demands of my job interfere with my family responsibilities	2.44	0.86
2	Due to my job, I'm unable to stay as involved as I would like in maintaining close relationships with my family or spouse/partner	2.46	0.84
3	The tasks I want to complete at home remain unfinished because of the demands of my job.	3.12	0.73
4	My job often requires me to miss important family events.	3.03	1.1
5	My work responsibilities conflict with the commitments and obligations I have toward my family or spouse.	2.94	0.85
Total Score		14.02±2.31	
Sr.No.	**Job satisfaction**	**Mean**	**SD**
1	Remaining engaged at all times	3.08	1.10
2	The chance to work alone on the job	3.36	.99
3	The opportunity to try various activities occasionally	3.04	1.00
4	The chance to be "somebody" in the community	3.21	.93
5	The way my boss handles his/her workers	3.55	1.02
6	The decision-making skills of my supervisor	3.62	.89
7	Having the ability to act in ways that align with my conscience.	3.72	.96
8	How my job offers stable employment	3.37	.89
9	The opportunity to help others.	3.81	.97
10	The chance to tell people what to do	3.50	1.05
11	An opportunity to put my talents to use	3.44	1.23
12	The approach to enforcing company policies	3.54	.97
13	The compensation I receive and the workload I handle	3.59	1.12
14	The opportunities for career growth in this position	3.31	1.07
15	The ability to rely on my own discretion.	3.71	1.09
16	The opportunity to experiment with my own approach to completing the task.	3.76	.80
17	The workplace environment	3.47	1.25
18	The way my team members cooperate with each other	3.65	1.11
19	The appreciation I receive for performing well	3.36	1.20
20	The feeling of accomplishment I get from the work	3.55	.95
Total Score		69.64±10.29	

Table No.2: Compassion of Job satisfaction with Study Participants Characteristics

		n	Job Satisfaction Score		Work Family Conflict Score	
			Mean±SD	p-value[a]	Mean±SD	p-value[a]
Marital Status	**Married**	**8**	70.00±9.42	**0.919**	15.12±1.72	**0.165**
	Unmarried	**131**	69.61±10.38		13.95±2.32	
Salary	**Up to 50,000**	**125**	69.63±10.14	**0.978**	14.05±2.29	**0.602**
	>50,000	**14**	69.71±11.97		13.71±2.49	
Education	**Matriculation**	**123**	69.67±10.12	**0.913**	14.06±2.31	**0.541**
	BSc Nursing	**16**	69.37±11.88		13.68±2.33	

Note: (a): Independent sample t-test

DISCUSSION

The study sought to examine the connection between work-family conflict (WFC), job satisfaction, and job performance among female nurses at M. Islam Teaching Hospital in Gujranwala, Pakistan. The findings revealed a weak positive correlation between work-family conflict and job satisfaction, which contrasts with the majority of global studies that have consistently identified WFC as a negative predictor of job satisfaction.[5] This discrepancy may be attributed to cultural and contextual differences in Pakistan, where societal norms and family structures might influence how nurses perceive and manage work-family conflicts.

Work-Family Conflict and Job Satisfaction

The study found that the mean work-family conflict score was relatively low (14.02±2.31), suggesting that the nursing staff in this setting may not experience extreme levels of conflict between their work and family roles. However, the weak positive correlation ($r = 0.211$, $p = 0.013$) between WFC and job satisfaction indicates that, in some cases, higher levels of WFC were associated with slightly higher job satisfaction. This finding is unexpected, as previous research has shown that WFC typically leads to decreased job satisfaction due to the stress and strain it places on individuals[6]. One possible explanation for this anomaly could be the coping mechanisms employed by the nurses, such as social support from family or colleagues, which might mitigate the negative effects of WFC.[8] Additionally, the predominantly unmarried status of the participants (94.2%) may have influenced the results, as unmarried individuals might have fewer family responsibilities and thus experience less conflict.

Job Satisfaction and Its Determinants

The mean job satisfaction score was 69.64±10.29, indicating a moderate level of satisfaction among the nursing staff. Factors such as salary, marital status, and educational level did not significantly influence job satisfaction or WFC scores, which aligns with some studies[9,10] but contradicts others that have found these variables to be significant predictors of job satisfaction[11,12]. The lack of significant differences based on these variables suggests that job satisfaction among nurses in this context may be more influenced by intrinsic factors, such as the nature of the work, relationships with colleagues, and the sense of accomplishment derived from patient care.[13]

Implications for Nursing Performance

The study emphasizes the need to address work-family conflict and job satisfaction to enhance nursing performance. Although the correlation between WFC and job satisfaction was weak, it remains essential for healthcare organizations to adopt policies that promote work-life balance, including flexible work hours, childcare assistance, and stress management initiatives.[14] These measures could help reduce WFC and enhance job satisfaction, ultimately leading to better job performance and patient care outcomes.[13]

Cultural and Contextual Considerations

The findings of this study underscore the need for context-specific research, particularly in regions like Pakistan, where cultural norms and healthcare systems differ significantly from those in Western countries. For instance, the high nurse-to-patient ratio and the stressful nature of the nursing profession in Pakistan may exacerbate WFC and job dissatisfaction.[15] Therefore, interventions tailored to the local context, such as improving working conditions, providing adequate compensation, and offering professional development opportunities, are essential for enhancing job satisfaction and reducing WFC among nurses.[16-18]

Limitations

This study has a few limitations. First, its cross-sectional design restricts the ability to draw causal inferences between WFC, job satisfaction, and job performance. Second, the relatively small sample size ($n = 139$) and the inclusion of only female nurses from a single hospital may reduce the broader applicability of the results. Future studies should consider larger, more diverse samples and adopt longitudinal designs to gain deeper insights into the evolving relationship between WFC and job satisfaction over time.

CONCLUSION

In summary, this research offers important understanding of the link between work-family conflict and job satisfaction among female nurses in Pakistan. While the findings suggest a weak positive correlation between WFC and job satisfaction, they also highlight the need for further research to explore the underlying mechanisms and contextual factors that influence these relationships. Addressing WFC and enhancing job satisfaction through targeted interventions could significantly improve nursing performance and, ultimately, patient care outcomes in healthcare settings.

Acknowledgement: We sincerely thank Mr. Kashif Siddique for his contribution to the statistical analysis, which greatly enhanced the quality of this research.

Author's Contribution:

Concept & Design or acquisition of analysis or interpretation of data:	Zumirah Atiq, Aniba Zahid, Athar Maqbool
Drafting or Revising Critically:	M. Sohaib Siddiq, Azmat Ali Rawn, Humna Akhtar Ali
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.

Source of Funding: None

Ethical Approval: No.CM/MIMDC/21/23 Dated 28.12.2023

REFERENCES

1. Puspitawati NM, Yuliawan AK. The role mediation of work satisfaction in the effect of work family conflict on female nurse performance. Int J Business, Economics Law 2019;19(5):19-24.
2. Wijaya PD, Suwandana IG. The role of job satisfaction, work-life balance on the job performance of female nurses at local general hospital. Europ J Business Management Res 2022; 7(1): 208-12. DOI: 10.24018/ejbmr.2022.7.1.1268.
3. AlAzzam M, Abu Al Rub RF, Nazzal AH. The relationship between work–family conflict and job satisfaction among hospital nurses. In Nurs forum 2017;52 (4): 278-288. doi: 10.1111/nuf.12199.
4. Haji Matarsat HM, Rahman HA, Abdul-Mumin K. Work-family conflict, health status and job satisfaction among nurses. Bri J Nursing 2021; 30(1): 54-8. DOI: 10.12968/bjon.2021.30.1.54.
5. Selebi C, Minnaar A. Job satisfaction among nurses in a public hospital in Gauteng. Curationis 2007;30(3): 53-61.
6. Hajar N, Rumaya J, Yaacob S. The effect of job satisfaction and family satisfaction on work-family conflict (W-FC) and family-work conflict (F-WC) among married female nurses in Shiraz-Iran. Asian Social Science 2011; 7(2): 88-95. DOI:10.5539/ ass.v7n2p88.
7. Safarpour HA, Sabzevari SA, Delpisheh A. A study on the occupational stress, job satisfaction and job performance among hospital nurses in Ilam, Iran. J Clin Diagnostic Res 2018;12(6):1-5. DOI: 10.7860/JCDR/2018/27410.11573.
8. Wang ML, Tsai LJ. Work–family conflict and job performance in nurses: The moderating effects of social support. J Nursing Res 2014;22(3):200-7. DOI:10.1097/jnr.0000000000000040.
9. Sudiarditha IK, Susita D, Kartini TM. Compensation and work discipline on employee performance with job satisfaction as intervening. Trikonomika 2019;18(2):27-34.
10. Bahalkani HA, Kumar R, Lakho AR, Mahar B, Mazhar SB, Majeed A. Job satisfaction in nurses working in tertiary level health care settings of Islamabad, Pakistan. J Ayub Med Coll Abbottabad 2011;23(3): 130-3.
11. Lascelles K, Groves S, Hawton K. Suicide among nurses: What can we do to protect our work force? J Adv Nurs 2024;80(5):1667-1669. DOI: 10.1111/jan.15956.
12. Platis C, Reklitis P, Zimeras SU. Relation between job satisfaction and job performance in healthcare services. Procedia-Social Behavioral Sci 2015; 175: 480-7. DOI: 10.1016/j.sbspro.2015.01.1226.
13. Ekici D, Cerit K, MERT T. Factors that influence nurses’ work-family conflict, job satisfaction, and intention to leave in a private hospital in Turkey. Hospital Practices Res 2017;2(4):102-108. DOI:10.15171/hpr.2017.25.
14. Feskanich D, Hastrup JL, Marshall JR, Colditz GA, Stampfer MJ, Willett WC, et al. Stress and suicide in the nurses' health study. J Epidemiol Comm Health 2002;56(2):95–98. DOI: 10.1136/jech. 56.2.95.
15. Grzywacz JG, Frone MR, Brewer CS, Kovner CT. Quantifying work–family conflict among registered nurses. Research Nursing Health 2006; 29(5): 414-26. DOI:10.1002/nur.20133.
16. Patel CJ, Beekhan A, Paruk Z, Ramgoon S. Work-family conflict, job satisfaction and spousal support: An exploratory study of nurses' experience. Curationis 2008;31(1):38-44. DOI: 10.4102/curationis.v31i1.906.
17. Ranjan KA, Khatke A. Dimensions of work life balance and its impact on job satisfaction of clinical staff in cancer hospitals. Int J Res Engin Sci Manage 2021;4(6):73-6.
18. Bagheri Hosseinabadi M, Etemadinezhad S, Khanjani N, Ahmadi O, Gholinia H, Galeshi M, et al. Evaluating the relationship between job stress and job satisfaction among female hospital nurses in Babol: An application of structural equation modeling. Health Promot Perspect 2018;8(2):102-108. DOI: 10.15171/hpp.2018.13.

Original Article

The Influence of Sociodemographic Factors on Resilience and Subjective Wellbeing among University Students

Abeer Abd AL-Abass Sattar[1] and Sarab Nasr Fadhil[2]

ABSTRACT

Objective: To assess the impact of selected sociodemographic factors on resilience and SWB among female university students in southern Iraq.

Study Design: Descriptive cross-sectional study

Place and Duration of Study: This study was conducted at the College of Education for Human Sciences, Nasiriyah City Iraq from 19th November 2024 to 13th April 2025.

Methods: A total of 396 female students were recruited using simple random sampling. Data were collected through a validated self-administered questionnaire measuring resilience (CD-RISC-10) and global life satisfaction (GLS). Instruments were translated using a forward-backward translation process and reviewed by an expert panel. Reliability coefficients ranged from 0.77 to 0.90.

Results: A significant difference was found in resilience and subjective wellbeing based on socioeconomic class ($p<0.001$), with higher scores reported among students from upper-class backgrounds. No significant differences were observed in age, academic level or body mass index.

Conclusion: Socioeconomic status significantly influences resilience and subjective wellbeing among university students. These findings underscore the importance of developing targeted mental health support programs tailored to students from disadvantaged backgrounds.

Key Words: Influence, Sociodemographic Factors, Resilience, Subjective wellbeing

Citation of article: Sattar AA, Fadhil SN. The Influence of Sociodemographic Factors on Resilience and Subjective Wellbeing among University Students. Med Forum 2025;36(8):59-63. doi:10.60110/medforum.360812.

INTRODUCTION

University life represents a critical transitional period when students encounter various academic, social, and emotional challenges. These experiences can significantly impact their mental health, emotional stability, and overall quality of life.[1] In this context, resilience, the ability to adapt and recover from adversity, is vital in helping students cope with stress and maintain psychological balance.[2] Similarly, subjective wellbeing - an individual's self-assessment of happiness, life satisfaction, and emotional functioning - is increasingly recognized as a key indicator of mental health among young adults.[3]

For instance, students from lower socioeconomic backgrounds may face increased financial stressors, potentially diminishing their psychological resources and coping mechanisms.[4] Understanding how these sociodemographic factors affect resilience and subjective well-being is crucial for developing effective mental health interventions and support services within university settings.[5] By identifying vulnerable subgroups and their specific challenges, universities can tailor their programs to foster a healthier, more supportive academic environment.[6]

Despite the growing recognition of resilience and subjective well-being as critical aspects of mental health in university students, there remains a lack of localized research examining how these constructs are shaped by sociodemographic variables within the Iraqi context. Most existing studies are either conducted in Western societies or focus on clinical populations, limiting their generalizability to healthy, non-clinical university cohorts in the Middle East. This study addresses this gap by exploring the association between sociodemographics and sociodemographic characteristics including socioeconomic status, academic level, BMI, and age and psychological well-being among female university students in southern Iraq. By contextualizing these variables within a population that faces unique cultural, educational, and economic challenges, this research contributes novel insights that can inform more targeted and culturally appropriate mental health interventions in academic settings.

[1.] Department of Community Health Nursing / Maternal & Neonate Nursing[2], College of Nursing, University of Baghdad, Baghdad, Iraq.

Correspondence: Abeer Abd AL-Abass Sattar, Community Health Nursing, Department of Community Health Nursing, College of Nursing, University of Baghdad, Baghdad Iraq.
Contact No: 07873205442
Email: abeer.abd2306m@conursing.uobaghdad.edu.iq

Received: May, 2025
Reviewed: June, 2025
Accepted: July, 2025

METHODS

This quantitative cross-sectional design was employed from 19th November 2024 to 13th April 2025. The study was conducted at the College of Education for Human Sciences in Nasiriyah City, Iraq. After receiving ethical approval from the College of Nursing, University of Baghdad (Approval No. 68, dated 5/12/2024), formal permissions were obtained from the Ministry of Higher Education and Scientific Research and the College of Education for Human Sciences at Thi-Qar University. Participants were fully informed about the study objectives and procedures, and informed consent was obtained. Confidentiality and anonymity were ensured throughout the research process. The participating college was selected using a simple random sampling technique. A simple random sampling method was applied to select one female-only college from the faculties of education for humanities in Nasiriyah. All eligible colleges were listed, and one was randomly drawn using a lottery method. The institution selected was the College of Education for Human Sciences. Three hundred ninety-six female university students were selected through probability sampling for inclusion in the present study.

Resilience was assessed using a modified version of the 10-item Connor-Davidson Resilience Scale (CD-RISC-10)[7], adapted from the original scale by Connor and Davidson.[8] An 11-point Likert scale (0 = "Not true at all" to 10 = "Completely true") was used to align with other measures in the study and reduce cognitive burden. This scale showed high internal consistency (Cronbach's α = 0.90). Subjective Wellbeing (SWB) was measured using the Global Life Satisfaction (GLS) item recommended by the International Wellbeing Group:[9] "How satisfied are you with your life as a whole?" Responses were rated from 0 (no satisfaction at all) to 10 (completely satisfied).

Data were collected at a single point in time using a self-administered questionnaire. Participants completed the instrument independently under the researcher's supervision. The questionnaire was translated using a forward-backward translation process. Two bilingual experts independently translated the instrument from English to Arabic. A panel of experts compared and reconciled the translations. Two additional native Arabic-speaking translators then performed back-translations into English. Final reconciliation ensured semantic and conceptual equivalence. A panel of 11 faculty experts from the College of Nursing, University of Baghdad established face and content validity. Internal consistency reliability was confirmed with Cronbach's alpha coefficients ranging from 0.77 to 0.90. Data were analyzed using SPSS-27. One-way ANOVA were used to assess group differences in resilience and subjective wellbeing.

RESULTS

The study results show that the mean age of participants is 20.76±2.03 years, with the largest age groups being 18-19 years (32.1%) and 20-21 years (30.4%). Regarding parental education, about one-fifth of fathers are middle school graduates (19.6%).

Table No. 1: Sociodemographic characteristics of the participants (N = 396)

Variable	No.	%
Age (years)		
18-19	126	32.1
20-21	119	30.4
22-23	107	27.3
24-25	40	10.2
Father's Level of Education		
Unable to read and write	29	7.4
Read and write	63	16.1
Elementary school	69	17.6
Middle school	77	19.6
High school	48	12.2
Diploma	45	11.5
Bachelor's degree	39	9.9
Postgraduate Diploma	11	2.8
Master's degree	5	1.3
Doctoral Degree	6	1.5
Mother's Level of Education		
Unable to read and write	62	15.8
Read and write	106	27.0
Elementary school	106	27.0
Middle school	57	14.5
High school	28	7.1
Diploma	11	2.8
Bachelor's degree	20	5.1
Doctoral Degree	2	0.5
Occupation		
Unemployed	50	12.8
Unskilled worker	43	11.0
Semi-skilled worker	31	7.9
Skilled worker	82	20.9
Clerical, Shop owner, farmer	62	15.8
Semi-Professional	54	13.8
Professional	70	17.9
Income (Iraqi Dinar)		
< 300.000	98	25.0
300.000-600.000	120	30.6
601.000-900.000	78	19.9
901.000-1.200.000	45	11.5
1.201.000-1.500.000	35	8.9
≥ 1.501.000	16	4.1
Family's Socioeconomic Class		
Lower Class	15	3.8
Lower Middle Class	199	50.8
Middle Class	98	25.0
Upper Middle Class	78	19.9
Upper Class	2	0.5

Table No.2: Difference in resilience and subjective wellbeing among age groups applying ANOVA test

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	1564.396	3	521.465	1.213	.305
Within Groups	166826.666	388	429.966		
Total	168391.061	391			

Df: Degree of freedom, F: F-statistics, Sig: Significance No statistically significant differences were found (p>0.05)

Table No. 3: Differences in resilience and subjective wellbeing by academic level applying ANOVA test

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	2963.350	3	987.783	2.317	.075
Within Groups	165427.711	388	426.360		
Total	168391.061	391			

Table No. 4: Differences in resilience and subjective wellbeing by socioeconomic class applying ANOVA test

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	8606.349	4	2151.587	5.211	.000
Within Groups	159784.712	387	412.880		
Total	168391.061	391			

Table No.5: Difference in resilience and resilience and subjective wellbeing among body mass index class groups applying ANOVA test

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	2427.157	3	809.052	1.891	.130
Within Groups	165963.904	388	427.742		
Total	168391.061	391			

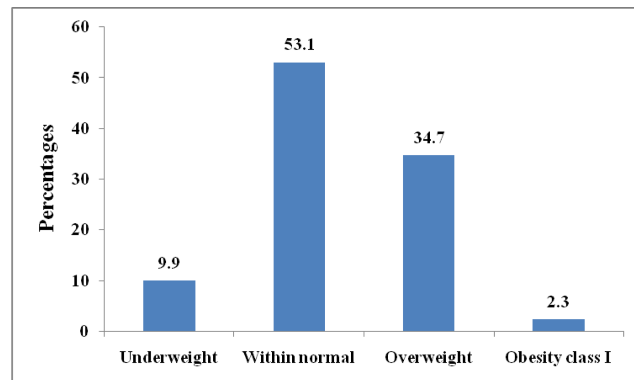


Figure No. 1: Participants' distribution according to their body mass index

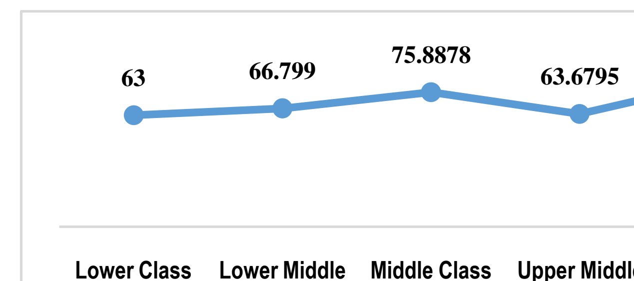


Figure No. 2: Mean values of participants' resilience and subjective wellbeing among family's socioeconomic class groups

In comparison, more than a quarter of mothers can read and write or are elementary school graduates (27.0% each). Regarding household occupation, skilled workers represent the largest group (20.9%), followed by professionals (17.9%). Concerning family income, nearly one-third reported monthly income between 300,000 and 600,000 ID (30.6%). Over half of the families belong to the lower middle socioeconomic class (50.8%) [Table 1].

More than half are within normal weight-to-height proportion 208 (53.1%), followed by those who are overweight 136 (34.7%), those who are underweight 39 (9.9%), and those who have obesity class I 9 (2.3%) [Fig. 1). There was no statistically significant difference in resilience and subjective wellbeing among age groups (Table 2). Statistically no significant difference was found in grade groups' resilience and subjective well-being (Table 3). Table 4 and Figure 2 demonstrate a statistically significant difference in resilience and subjective wellbeing among families' socioeconomic class groups (p=0.000). Table 5 demonstrate no statistically significant difference in resilience and subjective wellbeing among body mass index class groups.

DISCUSSION

In the present study, the mean age was 20.76 years and age distribution shows that a substantial portion of participants (62.5%) were between 18 and 21 years old, indicating a focus on younger university students. This finding is consistent with Awad and Naji[10], who reported that the average age of female nursing students was 20.63 years, with a significant association between age and preconception health behaviors. Furthermore, the socioeconomic status of participants in the current

study reveals that most students come from lower-middle-class families (50.8%). This trend aligns with findings by Tuffah and Al-Jubouri[11], who observed a significant relationship between academic stress and the sociodemographic sociodemographic background of nursing students during the COVID-19 pandemic. Similarly, Abdown and Hussein[12] highlighted the influence of lifestyle behaviors on students' mental well-being, emphasizing the role of social and economic conditions.

This study showed that no significant difference in resilience and SWB among different age groups. This suggests that chronological age alone may not strongly determine psychological outcomes in young adults. This finding aligns with the study by Tseliou and Ashfield-Watt[13], who reported that resilience is shaped more by individual coping strategies and support systems than by age. In the Iraqi context, Ali and Hussein[14] found no significant association between age and psychological hardiness among ICU nurses. It is plausible that in a collectivist society like Iraq, the responsibilities and life pressures typically associated with age may not vary significantly among university-aged individuals, thereby diluting age-related differences in mental health.

In the present study the differences in mean scores were observed across BMI categories, the results were not statistically significant ($p = 0.130$). This finding contrast with study of Li et al[15], which reported better psychological functioning among individuals with normal BMI. However, the current results suggest that BMI alone may not be a critical determinant of resilience or wellbeing in this population. Taher[16] and Sahib et al[17] reported that lifestyle behaviors and coping strategies rather than physical indicators like BMI may play a more substantial role in mental health. Furthermore, cultural attitudes toward body image and weight in Iraqi society may buffer against the psychological effects typically associated with BMI in Western populations.

This study showed that strongest finding was the significant association between socioeconomic status and psychological outcomes. Students from upper-middle and upper-class families exhibited higher resilience and SWB than those from lower classes. These results are consistent with studies conducted by Al-Hadithi et al[18] and Al-Khafaji and Hussein[19], which emphasized the influence of economic stability on mental health. Socioeconomic resources likely enhance access to social support, healthier living conditions, and mental health services ,all contributing to better psychological outcomes. In the Iraqi setting, where healthcare access and mental health infrastructure are limited, financial security may serve as a crucial protective factor.

In the current study, no significant differences in resilience and SWB across academic levels. This indicates that academic progression does not directly influence psychological health in this sample. Supporting evidence from Mohammed[20] suggests that environmental and personal circumstances influence nursing students' stress and wellbeing more than academic standing. Moreover, the study by Abdown and Hussein[12] highlighted that lifestyle behaviors, such as sleep and diet, have a greater psychological impact than academics. This may indicate that institutional or structural academic challenges affect students equally, regardless of their academic year.

This study showed that a significant strength of this study is its use of validated psychological instruments with strong reliability alongside a relatively large, randomly selected sample. However, several limitations must be acknowledged. The cross-sectional design precludes causal inferences. The sample included only female students from a single academic institution, which limits generalizability. Additionally, self-reported measures are susceptible to bias.

The findings of this study highlight the need for targeted mental health interventions that consider students' socioeconomic conditions. Universities should implement support services, such as financial aid, mental health counseling, and peer mentorship programs, especially for those from lower-income backgrounds. Health promotion strategies focusing on nutrition, physical activity, and coping skills can also enhance resilience and wellbeing.

Recommendations: The study findings underscore the importance of addressing socioeconomic disparities to enhance students' psychological resilience and wellbeing. Universities should provide accessible mental health services, promote supportive peer environments, and implement health promotion programs targeting students from disadvantaged backgrounds. Additionally, future research should explore longitudinal effects and test targeted interventions within similar educational settings.

CONCLUSION

Overall, the findings underscore the multifactorial nature of psychological resilience and wellbeing, emphasizing the role of external environmental and economic factors. Further longitudinal and interventional studies are recommended to examine how these factors interact over time and to evaluate the effectiveness of tailored mental health programs within Iraqi universities. Socioeconomic status significantly impacts resilience and wellbeing, with higher-status students showing better outcomes. Age and academic level had no significant effect, indicating that socioeconomic status and health behaviors are more crucial in shaping resilience and well-being.

Author's Contribution:

Concept & Design or	Abeer Abd AL-Abass

acquisition of analysis or interpretation of data:	Sattar, Sarab Nasr Fadhil
Drafting or Revising Critically:	Abeer Abd AL-Abass Sattar, Sarab Nasr Fadhil
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.

Source of Funding: None

Ethical Approval: No. 68 dated 5th December 2024

REFERENCES

1. Arslan G. Psychological resilience and mental health in university students: a structural equation modeling approach. J Am Coll Health 2021; 69(8): 936-45.
2. Masten AS. Global perspectives on resilience in children and youth. Child Dev 2014; 85(1): 6-20.
3. Diener E, Oishi S, Tay L. Advances in subjective wellbeing research. Nat Hum Behav 2018; 2(4): 253-60.
4. Arvidsdotter T, Marklund B, Kylén S, Taft C, Ekman I. Understanding socioeconomic influences on student wellbeing: A qualitative study. Int J Qualitative Studies Health Wellbeing 2020;15(1): 1831241.
5. World Health Organization. Mental health and psychosocial wellbeing among young people: A public health priority. Geneva: WHO, 2021; 19-23.
6. Brougham RR, Zail CM, Mendoza CM, Miller JR. Stress, sex differences, and coping strategies among college students. Curr Psychol 2009; 28(2): 85-97.
7. Campbell-Sills L, Stein MB. Psychometric analysis and refinement of the Connor–Davidson Resilience Scale (CD-RISC): Validation of a 10-item measure of resilience. J Traumatic Stress 2007;20(6):1019-28.
8. Connor KM, Davidson JRT. Developing a new resilience scale: The Connor-Davidson Resilience Scale (CD-RISC). Depression Anxiety 2003;18(2): 76-82.
9. International Wellbeing Group. Personal Wellbeing Index – Adult. 5th ed. Melbourne: Australian Centre on Quality of Life, Deakin University; 2013.p.19-45.
10. Awad AM, Naji AB. Health behaviors among high school students in Baqubah City/Iraq. Iraqi Nat J Nurs Specialties 2024;37(2):1-9.
11. Tuffah BM, Al-Jubouri M. Academic stress and its relationship with sociodemographic variables among nursing students during COVID-19 pandemic. Kufa J Nurs Sci 2021;11: 1-19.
12. Abdown SN, Hussein H. Lifestyle behavior and mental health among nursing collegians at Baghdad University. Int J Health Sci 2022;6(S2): 15209-16.
13. Tseliou F, Ashfield-Watt P. The association between resilience resources, contextual factors, and mental health status: a national population-based study. BMC Public Health 2022;22(1):602.
14. Ali N, Hussein I. The predictive role of sociodemographic sociodemographic factors in nurses' psychological hardiness. Iraqi Nat J Nurs Specialties 2023; 36(1): 44-7.
15. Zheng N, Zhuang M, Zhu Y, Wang Y, Ye M, Zhang Y, et al. Association between psychological resilience and body mass index in a community-based population: A cross-sectional study. Obes Sci Pract 2024;10(3):e761.
16. Taher TMJ. Association between eating habits and body mass index in a sample of medical college students in Wasit University. Indian J Public Health Res Develop 2019;10(6): 704-9.
17. Sahib AS, Raheem TS, Saleh MS, Khleel LS, Abdulhussein AM, Sadiq SR, et al. Eating behavior in a sample of overweight and obese: a cross-sectional study. J Obes Weight-Loss Medic 2016; 2(014): 10–23937.
18. Al-Hadithi TJ, Al-Shammari MA, Al-Obaidi, AR. Socioeconomic factors and psychological resilience among university students in Baghdad. J Nurs Educ Prac 2020; 10(6): 45–53.
19. Al-Khafaji MH, Hussein NK. A cross-sectional study of mental health outcomes and socioeconomic determinants among Iraqi nursing students. Int J Mental Health Nurs 2021; 30(2), 312-20.
20. Mohammed QQ. Stress and its associated factors among students of the College of Nursing University of Baghdad. (2016). Iraqi Nat J Nurs Specialties 2021;29(2):30-37.

Original Article

Effects of Mediating Model-Based Nursing Intervention on Nurse Retention and Employee Engagement in Organizational Culture

Muhammad Tahir, Madiha Mukhtar and Sarfraz Masih

ABSTRACT

Objective: To evaluate the impact of a mediating model-based nursing intervention on employee engagement, organizational culture, and nurse retention.

Study Design: Quasi-experimental study

Place and Duration of Study: This study was conducted at the CDA Hospitals in Islamabad and Pakistan Institute of Medical Sciences from 1st June 2024 to 30th November 2024.

Methods: 110 nurses were selected. The 12-week intervention began with a pre-assessment, followed by data collection after completion of the intervention.

Results: The significant improvements across all three domains. Employee engagement increased with mean of 24.24±3.907, organizational culture improved with mean of 24.84±2.293, and nurse retention rose with mean of 18.80±2.789). Negative Z-test values (employee engagement: -9.135; organizational culture: -9.123; nurse retention: -9.258) indicated statistically significant ($p<0.05$) differences between pre- and post-intervention scores.

Conclusion: The mediating model-based nursing intervention effectively enhanced employee engagement, strengthened organizational culture, and improved nurse retention. These findings highlight the potential of structured interventions to create a more supportive and sustainable work environment for nurses.

Key Words: Employee Engagement, Organizational Culture, Nurse Retention, Model-Based Nursing Intervention

Citation of article: Tahir M, Mukhtar M, Masih S. Effects of Mediating Model-Based Nursing Intervention on Nurse Retention and Employee Engagement in Organizational Culture. Med Forum 2025;36(8):64-69. doi:10.60110/medforum.360813.

INTRODUCTION

The healthcare industry is complex and dynamic, making effective management critical for cultivating positive organizational culture, enhancing employee engagement, and retaining skilled staff.[1] High turnover rates, staffing shortages, and migration of healthcare professionals pose serious challenges, particularly in developing countries like Pakistan.[2] Between 2019 and 2021, more than 1.1 million skilled workers left Pakistan, including over 40,000 physicians, while the number of registered nurses remains alarmingly low (116,659 for a population exceeding 225 million).[3] This shortage highlights the urgent need for strategies that strengthen workforce stability and prevent the loss of vital expertise.

Department of Lahore School of Nursing, The University of Lahore.

Correspondence: Muhammad Tahir, MSN Student, Lahore School of Nursing, The University of Lahore.
Contact No: 03005585390
Email: mtahir.pims@gmail.com

Received: January, 2025
Reviewed: February-March, 2025
Accepted: April, 2025

Nursing is a demanding profession marked by high burnout and turnover. Globally, developed nations mitigate workforce gaps by recruiting from underdeveloped countries, further straining Pakistan's healthcare system.[4] Employee retention, defined as an organization's ability to maintain a stable workforce, is closely tied to job satisfaction, supportive work environments, and professional development opportunities.[5] Research indicates that low retention rates negatively impact organizational culture, management practices, and ultimately patient care.[6]

Employee engagement, the emotional commitment of workers to their organization, is equally crucial. In nursing, engagement directly influences job satisfaction, performance, and patient outcomes.[7] Positive organizational culture, supportive leadership, and opportunities for growth are central to sustaining engagement.[8] Model-based nursing interventions provide a structured approach to addressing these challenges by reducing burnout, fostering teamwork, incorporating mentorship, and creating a sense of community.[9] Such interventions not only improve retention but also enhance organizational efficiency and patient care quality.[10]

Despite their proven benefits internationally, model-based interventions remain underutilized in Pakistan, where traditional retention strategies focus mainly on

financial incentives.[11] This gap underscores the need to evaluate the effectiveness of structured, model-based approaches in improving engagement, culture, and retention within the Pakistani healthcare context.[12]

Therefore the present study was conducted to assess the effect of mediating model-based nursing interventions on employee engagement, organizational culture, and nurse retention.

METHODS

The effect of a model-based nursing intervention on organizational culture, employee engagement, and nurse retention were evaluated using a quasi-experimental pre and post study design. The Pakistan Institute of Medical Sciences and CDA Hospital Islamabad, two governmental hospitals in the city, served as the study's sites. Nurses, head nurses, and supervisors from both institutions were studied. From the research settings, 110 people were recruited as a non-probability purposive sample. Nurse supervisors, head nurses, and male and female nurses with ages ranging from 25-50 were enlisted. The study excluded nurses who worked in private hospitals, had less than a year of experience, or lacked a bachelor's degree in nursing. First, approval was given by the Research Ethical Committee (REC) of the University of Lahore (Letter No. 169/24) dated 8/3/2024. The nursing superintendents of the hospitals in question were then asked for their consent. Data from the individuals was gathered using a structured questionnaire. Overall, seven questions about employee engagement (EE1–EE7), six questions about organizational culture (OC1–OC6), and five questions about employee retention (ER1–ER5) were posed. Before any data was collected from the study participants, their signed informed consent was obtained. The goal of this investigation was also conveyed to them. All of the participants were introduced. The pre-assessment was completed in May of 2024. Following the pre-assessment, a 12-week educational program utilizing model-based nursing intervention was offered. This educational program was developed with the help of different books, internet material and professional leaders experts. The educational intervention consisted of 4 sessions where each session consisted of 50-60 minutes. The participants were divided in to 5 groups (each group consisted of 20-25 participants). Each session had specific objectives regarding organizational culture role in nurses' engagement and employee retention. This was done through different learning and teaching methods like brain storming, lecture, discussion and handout, Use illustrated media e.g. video, pictures and lab top. To conduct this educational program, the participants were approached in groups on the day of their availability at their respective departments. The educational interventions plan started from June, 2024 till August 2024, where each study participant received all the education sessions one by one each month during their duties. The data was used and analyzed through SPSS-21. Since the data on the effects of organizational culture, employee engagement, and nurse retention were not normally distributed, the non-parametric Wilcoxon sign rank test was employed.

RESULTS

The demographic information of the participants, such as age, gender, work status, education, religion, and work experience, provides a comprehensive picture of their backgrounds. Among the participants, 40.9% were in the 36–40 age range, 33.6% were between and 31 and 35 years and 16.4% were 25-30 years. Only a lesser percentage of people over 40 (9.1%) were over 40 years. Additionally, the largest job group was staff nursing with 53 individuals, or 48.2%, a lesser number (15 participants, 13.6%) were supervisors, whereas 38.2% (42 persons) were head nurses. The majority of participants 71 people, or 64.5% of the sample identified as Muslims. Of the 39 participants, the remaining 35.5% identified as Christians. The educational backgrounds of the participants also varied; 58 people, or 52.7% of the total, had earned a Bachelor of Science in Nursing (BSN) after completing post-registered nursing. With 48 individuals, or 43.6% of the total, the second-largest group held a generic BSN.

Table No.1: Demographic information of the participants (n=110)

Demographic characteristics	No.	%
Age (years)		
25-30	18	16.4
31-35	37	33.6
36-40	45	40.9
> 40	10	9.1
Gender		
Males	37	33.6
Females	73	66.4
Job Status		
Staff Nurse	53	48.2
Head Nurse	42	38.2
Supervisor	15	13.6
Religion		
Muslim	71	64.5
Christian	39	35.5
Education		
Post RN BSN	58	52.7
Generic BSN	48	43.6
MSN/MPH/MSPH	4	3.6
Job Experience (years)		
<5	7	6.4
6-10	21	19.1
11-15	54	49.1
>15	28	25.5

Four individuals, or 3.6% of the total, had a more advanced degree, such as a Master of Science in Public

Health (MSPH) or Master of Science in Nursing (MSN). There were 37, or 33.6%, male participants and 73, or 66.4%, female participants. Moreover, the largest group, with 54 individuals, or 49.1% of the sample, had 11–15 years of experience. Those with over 15 years of experience came next (28, or 25.5%). While a smaller portion of the sample had 6–10 years (19.1%), just 6.4% (7 participants) had 5 years or less of experience (Table 1).

Figure 1 displays the levels of employee engagement for a group of 110 workers both before and after an intervention. It appears that the intervention had a positive impact on overall engagement based on changes in engagement categories before and after the assessment. First, 62 employees, or 56.4% of the workforce, were categorized as having "Moderate Disengagement", 37 employees, or 33.6% displayed "Neutral Engagement", eleven employees, or 10% were found as "Moderate Engagement". Importantly, none of the employees were classified as "High Disengagement" or "Fully Engaged" before the intervention. After the intervention, there was a notable rise in the overall level of engagement. No employees were left in the "Moderate Disengagement" group. While the percentage of employees with "Neutral Engagement" fell to 19% (21 employees), the bulk of employees (72 employees, or 65.5%) shifted into the "Moderate Engagement" group. Additionally, 15.5% of employees, or 17.5% of the workforce, achieved the "Fully Engaged" level, indicating a high degree of commitment and job satisfaction.

Table 2: Engagement, culture and retention test values before and after intervention. (N=110)

Value	Pre-intervention	Post-intervention	Mean Rank	Z test	P-value
Employee Engagement	15.43±3.889	24.24±3.907	55.50	-9.135b	0.000
Organizational Culture	15.06±3.645	24.84±2.293	55.50	-9.123b	0.000
Nurse Retention	13.07±3.250	18.80±2.789	55.50	-9.258b	0.000

Wilcoxon Signed rank test with p<.05 value as significant

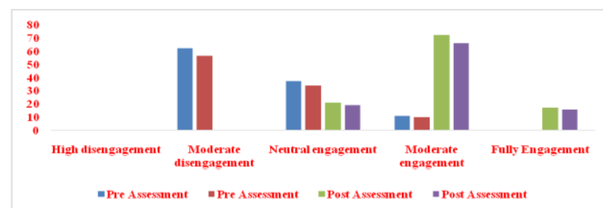


Figure No. 1: Employee engagement score before and after the intervention (n=110)

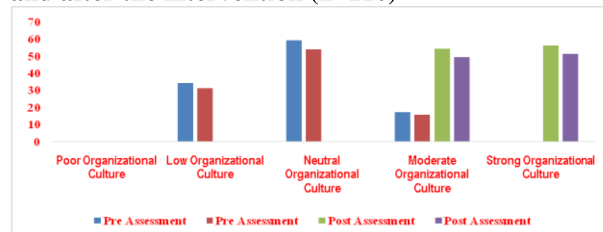


Figure No. 2: Organizational culture score before and after the intervention (n=110)

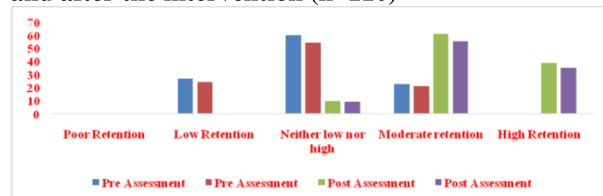


Figure No. 3: Nurse retention score before and after the intervention (n=110)

Significant improvements in the way organizational culture was viewed were evident in Figure 2, which compares the organizational culture scores of 110 participants before and after an intervention. Prior to the intervention, the majority participants gave the organizational culture a "Low" or "Neutral" rating. With 30.9% of participants (34 persons) expressing a "Low Organizational Culture" and the majority, 53.6% (59 employees), reporting a "Neutral Organizational Culture," over half of the employees thought the culture was neither very supportive nor positive. Additionally, those who received a "Moderate Organizational Culture" grade from 17 employees, or 15.5% of the participants, the fact that no employee gave the organizational culture a "strong" or "poor" rating during pre-assessment. After the intervention, a discernible shift toward more favorable perceptions of the organizational culture was noted. It appears that the intervention was successful in addressing these mid-to-lower attitudes because no employees were left in the "Low" or "Neutral" groups. Rather, 49.1% of participants (54 employees) indicated a "Moderate Organizational Culture". Furthermore, 56 employees, or 50.9% of the workforce, rated the organizational culture as having a "Strong Organizational Culture," which means they had a positive view of its ideals, support system, and atmosphere.

Figure 3 shows that the majority of nurses first determined that their retention status was "Low Retention" or "Neither Low nor High." Specifically, "Low Retention," was indicated by 27 nurses, or 24.5% of the participants. The retention status of 60 nurses, or 54.5% of the sample, was classified as "Neither Low nor High". Additionally, compared to those who reported low retention, 23 nurses, or 21% of the total, rated their retention as "Moderate Retention," which is a more favorable evaluation. Importantly, before the intervention, none of the nurses were categorized as having "High Retention" or "Poor Retention". After the intervention, there was a discernible shift in the

retention ratings. None of the participants remained in the "Low Retention" group, demonstrating how effectively the intervention addressed any issues that might have caused dissatisfaction. The percentage of nurses who rated their retention status as "Neither Low nor High" also fell sharply to just 9.1% (10 nurses). On the other hand, 61 nurses (55.5%) reported "Moderate Retention," meaning that majority of them felt more comfortable in their employment. Remarkably, 35.5% of nurses (39 participants) were classified as "High Retention" following the intervention, suggesting a significant improvement in their perception of commitment and job satisfaction.

Table 2 displays test results for employee engagement, corporate culture, and nurse retention before and after a 110-person intervention. Notable statistical gains are shown by all three criteria. The mean ratings were originally a little low, with staff engagement at 15.43±3.889), organizational culture at 15.06±3.645 and nurse retention at 13.07±3.250. Following the intervention, there were noticeable increases in all three locations. Employee engagement rose to a mean of 24.24±3.907, while organizational culture improved to a mean of 24.84±2.293. Nurse retention also showed a significant improvement, with a mean score of 18.80±2.789. The matching p-values, which were all 0.000 and far lower than the conventional significance threshold of 0.05, validated the statistical significance of these alterations.

DISCUSSION

This study demonstrated that mediating model-based nursing interventions significantly improved employee engagement, organizational culture, and nurse retention. Engagement rose consistently from the start to the conclusion of the intervention, confirming that structured programs addressing both personal and workplace resources can effectively enhance nurses' commitment.[16] Similar improvements in engagement and commitment have been reported in Jordanian and Chinese hospital settings, where interventions led to higher post-test engagement compared to control groups.[17] However, not all studies found consistent results, with some reporting limited or no improvements in engagement over time.[18]

The present findings also highlight a marked improvement in organizational culture, with more than half of the nurses shifting to the "strong culture" category post-intervention. This aligns with earlier evidence that workplace resources, leadership, and individual strengths directly influence employee well-being and engagement.[19,20] Other studies similarly reported that interventions improved nurses' perceptions of their work environment, job satisfaction, and quality of care.[21] Moreover, supportive organizational culture has been linked to leadership style, particularly situational leadership, which can strengthen employee performance.[22,23]

Nurse retention also improved substantially following the intervention, with 35.5% of nurses moving into the "high retention" category. These results are consistent with international studies showing that retention strategies whether through rural training, turnover reduction programs, or inter-professional team interventions can lower turnover and increase satisfaction.[24-26] The Job Demands-Resources (JDR) model further supports these outcomes by emphasizing the importance of balancing demands with adequate resources to sustain motivation and engagement.[27] While most studies support the positive impact of structured interventions, some findings remain inconsistent. For example, research in Turkey suggested that organizational socialization models may only partially address new nurses' adaptation needs.[28]

Such variations highlight the complexity of workforce engagement and suggest that intervention effectiveness may depend on contextual factors such as program design, duration, and organizational support. Overall, the current study reinforces that model-based nursing interventions provide a practical and effective strategy for enhancing engagement, strengthening organizational culture, and improving retention. By addressing burnout, fostering teamwork, and promoting supportive leadership, these interventions contribute to a more sustainable and efficient healthcare system.

Recommendations

- Healthcare organizations use comparable structured interventions in light of these findings in order to increase employee engagement, retain nurses, and create a positive workplace culture.
- Regular evaluations of Organizational culture and employee engagement levels should be carried out to find possible areas for development and modify treatments as necessary.
- By fostering employee growth and job satisfaction, institutions can further increase engagement and retention by offering mentorship and continuous professional development initiatives.
- Additionally, establishing open lines of communication and feedback can allow nurses to voice their issues and help create a more favorable work environment.
- Last but not least, sustaining the beneficial benefits seen in this study and fostering long-term workforce stability can be achieved by continuing a continuous improvement approach with regular assessments of intervention outcomes.

CONCLUSION

All significant metrics, such as organizational culture, nurse retention, and staff engagement, significantly improved as a result of the intervention. Following the intervention, there were notable gains in nurse retention as well as organizational culture and staff engagement. The significantly negative values for all three metrics (employee engagement: -9.135, organizational culture: -9.123, nurse retention: -9.258). The intervention was highly effective in increasing staff engagement, retaining nurses, and fostering a more positive work environment.

Author's Contribution:

Concept & Design or acquisition of analysis or interpretation of data:	Muhammad Tahir, Madiha Mukhtar
Drafting or Revising Critically:	Muhammad Tahir, Sarfraz Masih
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.

Source of Funding: None

Ethical Approval: No.REC-UOL/169/08/24 dated 14/5/2024

REFERENCES

1. Pauliene R, Kasnauskiene G, Raudone O, Liubauskiene V, Vrontis D. Employee motivation and professional burnout as impacts of organizational culture on medical institutions. Int J Organ Anal 2024;12:39-42.
2. Ranegger R, Haug S, Vetsch J, Baumberger D, Bürgin R. Providing evidence-based knowledge on nursing interventions at the point of care: findings from a mapping project. BMC Med Inform Decis Mak 2022;22(1):308.
3. Li X, Yuan Y, He X. The role of job satisfaction and organizational culture match in the relationship between pay satisfaction and turnover intention: A moderated mediation model. Int Soc Work. 2024;67:19-22.
4. Suhendi S, Sawahel WA-F, Abdillah KY. Preventing radicalism through integrative curriculum at higher education. Jurnal Pendidikan Islam. 2020;6(1):79-94.
5. Aman-Ullah A, Aziz A, Ibrahim H. Anomalies of the healthcare sector using workplace safety and job satisfaction: A case study of Pakistan. J Asian Finance Econ Bus 2021;8(3):1181-91.
6. Bronder M. Program evaluation: Implementing trauma-informed care via the Sanctuary Model. 2024;9:12-5.
7. Salameh AA, Aman-Ullah A, Mehmood W, Abdul-Majid A-HB. Does employer branding facilitate the retention of healthcare employees? A mediation moderation study through organisational identification, psychological involvement, and employee loyalty. Int J Hosp Manag 2023;112:103414.
8. Mukaihata T, Kato Y, Swa T, Fujimoto H. Work engagement of psychiatric nurses: a scoping review. BMJ Open 2024;14(4):e081941.
9. Long T. Effect of authentic leadership on newly qualified nurses: A scoping review. Nurs Manag (Harrow). 2024;31(3):21-3.
10. Pollack D, Chong K, Bahru R. Using a flipped classroom model to deliver cardiovascular nursing education: A continuous quality improvement study. J Nurses Prof Dev 2024;40(1):E15-20.
11. Kitsios F, Kamariotou M. Job satisfaction behind motivation: An empirical study in public health workers. Heliyon 2021;7(4):e06857.
12. Bilal A. Cognitive behavioral crisis intervention model for health care professionals in Pakistan. Pak J Public Health. 2021;11(1):6.
13. Thorbjørnsen MJ, Undheim LK. Factors influencing employee retention in the service sector: a literature review. 2024;13-8.
14. Parreira P, Santos-Costa P, Neri M, Marques A, Queirós P, Salgueiro-Oliveira A. Work methods for nursing care delivery. Int J Environ Res Public Health 2021;18(4):2088.
15. Hamidi R, Barari R, Sahebdel F, Bayat F. Evaluating the model of causal relations between organizational identity and organizational commitment in hospital nursing staff through the mediation of organizational culture. Employee Respons Rights J 2024;36(1):79-100.
16. Alzoubi MM, Hayati K, Rosliza A, Al-Zoubi KM, Khalid A-M, Alsenany SA, et al. Effect of total quality management intervention on nurse commitment and nurse performance: A quasi-experimental study. Medicine (Baltimore) 2023;102(40):e35390.
17. Yue FY, Wang SJ, Du Y, Sun FY, Wang YP, Guo YF. Effects of a nurse–manager dualistic intervention (NMDI) program on work engagement and job crafting of ICU burnout nurses: A quasi-experimental study. J Nurs Manag 2024;2024(1):6828123.
18. Knight C, Patterson M, Dawson J, Brown J. Building and sustaining work engagement–a participatory action intervention to increase work engagement in nursing staff. Eur J Work Organ Psychol 2017;26(5):634-49.
19. Nielsen K, Nielsen MB, Ogbonnaya C, Känsälä M, Saari E, Isaksson K. Workplace resources to improve both employee well-being and

performance: a systematic review and meta-analysis. Work Stress 2017;31(2):101-20.
20. Van Wingerden J, Derks D, Bakker AB. The impact of personal resources and job crafting interventions on work engagement and performance. Hum Resour Manag 2017;56(1): 51-67.
21. Bloemhof J, Knol J, Van Rijn M, Buurman BM. The implementation of a professional practice model to improve the nurse work environment in a Dutch hospital: a quasi-experimental study. J Adv Nurs 2021;77(12):4919-33.
22. Heryyanoor H, Nursalam N, Hidayat AAA, Hidayat T, Raziansyah R, Zubaidah Z, et al. Culture-based situational leadership model in improving the organization nurse performance. J Int Dent Med Res 2021;14(3):1251-9.
23. Stemmer R, Bassi E, Ezra S, Harvey C, Jojo N, Meyer G, et al. A systematic review: Unfinished nursing care and the impact on the nurse outcomes of job satisfaction, burnout, intention-to-leave and turnover. J Adv Nurs 2022;78(8):2290-303.
24. Rodríguez-Fernández M, Herrera J, de Las Heras-Rosas C. Model of organizational commitment applied to health management systems. Int J Environ Res Public Health. 2021;18(9):4496
25. Russell D, Mathew S, Fitts M, Liddle Z, Murakami-Gold L, Campbell N, et al. Interventions for health workforce retention in rural and remote areas: a systematic review. Hum Resour Health. 2021;19(1):103.
26. Aull M, Nobles PM. The Academic Partnership Unit: Educating, recruiting, and retaining BSN nurses. J Nurs Adm. 2022;52(2):E1-2.
27. Skyvell Nilsson M, Gadolin C, Larsman P, Pousette A, Törner M. The role of perceived organizational support for nurses' ability to handle and resolve ethical value conflicts: a mixed methods study. J Adv Nurs 2024;80(2):765-76.
28. Çamveren H, Kocaman G, Vatan F. The effects of a preceptorship program on newcomer nurses' turnover intention, commitment and job satisfaction: quasi-experimental study. Nurse Educ Pract. 2022;63:103358.

Review Article

Therapeutic Play as a Tool for Emotion Regulation in Children with Anxiety and Behavioral Challenges

Syaiful Anwar and Yunias Setiawati

ABSTRACT

Objective: To explore the role of therapeutic play in supporting emotion regulation among children with anxiety and behavioral difficulties, and to examine its benefits for development, learning, and relationships.
Study Design: Narrative review based on a comprehensive literature search.
Methods: A narrative review of the literature on therapeutic play interventions was conducted.
Results: Evidence indicates that therapeutic play is a developmentally appropriate and noninvasive approach for children experiencing emotional and behavioral challenges. Play-based techniques help children externalize feelings that may be difficult to verbalize, reduce anxiety, and improve behavior. Such methods also enhance coping skills, interpersonal functioning, and overall resilience. Clinicians, educators, and community workers can implement structured play activities with minimal training, using familiar materials and guided sessions.
Conclusion: Therapeutic play offers a valuable complement to traditional behavioral and pharmacological interventions. By fostering safe expression, self-regulation, and resilience, it provides a holistic and child-centered pathway to improved outcomes. Integrating therapeutic play into pediatric care may strengthen early intervention efforts and promote healthier emotional development.
Key Words: therapeutic play, emotion regulation, child mental health, low resource settings, anxiety, behavioral challenges

Citation of Review Article: Anwar S, Setiawati Y. Therapeutic Play as a Tool for Emotion Regulation in Children with Anxiety and Behavioral Challenges. Med Forum 2025;36(8):70-74. doi:10.60110/ medforum.360814.

INTRODUCTION

Emotion regulation is a key developmental task in early childhood, closely tied to mental health, learning, and social relationships. Children with anxiety or behavioral difficulties often struggle to manage emotional responses, leading to irritability, impulsivity, or withdrawal. If not addressed early, these difficulties can evolve into more serious psychiatric conditions.[1,2] Access to appropriate care remains limited in many communities. Long wait times, a shortage of child mental health professionals, and stigma often prevent children from receiving timely support. Standard treatments such as medication or talk-based therapy may not be feasible or effective for younger children, particularly in settings with limited resources.[3-5]

Department of Child and Adolescent Psychiatry, Faculty of Medicine, Airlangga University/Dr. Soetomo General Academic Hospital Surabaya, Indonesia.

Correspondence: Yunias Setiawati, Department of Child and Adolescent Psychiatry, Faculty of Medicine, Airlangga University/Dr. Soetomo General Academic Hospital Surabaya, Indonesia.
Contact No:
Email: yunias.setiawati@fk.unair.ac.id

Received: April, 2025
Reviewed: May, 2025
Accepted: June, 2025

Therapeutic play offers a developmentally appropriate and accessible alternative. By using structured play to support emotional expression and problem solving, it helps children build self-regulation skills in a natural and engaging way.[6] Unlike interventions that rely on verbal reasoning, play allows children to express and process emotions through action, story, and symbolic interaction.[7-8] This approach is especially valuable in low resource settings. It can be delivered with minimal training and cost, using familiar materials and cultural traditions. When thoughtfully applied, therapeutic play can provide meaningful emotional support even in the absence of formal services.[9.10]

In this paper, we examine the use of therapeutic play to support emotion regulation in children with anxiety and behavioral challenges. We focus on its practical application in settings with limited resources and illustrate its use through a clinical case. Our aim is to provide health care providers with a flexible and effective approach to supporting children's emotional development where standard interventions may not be available.[11,12]

Understanding Emotion Regulation in Children

Emotion regulation is the ability to notice, respond to, and adjust emotional states in ways that support learning, behavior, and relationships. This skill develops gradually during early childhood and is shaped by brain development, caregiving experiences, and environmental stability.[1] It involves both conscious

effort and automatic processes and requires coordination between emotional, cognitive, and physical systems.[2,8]

In early childhood, the parts of the brain involved in planning and impulse control, especially the prefrontal cortex, are still developing. In contrast, structures that respond to emotional stimuli, such as the amygdala and other deep brain regions, are already active. This developmental difference explains why children often experience strong emotional reactions and have limited ability to manage them without help.[8] At this stage, they depend on caregivers to help them recover from distress, a process often described as emotional co-regulation.[9,10] Over time, through repeated supportive interactions, children begin to develop their own internal capacity to manage emotions. Children who present with anxiety or behavioral concerns often show difficulties with this process. These difficulties can arise from many sources, including biological sensitivity, trauma, inconsistent caregiving, or exposure to ongoing stress.[3,13] Such children may struggle with transitions, become overwhelmed by frustration, or respond to perceived threats with avoidance or aggression.[10,14] These are not signs of poor discipline or lack of motivation but reflect immature regulatory systems under strain.[2]

From a clinical perspective, these children are often misunderstood. Their behaviors may be labeled as oppositional or disruptive, but these labels overlook the underlying emotional struggle. They are often trying to manage a flood of internal reactions without the skills or support to do so.[11] These difficulties may show up as emotional outbursts, difficulty concentrating, impulsive decisions, or complete withdrawal. The impact can be seen across home, school, and peer relationships, and over time, these patterns may lead to more persistent emotional or behavioral disorders.[6,15]

Emotion regulation is not only psychological but also biological. Children who experience frequent or prolonged stress often show elevated levels of cortisol and other changes in their stress response systems. This can lead to increased baseline arousal, making it harder for them to stay calm, follow directions, or adjust to changes in routine.[16] This physiological reactivity also interferes with sleep, appetite, and learning, adding further strain to their development.[17,18]

Environmental factors play a major role. Consistent adult responses, predictable routines, and a sense of emotional safety all support the development of regulation. Without these, children may remain in a reactive state, unable to organize their emotions or reflect before acting.[19] In situations of neglect, threat, or frequent disruption, the developing brain shifts into a survival mode where emotional expression becomes urgent and unfiltered. Over time, this affects how children see others, how they interpret stress, and how they relate to the world around them.[12,20]

Standard therapies that depend on verbal reasoning or insight are often not effective for children in this state. These children benefit more from approaches that match their stage of development. They need support that is experiential, relational, and rooted in repetition and structure.[21,22] Play allows for this kind of interaction. It offers a familiar and safe way to explore difficult emotions, rehearse new responses, and experience moments of mastery and regulation. Through play, clinicians can help children develop awareness of their feelings, build tolerance for stress, and begin to feel in control of their internal world.[7,23]

For physicians and other health professionals, recognizing the central role of emotion regulation can shift the clinical focus. Rather than treating isolated behaviors, they can begin to understand the emotional needs that drive them.[24] Supporting regulation is not only a way to reduce distress but also a step toward strengthening relationships, improving engagement with learning, and promoting resilience in children facing complex challenges.[25,26]

Therapeutic Play: Principles and Techniques

Therapeutic play uses structured forms of play to help children express emotion, process experience, and develop regulation skills in a way that reflects their stage of development. Unlike free play, which is spontaneous and self-directed, therapeutic play is guided by an adult who creates a safe and predictable space where emotional exploration can take place. It is based on the understanding that children often express themselves more clearly through movement, imagination, and symbolism than through direct conversation.[6] For many children, especially those who struggle with anxiety or behavioral difficulties, play becomes the most accessible and effective medium for emotional healing.[10]

The clinical use of play is supported by a wide range of theoretical models. Developmental psychologists such as Jean Piaget viewed play as essential to cognitive and emotional growth. Through play, children consolidate experience and make sense of their environment. Lev Vygotsky emphasized its role in building social understanding and self-regulation, showing that play allows children to rehearse roles, test boundaries, and strengthen emotional control within a relational contex.[24] These early theoretical foundations have influenced contemporary models of therapeutic play that incorporate emotional learning within structured and imaginative contexts.[21]

Psychoanalytic thinkers including Anna Freud and Melanie Klein introduced the idea that play could reveal inner conflicts in a way similar to how dreams function in adults. Through symbolic actions, role assignments, and repeated themes, children reveal their fears, desires, and unmet needs. The therapist or caregiver does not rush to interpret but rather provides space, reflection, and containment.[8] When the adult is

emotionally available and responsive, the child can externalize difficult feelings and begin to develop emotional understanding without feeling exposed or overwhelmed.[11]

Attachment theory also underpins therapeutic play. Emotional development depends on the presence of safe, consistent adults who can help the child return to calm after distress. Play becomes a relational activity where the adult offers security, recognition, and gentle guidance.[13] When the adult remains present, steady, and responsive, the child feels safe enough to take emotional risks, revisit troubling experiences, and eventually develop internal strategies for self-regulation.[23]

Recent neuroscience helps explain the calming and integrative power of play. Engaging in play activates multiple brain regions involved in stress response, memory, executive function, and social cognition. Repetitive and rhythmic play helps organize the nervous system.[27] Symbolic play supports emotional processing by allowing children to create distance from overwhelming feelings.[8,28] These processes build new pathways that support recovery, problem solving, and emotional resilience.[7]

Therapeutic play can take many forms. Sensory play using water, sand, or soft materials helps calm the body through touch. Symbolic play with dolls, drawings, or stories allows the child to explore conflict, loss, or fear in ways that feel manageable. Constructive play using blocks or puzzles supports frustration tolerance, planning, and a growing sense of competence.[24] Each of these forms can be adapted to meet the child's emotional needs and readiness for engagement.[29]

The adult's role is central. What makes play therapeutic is not the material but the presence of an attuned adult who provides emotional structure, consistency, and encouragement. The adult observes, listens, and gently reflects emotion without pressure or judgment.[19] This allows the child to remain in control while gradually building the capacity to manage emotion, tolerate stress, and organize behavior.[6]

Therapeutic play is especially valuable because of its flexibility. It can be used in clinics, schools, homes, and community settings with very limited resources. It does not require formal equipment or advanced training.[3] With simple tools and clear intention, it can be adapted to many different cultures, contexts, and caregiver roles. Its strength lies in its developmental sensitivity, relational depth, and ability to reach children in ways that are often missed by more structured or language-based methods.[25]

Therapeutic play can be applied in many forms, depending on the child's needs, setting, and available resources.[30] Table 1 summarizes key components of therapeutic play, the functions they serve in emotional development, and examples of how each can be adapted in practice. These elements are not rigid categories but overlapping strategies that can be used flexibly within a supportive relational context.[12,2]

Table No. 1. Core components of therapeutic play and their functions

Component	Function	Example Activities
Sensory play	Calms the body and reduces emotional arousal	Water, sand, clay, soft objects
Symbolic play	Supports emotional expression and distancing	Puppet play, dollhouse, drawing, storytelling
Constructive play	Encourages planning, mastery, and frustration tolerance	Building blocks, puzzles, sorting games
Adult emotional presence	Provides containment, reflection, and emotional safety	Mirroring, calm verbal labeling, staying nearby
Cultural adaptation	Enhances engagement and relevance in diverse communities	Local myths, traditional games, music, ritual

DISCUSSION

Therapeutic play offers a developmentally informed and clinically practical approach to supporting children with emotional and behavioral difficulties, particularly in contexts where formal mental health care is limited or unavailable.

For clinicians working in primary care, school health programs, or community settings, therapeutic play provides a way to reach children who may not respond to direct questioning or conventional behavioral strategies. It allows emotion to emerge in a safe and manageable form and helps adults understand what may be driving behaviors such as withdrawal, aggression, or difficulty with transitions.[8,15] This approach does not require specialized tools and can be used even in informal settings, guided by the principles of safety, curiosity, and emotional containment.[20] Therapeutic play also supports early intervention. Rather than waiting for symptoms to escalate or reach diagnostic thresholds, providers can use this method to engage with emotional distress as it begins to interfere with daily functioning. In this way, therapeutic play serves not only as a clinical tool but also as a preventive measure that helps protect emotional development and support adaptive coping.[12,16]

In community setting, the benefits are especially clear. Therapeutic play can be implemented without the need

for advanced training or equipment. It draws on familiar stories, cultural traditions, and locally available materials.[3,25] With basic orientation, teachers, health workers, or caregivers can integrate play-based strategies into daily routines or short sessions. This adaptability makes it a realistic and sustainable option where access to specialist care is constrained.[3,25]

Successful use of therapeutic play depends on more than technique. The adult must be emotionally present, able to reflect and respond without judgment, and comfortable allowing the child to lead. This requires support, especially in systems where providers are under pressure or emotionally depleted.[13] Regular supervision, opportunities for reflection, and attention to caregiver wellbeing are essential to maintain the depth and safety that therapeutic play requires.[10] It is also important to acknowledge the limits of this approach. While therapeutic play can be effective in addressing mild to moderate emotional difficulties, it may not be sufficient for children with complex trauma, persistent psychiatric symptoms, or severe developmental concerns. In these cases, it can serve as a stabilizing tool or a bridge to further care, but not as a substitute for formal mental health intervention.[1]

Even with these limitations, therapeutic play remains a valuable part of the clinical toolkit. It creates space for emotional learning, enhances relational connection, and offers a way to respond to distress with presence and respect rather than control or avoidance. For many children, especially those in under resourced settings, it may be the first time they are truly heard through the language they know best. For physicians and care providers, it is a reminder that healing often begins not with words, but with play, patience, and consistent human connection.[7,24]

CONCLUSION

Therapeutic play is a simple and powerful approach that supports emotional development in children who struggle with anxiety, behavioral difficulties, or emotional distress.[6,12] By following the natural way children express and process emotion, it offers a developmentally appropriate path to healing that does not depend on advanced equipment, formal diagnosis, or verbal explanation. This makes it especially useful in settings where mental health resources are limited.[25]

For physicians and other care providers, therapeutic play is a practical method to address emotional needs early and gently. It encourages a shift in perspective, from managing behavior to understanding the emotion behind it, and creates space for trust, reflection, and growth.[16] Even when used briefly or informally, it can help children feel safe, seen, and supported.[10]

In communities, therapeutic play offers a sustainable and accessible tool for emotional support. Its value lies not in technical complexity but in the presence of a steady adult who offers structure, attention, and emotional availability.[24] For many children, this may be the first step toward feeling understood and gaining the confidence to manage their emotional world.[7]

Source of Funding: None

REFERENCES

1. Midgley N, Mortimer R, Carter M, Casey P, Coffman L, Edbrooke-Childs J, et al. Emotion regulation in children (ERiC): A protocol for a randomised clinical trial to evaluate the clinical and cost effectiveness of Mentalization Based Treatment (MBT) vs Treatment as Usual for school-age children with mixed emotional and behavioural difficulties. PLoS One 2023; 18(8):e0289503.
2. Suveg C, Sood E, Comer JS, Kendall PC. Changes in emotion regulation following cognitive-behavioral therapy for anxious youth. J Clin Child Adolesc Psychol 2009;38(3):390-401.
3. Divan G. Editorial Perspective: 'From there to here': adapting child and adolescent mental health interventions for low-resource settings. J Child Psychol Psychiatr 2017;58(3):325-327.
4. Purgato M, Tedeschi F, Betancourt TS, Bolton P, Bonetto C, Gastaldon C, et al. Mediators of focused psychosocial support interventions for children in low-resource humanitarian settings: analysis from an Individual Participant Dataset with 3,143 participants. J Child Psychol Psychiatr 2020;61(5):584-593.
5. Li WHC, Chung JOK, Ho KY, Kwok BMC. Play interventions to reduce anxiety and negative emotions in hospitalized children. BMC Pediatr 2016;16:36.
6. Bratton SC, Ray D, Rhine T, Jones L. The efficacy of play therapy with children: a meta-analytic review of treatment outcomes. Prof Psychol Res Pract 2005;36(4):376–390.
7. Russ SW. Pretend play: a resource for children who are coping with stress and managing anxiety. NYS Psychol 2007;19(5):13–17.
8. Stewart AL, Field TA, Echterling LG. Neuroscience and the magic of play therapy. Int J Play Ther 2016;25(1):4–13.
9. Gjærde LK, Hybschmann J, Dybdal D, Topperzer MK, Schrøder MA, Gibson JL, et al. Play interventions for paediatric patients in hospital: a scoping review. BMJ Open 2021;11(7):e051957.
10. Ray DC, Burgin E, Gutierrez D, Ceballos P, Lindo N. Child-centered play therapy and adverse childhood experiences: a randomized controlled trial. J Couns Dev 2022;100(2):134–145.
11. Cohen-Yatziv L, Regev D. The effectiveness and contribution of art therapy work with children in 2018 what progress has been made so far? A

systematic review. Int J Art Ther 2019;24(3): 100–112.
12. Lin Y, Bratton SC. A meta-analytic review of child centered play therapy approaches. J Couns Dev 2015;93(1):45–58.
13. Skowron EA, Nekkanti AK, Skoranski AM, Scholtes CM, Lyons ER, Mills KL, Bard D, Rock A, Berkman E, Bard E, Funderburk BW. Randomized trial of parent-child interaction therapy improves child-welfare parents' behavior, self-regulation, and self-perceptions. J Consult Clin Psychol. 2024 Feb;92(2):75-92.
14. Obiweluozo PE, Ede MO, Onwurah CN, Uzodinma UE, Dike IC, Ejiofor JN. Impact of cognitive behavioural play therapy on social anxiety among school children with stuttering deficit: A cluster randomised trial with three months follow-up. Medicine (Baltimore). 2021 May 14;100(19):e24350.
15. Hateli B. The effect of non directive play therapy on reduction of anxiety disorders in young children. Couns Psychother Res. 2021 Jun;22(1):75–82.
16. Alemdar H, Karaca A, Konuk Şener D, Halmatov S. The impact of cognitive behavioral play therapy on children’s anxiety levels: a systematic review. Balıkesir Health Sci J. 2024 Mar;13(1):184–191.
17. Shayganfard M, Kaboudi B, Arabsheibani K, Shakiba E, Cheshmekaboudi S. Effectiveness of cognitive-behavioral group play therapy on anxiety-based school refusal and behavioral problems in elementary school boys: a preliminary randomized controlled trial. Arch Psychiatr Nurs. 2024 Jun;50:108-114.
18. Godino-Iáñez MJ, Martos-Cabrera MB, Suleiman-Martos N, Gómez-Urquiza JL, Vargas-Román K, Membrive-Jiménez MJ, Albendín-García L. Play Therapy as an Intervention in Hospitalized Children: A Systematic Review. Healthcare (Basel). 2020 Jul 29;8(3):239.
19. Jayaprakash S, Niraimathi K. Effect of non directive play therapy on strengths and difficulties of private and government school students. IAPS J Pract Ment Health. 2023 Jul–Dec;1(2):70–76.
20. Nilsson N, Hadiprodjo N, Parson J. The role of the play therapist in supporting children and families following a natural disaster: A scoping review. Aust J Rural Health. 2024 Oct;32(5):877-889.
21. Chauhan N, Sachdeva D, Malhotra S, Gupta N. Play therapy: an analytical mode of therapy in children. J Indian Assoc Child Adolesc Ment Health. 2024;20(2):136–146.
22. Davidson D, Stagnitti K. The process of Learn to Play Therapy with parent-child dyads with children who have autism spectrum disorder. Aust Occup Ther J 2021;68(5):419-433.
23. Baggerly J, Jenkins WW. The effectiveness of child centered play therapy on developmental and diagnostic factors in children who are homeless. Int J Play Ther 2009;18(1):45–55.
24. Koukourikos K, Tsaloglidou A, Tzeha L, Iliadis C, Frantzana A, Katsimbeli A, et al. An Overview of Play Therapy. Mater Sociomed 2021;33(4): 293-297.
25. Purgato M, Gross AL, Betancourt T, Bolton P, Bonetto C, Gastaldon C, et al. Focused psychosocial interventions for children in low-resource humanitarian settings: a systematic review and individual participant data meta-analysis. Lancet Glob Health 2018;6(4):e390-e400.
26. Wadley C, Stagnitti K. Implementation of Learn to Play Therapy for Children in Special Schools. Am J Occup Ther 2024;78(4):7804185030.
27. He HG, Zhu L, Chan SW, Klainin-Yobas P, Wang W. The effectiveness of therapeutic play intervention in reducing perioperative anxiety, negative behaviors, and postoperative pain in children undergoing elective surgery: a systematic review. Pain Manag Nurs 2015;16(3):425-39.
28. He HG, Zhu L, Chan SW, Liam JL, Li HC, Ko SS, et al. Therapeutic play intervention on children's perioperative anxiety, negative emotional manifestation and postoperative pain: a randomized controlled trial. J Adv Nurs 2015;71(5):1032-43/
29. Celik B, Canbulat Sahiner N. The effects of preoperative therapeutic play on anxiety and fear levels in preschool children. J Pediatr Nurs 2024; 78:e244-e249.
30. Gao J, Song W, Huang D, Zhang A, Ke X. The effect of game-based interventions on children and adolescents with autism spectrum disorder: A systematic review and meta-analysis. Front Pediatr 2025;13:1498563.

Case Report

Burn Trauma and Complicated Grief

When Survival Hurts: A Case of Burn Trauma Complicated by Parental Grief and Displaced Guilt

Dayu Triana Rahmawati and Azimatul Karimah

ABSTRACT

A young father with extensive burns following a house fire that killed his daughter displayed profound grief and emotional withdrawal, complicating his medical recovery. Despite surviving the event physically, he remained mute, refusing basic care and exhibiting signs of guilt, dissociation, and despair. His psychological state deteriorated rapidly, delaying wound care and rehabilitation. Psychiatric evaluation revealed overwhelming internalized blame and trauma, centered on his perceived failure to protect his child. A combination of bedside psychiatric engagement, family involvement, and trauma-informed care helped reestablish trust and emotional expression. This case illustrates the critical need for early psychiatric intervention in patients with complex grief and trauma, particularly when recovery hinges on motivation and adherence to care. It highlights the powerful role of mental health support in the acute management of burn patients and emphasizes the importance of narrative expression and therapeutic alliance in restoring a path toward healing.

Citation of Case Report: Rahmawati DT, Karimah A. When Survival Hurts: A Case of Burn Trauma Complicated by Parental Grief and Displaced Guilt. Med Forum 2025;36(8):75-76. doi:10.60110/ medforum.360815.

INTRODUCTION

Burn injuries often bring prolonged physical and psychological trauma.[1] In Indonesia, where more than half of burn survivors develop psychiatric symptoms,[2] the emotional toll is even more profound when the injury is coupled with family loss. The death of a child in a traumatic event presents unique clinical challenges, often leading to survival guilt, complicated grief, and emotional withdrawal that can interfere with recovery. This case illustrates the emotional complexity of a father recovering from burn trauma while grieving the loss of his young daughter, and the role of consultation psychiatry in facilitating treatment engagement.

Case Presentation

A 41-year-old man was admitted to the burn unit with deep partial-thickness burns involving 18 percent of his body, primarily the face and upper limbs, after escaping a house fire. His five-year-old daughter perished in the incident.

Department of Child and Adolescent Psychiatry, Faculty of Medicine, Airlangga University/Dr. Soetomo General Academic Hospital Surabaya, Indonesia.

Correspondence: Azimatul Karimah MD, Department of Psychiatry, Faculty of Medicine, Airlangga University, Dr. Soetomo General Academic Hospital, Jl. Mayjen. Prof. Dr. Moestopo, 47, Surabaya, Jawa Timur, 60286, Indonesia
Contact No:
Email: azimatul.karimah@fk.unair.ac.id

Received: April, 2025
Reviewed: May, 2025
Accepted: June, 2025

His wife sustained minor injuries and was admitted separately. The patient was hemodynamically stable but displayed minimal emotional reactivity. On day two, the burn team requested a psychiatric consultation due to emotional withdrawal and reluctance to participate in care.

During assessment, he spoke in a flat tone and avoided eye contact. He reported persistent guilt, disrupted sleep, poor appetite, and passive thoughts of wishing he had died instead. *"It should have been me,"* he said. He described hearing his daughter's cries: *"I can still hear her screaming."* Though cooperative, he showed signs of emotional numbing and disengagement from treatment. He refused visits from family and declined participation in rehabilitation planning.

He repeatedly blamed his wife, who had also been in the house, for failing to rescue their child. He avoided discussing the moment he realized his daughter had died. Interviews with his relatives revealed a man deeply invested in his role as a father, though emotionally reserved. One family member described him as *"someone who always needed control."* This trait appeared to amplify his response to trauma, leading to displaced anger and an inability to tolerate helplessness.

Despite requiring daily wound care and dressing changes, he became increasingly resistant, sometimes refusing care altogether. His withdrawal placed him at risk of delayed healing and infection. The psychological burden of guilt, unresolved grief, and disrupted family dynamics was impeding his physical recovery.

Clinical Challenges

This case illustrates the often-overlooked phenomenon of psychiatric morbidity in acute burn care, especially

when compounded by loss. The patient met criteria for acute stress reaction with features of complicated grief and depressive symptoms. His emotional rigidity and need for control, coupled with severe guilt and avoidance, made it difficult to engage him in both medical and psychological care.

His refusal of family visits and projection of blame were barriers to emotional processing and support. The absence of early psychiatric intervention in such scenarios can lead to worsening distress, poor adherence to medical recommendations, and longer hospital stays. This case highlights the necessity of trauma-informed psychiatric input in the acute setting to support both mental health and physical outcomes.

Intervention

We used a crisis intervention framework based on the SAFER-R model (Stabilize, Acknowledge, Facilitate understanding, Encourage adaptive coping, Restore functioning, and Refer when needed).[3] Initial sessions focused on emotional containment and rapport-building. We validated his reactions without immediately challenging his guilt or blame, allowing space for silence and tears.

Supportive psychotherapy was gradually introduced, with an emphasis on helping him name his emotions and develop a coherent trauma narrative. Over time, we gently reframed his self-blaming thoughts. He began to speak of his daughter not just in terms of the fire, but of memories from before the trauma. This shift allowed space for grief to emerge without overwhelming guilt.

We involved the burn care team in daily discussions, ensuring a consistent and compassionate approach. As emotional engagement improved, so did his cooperation with wound care. We held a joint session with his wife, facilitated by psychiatry and nursing, which allowed them to share their perspectives. This session marked a turning point. The patient was able to acknowledge his wife’s pain and begin reconciling with her emotionally, even while remaining deeply distressed.

Pharmacologic treatment was considered, but given the patient’s gradual improvement with psychotherapy and his resistance to medication, we deferred antidepressants. By the second week, he showed improved affect, increased engagement, and fewer signs of avoidance. He was discharged with plans for regular outpatient psychiatric follow-up and bereavement support.

DISCUSSION

This case illustrates how acute medical recovery can be derailed by unresolved psychological trauma, especially in the setting of bereavement. The emotional collision of survival, guilt, and anger following the loss of a child presents profound challenges. Without psychiatric intervention, these emotions can manifest in care avoidance, family conflict, and prolonged hospitalization.

Few published case reports explore how burn injuries intersect with parental grief in the early inpatient phase.[4,5] This case demonstrates the importance of early psychiatric involvement and collaboration with medical teams to address both emotional and physical healing. It also shows the power of narrative reframing and family engagement in moving patients from paralysis to participation in care.

CONCLUSION

The death of a child during a traumatic event such as a house fire introduces profound emotional complications that can derail recovery. This case underscores the importance of early psychiatric intervention when grief, guilt, and trauma intersect in the acute care setting. Without timely support, such distress may lead to withdrawal, disrupted medical adherence, and prolonged hospitalization. By integrating psychiatric care with burn management, offering a safe space for emotional processing, and engaging the family in healing, clinicians can support both physical and emotional recovery. This case illustrates the value of early interdisciplinary collaboration in turning emotional paralysis into therapeutic engagement.

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

Source of Funding: None

REFERENCES

1. Boersma-van Dam E, Shepherd L, Van De Schoot R, Engelhard IM, Van Loey NEE. The prevalence of posttraumatic stress disorder symptomatology and diagnosis in burn survivors: a systematic review and meta-analysis. Health Psychol Rev 2024:1-27.
2. Winanda RA, Kusumadewi I, Wardhana A, Wiguna T, Raharjanti NW. The association between psychopathology and quality of life in burn patients at Dr. Cipto Mangunkusumo Hospital, Jakarta. Jurnal Plastik Rekonstruksi 2018;4(2):105-112.
3. Wang D, Gupta V. Crisis Intervention. [Updated 2023 Apr 24]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2025 Jan-. Available from: https://www.ncbi.nlm.nih.gov/books/NBK559081/
4. Brady KJS, Grant GG, Stoddard FJ, Meyer WJ, Romanowski KS, Chang PH, et al. Measuring the Impact of Burn Injury on the Parent-Reported Health Outcomes of Children 1 to 5 Years: A Conceptual Framework for Development of the Preschool Life Impact Burn Recovery Evaluation Profile CAT. J Burn Care Res 2020;41(1):84-94.
5. Wickens N, Janse van Rensburg E, de Gouveia Belinelo P, Milroy H, Martin L, Wood F, et al. “It’s a big trauma for the family”: A qualitative insight into the psychological trauma of paediatric burns from the perspective of mothers. Burns 2024;50(1):262-274.