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Editorial

Constipation – Management and Treatment

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

Introduction: Constipation can be an uncomfortable and frustrating condition that affects people of all ages. It occurs when bowel movements become infrequent or difficult to pass, often resulting in discomfort and bloating. While occasional constipation is common and usually not a cause for concern.

Chronic constipation is a common condition seen in family practice among the elderly and women. There is no consensus regarding its exact definition, and it may be interpreted differently by physicians and patients. Physicians prescribe various treatments, and patients often adopt different over-the-counter remedies. Chronic constipation is either caused by slow colonic transit or pelvic floor dysfunction, and treatment differs accordingly.

In general, the prevalence of constipation among the general population, women are 2 to 3 times more likely to have constipation than men in terms of prevalence.[1-5] and physical symptoms.[6] Possible reasons include higher risk of injury to the pelvic floor from childbirth[7] and the general willingness of women to report their symptoms and respond to surveys. Advanced age is also a risk factor for chronic constipation, with the largest increase in prevalence after the age of 70 years.

In general, constipation has a significant impact on quality-of-life indicators irrespective of culture and nationalities,[8] especially on the elderly. A recent systematic review showed that impairment caused by constipation as measured by Health-Related Quality of Life scores predominates in the mental health domains and is comparable to that caused by serious chronic conditions such as osteoarthritis and diabetes.[9]

Etiology

Extrinsic Factors

Low fiber intake, inadequate hydration, reduced mobility as the result of general functional decline and institutionalization, reduced sensation of thirst, electrolyte disturbances (hypercalcemia, hypokalemia, hypermagnesemia), endocrine and metabolic disorders (e.g., diabetes mellitus, hyperparathyroidism, hypothyroidism, chronic renal failure), neurological disorders (e.g., dementia, Parkinson disease, neuropathies, multiple sclerosis, spinal cord injuries, cauda equine syndrome), psychological comorbidities (e.g., depression, distress, personality disorders, or history of abuse), and concurrent medications (e.g., anticholinergics, diuretics, β-blockers, opiates, iron supplements, calcium channel blockers, antidepressants, acetaminophen, aspirin and NSAIDs) all are said to contribute to chronic constipation, especially in the elderly.[10,11-12]

Intrinsic Factors

Intrinsic factors leading to chronic constipation can be broadly classified into 2 categories: pelvic floor dysfunction (PFD) and slow colon transit time (STC). A retrospective study reported the prevalence of PFD as 37% and STC as 23%, based on physiologic tests. However, a clear distinction between the two is often impossible, with an overlap of up to 55%.[13]

Complications

1. **Fecal Incontinence:** Constipation can lead to fecal incontinence, especially in older adults
2. **Hemorrhoids:** Straining during bowel movements can increase the risk of hemorrhoids
3. **Anal Fissure:** Constipation can cause anal fissures, especially in individuals with hard stools
4. **Organ Prolapse:** Chronic constipation may contribute to pelvic organ prolapse.
5. **Fecal impaction and bowel obstruction:** Prolonged stasis of fecal matter leads to impaction and giant fecolith obstructing the large bowel, necessitating surgery.
6. **Bowel perforation and stercoral peritonitis:** Extremely impacted feces (fecaloma) can compress the colonic wall, causing an ischemic ulcer and subsequent perforation.

Management and Treatment

- **Lifestyle Modifications:** Increasing dietary fiber, fluid intake, and exercise may help alleviate constipation, but evidence is limited

• **Medications:**

- **Bulk-forming agents:** Psyllium and methylcellulose can help soften stool and promote bowel movements
- **Osmotic agents:** Polyethylene glycol (PEG) and lactulose can help retain water in stool
- **Stimulants:** Senna and bisacodyl can stimulate bowel movements
- **Newer agents:** Chloride channel activators (lubiprostone) and 5-HT4 receptor agonists (prucalopride) show promise in treating chronic constipation
- **Biofeedback Therapy:** Effective for pelvic floor dysfunction-related constipation

Other Treatments:

- Bacteriotherapy (Probiotics)
- Traditional Chinese Medicine
- Surgery

Instead of relying on over-the-counter medications, consider trying these three simple yet effective tips for quick relief from constipation.

Jaggery and ghee after lunch: For a post-lunch digestive boost, combine equal portions of powdered jaggery and ghee. Jaggery is rich in iron, while ghee provides essential fats. This powerful duo promotes smoother digestion, enhances nutrient absorption, and aids in the efficient elimination of toxins from the body. Incorporating this simple ritual into your daily routine can work wonders for your digestive health.

Any melon for an evening snack: Dehydration often contributes to constipation. Melons, with their high water content, are the perfect remedy. They not only hydrate your body but also provide essential nutrients and help restore your electrolyte balance. Enjoy a refreshing serving of melon as an evening snack around 3-4 PM. If melons aren't in season, a ripe banana is a suitable alternative to keep your hydration levels in check.

Sesame seeds at dinner: Enhance your dinner with the inclusion of sesame seeds. These tiny powerhouses are packed with fibre, vitamin E, and essential fatty acids, all of which facilitate the digestive process. To incorporate them into your meal, simply add a teaspoon of sesame seeds to your dough when making roti. Whether you opt for jawar roti, ragi roti, or whole wheat roti, this small addition can go a long way in relieving constipation and promoting overall gut health.

Constipation is a common issue that can disrupt your daily life, but it's often manageable with simple lifestyle changes. By increasing your fiber intake, staying well-hydrated, and incorporating regular exercise into your routine, you can promote healthy digestion and find quick relief from constipation. Remember that consistency in these habits is key to maintaining regular bowel movements and preventing future bouts of constipation.

The standard advice of increasing dietary fibers, fluids, and exercise for relieving chronic constipation will only benefit patients with true deficiency. Biofeedback works best for constipation caused by pelvic floor dysfunction. Pharmacological agents increase bulk or water content in the bowel lumen or aim to stimulate bowel movements.

If problems persist, don't hesitate to seek medical advice for a more comprehensive evaluation and treatment plan.

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Original Article

Effect of Peripartum Counseling on Salivary Cortisol and Depression in Late Pregnancy and Early Postpartum

Peripartum Counseling and Its Impact on Maternal Mental Health

Novelita Mesah[1], Margarita Maria Maramis[1] and Muhammad Yusuf[2]

ABSTRACT

Objective: To evaluate the effect of peripartum counseling during the third trimester and early postpartum period on salivary cortisol levels and peripartum depression incidence in pregnant and postpartum patients.

Study Design: Non-randomized controlled trial study

Place and Duration of Study: This study was conducted at the Dr. Soetomo General Hospital and Airlangga University Hospital in Indonesia from September 2024 to January 2025.

Methods: This non-randomized controlled trial used a pretest-posttest control group design. Participants from the Obstetrics and Postpartum Outpatient Clinics underwent salivary cortisol testing and psychological assessment with the Edinburgh Postnatal Depression Scale (EPDS). The intervention included structured peripartum counseling focused on maternal self-confidence, emotional regulation, and marital satisfaction.

Results: There was no significant difference in salivary cortisol levels between the treatment and control groups ($p > 0.05$), though the treatment group showed a decreasing trend. However, a significant reduction in EPDS scores was observed in the treatment group compared to the control group ($p < 0.05$), indicating an improvement in depressive symptoms.

Conclusion: Peripartum counseling may help reduce symptoms of peripartum depression, though it did not significantly impact salivary cortisol levels. Further research with longer interventions, multiple cortisol measurements, and larger sample sizes is recommended to enhance understanding and optimize intervention strategies.

Key Words: Peripartum depression, peripartum counseling, salivary cortisol, maternal mental health

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INTRODUCTION

Peripartum depression (PPD) is a significant maternal mental health issue that remains underdiagnosed and understudied. It has serious consequences, including suicidal thoughts, with an estimated suicide rate of 20%.[1,2] PPD also contributes to identity loss and emotional distress[3] and negatively affects infant health, impacting birth weight, sleep quality, and cognitive and emotional development.[4,5] Poor mother-child bonding due to PPD is a known risk factor for developmental delays.[6]

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Globally, PPD affects 13–19% of postpartum mothers, yet nearly 50% remain undiagnosed. Additionally, 5% of PPD cases develop treatment-resistant depression,[7] underscoring the need for effective interventions.

Screening for PPD is standard in developed countries but should be more widely implemented elsewhere. The Edinburgh Postnatal Depression Scale (EPDS) is a widely validated tool, requiring less than five minutes to administer.[8,9] Biological markers such as salivary cortisol provide additional screening potential, as PPD is associated with hypothalamic-pituitary-adrenal (HPA) axis dysfunction, leading to elevated cortisol levels that persist postpartum.[10] Salivary cortisol is a non-invasive, reliable measure of free cortisol levels, unaffected by pregnancy-related fluctuations in corticosteroid-binding globulin.[11]

Peripartum counseling is a crucial early intervention, improving maternal mental health by enhancing self-confidence, emotional regulation, and marital satisfaction.[12] It is considered a safer alternative to psychopharmaceutical treatments for pregnant and lactating women.[13] Targeted screening and counseling during antenatal visits and early postpartum can help reduce PPD incidence.[14]

Given the significant impact of PPD, this study examines the effect of peripartum counseling in the

third trimester and early postpartum period on salivary cortisol levels and PPD incidence in patients at Dr. Soetomo General Hospital and Airlangga University Hospital.

METHODS

Study Design and Setting: This study employed a pretest-posttest control group design to evaluate the effect of peripartum counseling on salivary cortisol levels and peripartum depression. The study was conducted at Dr. Soetomo Hospital and Airlangga University Hospital, both tertiary referral centers providing maternal and perinatal healthcare, from September 2024-January 2025.

Participants: A total of 18 pregnant and postpartum women meeting the inclusion criteria were enrolled and randomized into two groups. The treatment group (n = 9) received standard antenatal and postpartum care plus structured peripartum counseling at 36 weeks gestation and 1 week postpartum, while the control group (n = 9) received standard care only. Eligible participants were 18–40 years old, at 36 weeks gestation, and had parity between one and three. Exclusion criteria included complex obstetric risks, initial EPDS scores above 12, major psychiatric disorders, chronic illnesses affecting cortisol, corticosteroid use, and pregnancy complications requiring emergency care. All participants provided informed consent.

Intervention: Peripartum Counseling: Peripartum counseling was delivered in two face-to-face sessions at 36 weeks gestation and 1 week postpartum, each lasting 45–60 minutes. Sessions were led by trained clinical psychologists using CBT-based techniques, focusing on maternal self-efficacy, emotional regulation, stress management, and improving marital communication and support.

Outcome Measures: Salivary cortisol was measured to assess physiological stress, with samples collected between 08:00–09:00 AM before breakfast to minimize diurnal variation. Analysis was performed using the Euroimmun kit and competitive ELISA method at two time points: 36 weeks gestation (pre-intervention) and 1 week postpartum (post-intervention). Depressive symptoms were assessed using the Edinburgh Postnatal Depression Scale (EPDS), with scores ≥10 indicating clinically relevant symptoms. EPDS was administered at the same two time points.

Ethical Clearance: This study was approved by the Ethics Committee of Airlangga University and Dr. General Soetomo Hospital. Written informed consent was obtained from all participants after they were informed about the study objectives, procedures, risks, and benefits. Participation was voluntary, and confidentiality was maintained throughout the study.

Statistical Analysis: Data were analyzed using SPSS version 26. Normality was assessed with the Shapiro-Wilk test. Paired t-tests or Wilcoxon signed-rank tests were used for within-group comparisons, depending on data distribution. Between-group differences were analyzed using the Mann-Whitney U test, with p-values <0.05 considered statistically significant.

RESULTS

A total of 18 pregnant women meeting the eligibility criteria were included in the study, with 7 participants recruited from the Obstetrics Polyclinic of Dr. General Soetomo Hospital Surabaya and 11 from Airlangga University Hospital.

Participants in both groups were similar in age, household size, religion, and employment status. Differences were noted in education, marital status, income, and housing. The treatment group had more participants with higher education and lived more often with parents, while the control group had lower income, more home ownership, and included individuals married only religiously.

The treatment and control groups were similar in gestational age, parity, delivery method, and breastfeeding status. Two-thirds in both groups delivered via cesarean section, and 77.8% in each group practiced exclusive breastfeeding. The control group had a higher prevalence of pre-existing medical conditions, family history of illness, and postpartum complications, including hemorrhage and surgical wound infection. In contrast, nearly 89% of the treatment group reported no complications. While the average birth weight was slightly higher and more stable in the treatment group, the median birth weight was identical in both groups.

Table No.1. Psychological Disorder Characteristics of Study Participants Based on MINI ICD-10, MSI-BPD, and SRSS

	Treatment (n = 9)	Control (n = 9)
MINI ICD-10		
Depressive episode	7 (77.8%)	8 (88.9%)
Depressive episodes, Dysthymia, PTSD	0 (0%)	1 (11.1%)
Depressive Episode, Suicide Risk	1 (11.1%)	0 (0%)
Depressive episode, GCM, PTSD	1 (11.1%)	0 (0%)
Duration of suffering from disorder (months)		
Mean ±Standard Deviation	1.28 ±1.481	1.89 ±2.702
Median (min – max)	0.5 (0.5 – 5)	1 (0.5 – 9)

Differences in marital history, relationship dynamics, and psychological health were noted between groups. All participants in the treatment group were in their first marriage, whereas 22.2% of the control group were in their third. Divorce in the control group was linked to spousal infidelity and domestic violence, neither of

which were reported in the treatment group. Most participants in both groups married by personal choice, although 11.1% in the treatment group had arranged marriages. Marital relationships were generally harmonious in both groups, though 11.1% of the treatment group reported experiencing disharmony.

Table No.2. Comparison of Salivary Cortisol Levels and EPDS Scores Between Treatment and Control Groups

	Mean ±Standard Deviation Median (min – max)		p-value
	Treatment (n = 9)	Control (n = 9)	
Salivary cortisol levels			
Beginning	7.85 (4.22 – 29.63)	7.47 (2.32 – 10.96)	0.825
End	6.06 ±3.578	8.76 ±4.155	0.160
Difference	-3.77 ±8.049	1.89 ±2.796	0.064
EPDS Score			
Beginning	13 (12 – 20)	13 (12 – 18)	0.963
End	10.22 ±5.540	14.67 ±4.555	0.082
Difference	-4 (-11 – 9)	0 (-2 – 9)	0.041

Table No.3. Changes in Salivary Cortisol Levels and EPDS Scores Before and After Peripartum Counseling

Group	Mean ±Standard Deviation Median (min – max)			p-value
	Beginning	End	Difference	
Treatment (n = 9)				
Salivary cortisol levels	9.83 ±8.074	6.06 ±3.578	-3.77 ±8.049	0.198
EPDS Score	6.87 ±2.919	8.76 ±4.155	1.89 ±2.796	0.077
Control (n = 9)				
Salivary cortisol levels	13.67 ±2.598	10.22 ±5.540	-3.44 ±6.267	0.138
EPDS Score	13 (12 – 18)	13 (10 – 22)	0 (-2 – 9)	0.497

Differences were observed in menstrual mood disturbances, attitudes toward pregnancy, and prior mental health. The treatment group reported more menstrual-related mood symptoms and negative attitudes toward pregnancy, while the control group had a higher prevalence of past depression. Stressor profiles also differed: the treatment group more frequently cited physical and fetal health concerns, whereas the control group more often reported emotional regulation difficulties and situational stress. Both groups reported similar levels of parenting insecurity and marital dissatisfaction. Psychometric assessments (Table 1) confirmed depressive episodes in both groups, though symptom patterns varied. In the treatment group, 11.1% had depressive episodes with suicide risk, and another 11.1% had comorbid depression, anxiety, and PTSD. In the control group, 11.1% experienced depression alongside dysthymia and PTSD. The average duration of symptoms was longer in the control group, with a median of one month compared to half a month in the treatment group.

Salivary cortisol and EPDS scores were analyzed to evaluate the impact of peripartum counseling. While no significant differences in cortisol levels were observed between groups at baseline, post-intervention, or in change scores ($p > 0.05$), the treatment group exhibited a downward trend following counseling. Similarly, although EPDS scores at baseline and post-intervention did not differ significantly, a significant difference was found in the change between time points ($p < 0.05$), indicating a greater reduction in depressive symptoms in the treatment group (Table 2). The treatment group also had a higher mean stress score, though mild stress levels were only found in the control group (11.1%). Overall, while between-group differences were not statistically significant for cortisol and EPDS at individual time points, the intervention group showed a more favorable trend in both biological and psychological outcomes (Table 3).

DISCUSSION

This study evaluated the effect of peripartum counseling on salivary cortisol and depressive symptoms. While no significant changes were observed in cortisol levels, the reduction in EPDS scores in the treatment group suggests a potential benefit for mood regulation. Although both groups were demographically similar, differences in socioeconomic status, education, and marital history may have shaped mental health outcomes. The control group had more participants with low income, prior medical conditions, and postpartum complications—factors that likely contributed to higher depression severity and stress responses.[15,16]

One of the key findings was the reduction in EPDS scores in the treatment group, which suggests that targeted counseling can help alleviate peripartum depressive symptoms. Previous studies have shown that psychological interventions, particularly those focusing on emotional regulation and maternal self-confidence, are effective in reducing perinatal depression.[17,18] Counseling may provide coping strategies that mitigate emotional distress and promote resilience, contributing to better psychological well-being even if physiological stress markers such as cortisol remain unchanged.

The lack of significant differences in cortisol levels between the treatment and control groups aligns with previous research showing that cortisol responses in peripartum women are complex and influenced by multiple factors, including sleep disturbances, chronic stress, and hormonal fluctuations. While some studies have suggested that cortisol can serve as a biomarker

for peripartum depression, the findings in this study indicate that psychological improvements do not always correlate with immediate physiological changes.[10,11, 19] The observed decreasing trend in cortisol levels in the treatment group suggests a potential long-term benefit, though a longer follow-up period would be needed to confirm this effect.

Differences in marital and relationship contexts also played a role in stress perception and coping strategies.[20,21] The control group had a higher proportion of participants with multiple marriages and a history of divorce due to infidelity or domestic violence. Such experiences are known to increase the risk of depression and stress-related disorders, which may explain the greater severity of depressive symptoms in this group. Conversely, the treatment group had a higher prevalence of menstrual mood disorders and negative attitudes toward pregnancy, which could indicate pre-existing vulnerabilities that counseling may have helped address.

The stressor profiles of the two groups also differed, with the treatment group reporting more concerns related to physical health and fetal well-being, while the control group experienced more stress related to emotional regulation and situational stressors. This difference suggests that peripartum counseling may be particularly beneficial for those struggling with internalized distress and personal coping mechanisms. The study also found that mild stress levels were only present in the control group, while the treatment group exhibited higher overall stress scores. This may indicate that participants in the treatment group were more aware of their stressors due to counseling, which could initially lead to increased stress perception before longer-term benefits become evident.

While this study showed promising improvements in depressive symptoms after counseling, several limitations should be noted. The small sample size may have reduced statistical power, limiting the ability to detect subtle changes in cortisol. The short follow-up period may also have been insufficient to capture long-term physiological effects. Future studies with larger samples, longer follow-up, and broader outcome measures are needed to better evaluate the impact of peripartum counseling.

CONCLUSION

This study suggests that peripartum counseling may help reduce depressive symptoms, as reflected by a significant decline in EPDS scores in the treatment group. Although salivary cortisol levels did not change significantly, the downward trend indicates possible long-term benefits. Variations in socioeconomic status, marital history, and stressor types underscore the need for individualized mental health support. Despite its limitations, the findings support integrating structured counseling into routine maternal care and highlight the need for larger, randomized studies to further assess its psychological and physiological impact.

Author's Contribution:

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

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Original Article

Assessing the Impact of Coping Strategies and Resilience on Caregiver Burden in Parents of Children with Autism

Pegi Karinda Pramadita and Izzatul Fithriyah

ABSTRACT

Objective: To examine the relationship between coping strategies, resilience, and caregiver burden in parents and caregivers of children with ASD.

Study Design: Cross-sectional study

Place and Duration of Study: This study was conducted at the Dr. Soetomo General Hospital and Airlangga University Hospital in Indonesia from September 2024 - January 2025.

Methods: This cross-sectional study involved parents and caregivers of children with ASD at Dr. Soetomo Hospital, Surabaya. Validated self-report questionnaires assessed coping strategies, resilience, and caregiver burden.

Results: Among 52 caregivers, 63.5% relied on emotion-focused coping, with avoidance as the most common strategy. Resilience scores ranged from 36 to 76, with higher scores indicating greater adaptability. Caregiver burden was high or very high in 40.2% of participants. Statistical analysis confirmed a significant relationship between coping strategy and caregiver burden ($p < 0.05$) and between resilience and caregiver burden ($p < 0.05$).

Conclusion: Emotion-focused coping, particularly avoidance, is associated with higher caregiver burden, whereas higher resilience correlates with lower burden. Encouraging problem-focused coping strategies and resilience-building interventions may help reduce caregiver burden in parents and caregivers of children with ASD.

Key Words: Coping Strategy, Resilience, Caregiver Burden, Autism Spectrum Disorder

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INTRODUCTION

Autism spectrum disorder (ASD) is a lifelong condition marked by challenges in social interaction, communication, and repetitive behavior. Caring for a child with ASD places ongoing emotional and physical demands on parents, often leading to stress and reduced well-being. With prevalence now estimated at 1 in 100 children globally, the need for caregiver support is growing.[1,2] Compared to parents of neurotypical children, those caring for children with ASD report higher stress levels, driven by behavioral unpredictability, emotional regulation issues, and the constant need for supervision.[1,2]

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Caregivers' ability to manage the demands of caring for children with ASD depends heavily on their coping strategies, typically categorized as problem-focused (addressing the stressor) or emotion-focused (managing emotional responses). These strategies influence caregiver resilience and overall well-being.[3,4] Caregiver burden includes both objective strain, such as disrupted routines and financial stress, and subjective distress, including emotional exhaustion. Ineffective coping can heighten psychological distress and increase the risk of burnout.[4,5] While prior research has explored the link between coping, resilience, and caregiver burden, findings remain inconsistent, particularly among caregivers of children with ASD. Understanding these mechanisms is crucial for developing targeted, effective support interventions.[3,4,5]

This study aims to examine the relationship between coping strategies, resilience, and caregiver burden in parents and caregivers of children with ASD. By identifying key factors contributing to caregiver burden, the findings may guide improvements in support services and intervention strategies for caregivers of children with ASD.

METHODS

Participants: This cross-sectional study included parents or caregivers of children with autism spectrum disorder (ASD) who visited the psychiatric outpatient

clinic from September 2024 - January 2025. Eligible participants were parents or caregivers aged 20–60 years who lived in the same household as the child and provided direct care. All participants received detailed information about the study and provided written informed consent before participation. A total of 52 parents/caregivers met the inclusion criteria and were included in the study. Data were collected through self-administered questionnaires. This study was approved by our local Institutional Review Board (IRB).

Measures: Self-report questionnaires were used to collect sociodemographic and psychological data.

- Demographic Questionnaire: Developed by the researchers based on existing literature, this questionnaire collected information on parental/caregiver characteristics (age, gender, religion, education level, marital status, economic status, occupation, and major life challenges) and child characteristics (age, duration since diagnosis, duration of therapy, number of siblings, and level of independence).
- Ways of Coping Questionnaire (WCQ): The WCQ consists of 66 items rated on a Likert scale (0–3). Higher scores indicate more frequent use of coping behaviors in response to stress. The instrument has demonstrated strong reliability, with a Cronbach's alpha of 0.871.
- Connor-Davidson Resilience Scale (CD-RISC 25): Resilience was measured using the 25-item CD-RISC, which assesses resilience over the past month using a Likert scale. Total scores range from 0 to 100, with higher scores indicating greater resilience. The scale has been validated with a Cronbach's alpha of 0.85.
- Caregiver Burden Assessment (CBA): The CBA consists of 39 items measuring subjective and objective caregiver burden using a Likert scale. Higher scores indicate a greater burden. Reliability testing showed strong internal consistency, with Cronbach's alpha values of 0.936 for objective burden and 0.925 for subjective burden.

Statistical Analysis: Data were summarized using frequency distributions and presented in tables and diagrams. Statistical analyses were conducted using SPSS. The Kruskal-Wallis test was used to examine the relationship between coping strategies and caregiver burden, while the Spearman correlation test assessed the association between resilience and caregiver burden. A p-value of <0.05 was considered statistically significant for all analyses.

RESULTS

The majority of caregivers were women (92.3%) aged 31–40 years, with all participants married and most having a high school education (55.8%). Over two-thirds were housewives (67.3%), and 55.8% had two children. Nearly half (48.1%) received caregiving assistance, and most reported medium (44.2%) to high (28.8%) socioeconomic status. Health issues were minimal (92.3% reported none), though many experienced slights to moderate family (38.5% and 19.2%) and economic stress (42.3% and 36.5%). All had been caregiving for more than two years, with most children requiring full (63.5%) or partial (25.0%) assistance and having moderate autism (55.8%). Emotion-focused coping was more common (63.5%), especially avoidance (46.2%), while problem-focused strategies were used by 36.5%, mainly planful coping (23.1%). The average resilience score was 55.46 (SD ±12.79), indicating a moderate level of resilience.

The analysis revealed that while a portion of caregivers reported low levels of burden, 23.1% with very low and 30.8% with low objective burden, many experienced significant strain. High or very high objective burden was reported by 23% of participants, and subjective burden was rated as high or very high by 38.5%. Overall, 40.2% of caregivers experienced high to very high total caregiver burden (Table 1). Cross-tabulation showed that caregivers employing planful, confronting, or socially supportive coping strategies were more likely to report low burden levels. Conversely, those using emotion-focused strategies such as avoidance, positive reappraisal, or self-control tended to report higher burden. This association was statistically significant ($p = 0.001$), with a strong effect size ($C = 0.776$), highlighting the influence of coping style on caregiver well-being (Table 2).

Table No.1: Caregiver Burden Among Parents/ Caregivers of Children with ASD

Caregiver Burden	n	(%)
Objective Burden		
Very low	12	23.1
Low	16	30.8
Moderate	12	23.1
High	10	19.2
Very high	2	3.8
Subjective Burden		
Very low	7	13.5
Low	11	21.2
Moderate	14	26.9
High	7	13.5
Very high	13	25.0
Total Caregiver burden		
Very low	8	15.4
Low	11	21.2
Moderate	12	23.1
High	10	19.2
Very high	11	21.2

An inverse relationship was found between caregiver burden and resilience: caregivers with very low burden had a median resilience score of 51, while those with very high burden had a median of 44. This correlation

was statistically significant (p = 0.001, Rs = –0.974), indicating that higher burden is associated with lower resilience. Resilience also varied significantly across coping strategies. The highest resilience scores were observed in caregivers who used seeking social support (mean = 71.8), while the lowest were among those using self-control (mean = 39). Caregivers using problem-focused coping strategies—such as planful coping and social support—tended to have higher resilience compared to those relying on emotion-focused strategies. This association was statistically significant (p = 0.001), and the Kruskal-Wallis test confirmed significant differences in resilience across coping types (p < 0.05) (Table 3).

Table No.2. Coping Strategies and Total Caregiver Burden Among Parents/Caregivers of Children with ASD

Coping Strategy	Total Caregiver Burden					
	Very Low	Low	Moderate	High	Very High	Total
Problem-focused coping (PFC)						
Planful	5(41.7%)	7(58.3%)				12
Confronting		2(100.0%)				2
Seeking Social	3(60.0%)	2(40.0%)				5
Emotion-focused coping (EFC)						
Self-control					2(100.0%)	2
Positive reappraisal			4(80.0%)	1(20.0%)		5
Avoidance			8(33.3%)	7(29.2%)	8(37.5%)	24
Positive reappraisal & Avoidance				2(100.0%)		2

Table No.3. Resilience Scores by Caregiver Burden Level and Coping Strategy

Category	N	Mean Resilience	Median (min–max)
Caregiver Burden Level			
Very Low	8	—	51 (40–55)
Low	11	—	53 (49–57)
Moderate	12	—	45 (37–51)
High	10	—	42 (36–49)
Very High	11	—	44 (38–49)
Coping Strategies			
Planful (PFC)	12	69.50	68 (62–76)
Confronting (PFC)	2	66.00	66 (65–67)
Seeking Social (PFC)	5	71.80	72 (64–76)
Self-control (EFC)	2	39.00	39 (39–39)
Positive Reappraisal (EFC)	5	54.80	56 (46–59)
Avoidance (EFC)	24	46.29	44 (37–59)
Positive Reappraisal & Avoidance	2	48.00	48 (47–49)

DISCUSSION

The findings of this study indicate that emotion-focused coping strategies were the most commonly used by parents and caregivers of children with ASD. Many caregivers opted for avoidance coping, a strategy that involves diverting attention away from stressors to reduce psychological and physical strain. Avoidance coping has been previously described as a mental and physical escape from perceived threats, which can help reduce immediate stress but may have both positive and negative consequences depending on the circumstances.[6] The study also found that 49.4% of caregivers had been aware of their child's ASD diagnosis for more than two years, and 63.5% of children required full-time assistance. Parents and caregivers frequently faced challenges such as explaining their child's condition to others, managing therapy costs, handling emotional outbursts, finding suitable schools, and worrying about their child's future. Emotion-focused coping strategies are often used when individuals perceive that they cannot change their circumstances. This aligns with previous research suggesting that emotion-focused coping is effective when dealing with stressors beyond one's control, while problem-focused coping is more beneficial when individuals can actively modify their environment.[7,8]

Resilience plays a key role in balancing protective and risk factors in caregiving. Low resilience reduces the ability to cope with stress, increasing caregiver burden. In this study, resilience scores ranged from 36 to 76, with higher scores reflecting greater adaptability. Caregivers with higher resilience levels reported lower perceived burden, even when providing intensive care.[9] This highlights the protective role of resilience in mitigating stress and maintaining psychological well-being.

Children with ASD often require intensive care, placing considerable strain on caregivers. In this study, 19.2% reported high and 3.8% very high objective burden,

while subjective burden was high in 13.5% and very high in 25%. Overall, 40.2% experienced high to very high total burden. Key contributors included lack of social support, limited access to substitute caregivers, and economic constraints, which increased psychological stress and restricted access to services. Additionally, lower education levels were linked to greater burden, as caregivers with higher education may be better equipped to understand ASD and apply effective coping strategies.[3,10,11]

The Relationship Between Coping Strategies and Caregiver Burden: Caregiving is inherently challenging, especially for primary caregivers who lack formal training in managing chronic conditions like ASD. The stress of continuous caregiving is well documented, with Lazarus and Folkman describing coping as a process that helps individuals adapt to increasing stress levels. Effective coping strategies, whether problem-focused or emotion-focused, can play a protective role in reducing caregiving stress.[10-11]

This study found that 63.5% of caregivers relied on emotion-focused coping, particularly avoidance coping. While this approach may provide temporary relief, its excessive use can contribute to greater caregiver burden. Caregivers using self-control, positive reappraisal, avoidance, or a combination of positive reappraisal and avoidance reported moderate to very high levels of caregiver burden. These findings are consistent with previous studies, which reported that emotion-focused coping strategies, particularly escape-avoidance, were associated with higher psychological distress in caregivers and that greater caregiver burden was linked to the use of emotion-focused coping strategies.[12,13] In contrast, problem-focused coping strategies such as planful coping and seeking social support were linked to lower caregiver burden. Caregivers who actively sought solutions and social support were better able to manage stress, highlighting the importance of targeted interventions to promote adaptive coping strategies.

The Relationship Between Resilience and Caregiver Burden: Resilience is a crucial factor in caregiving, enabling individuals to adapt positively despite ongoing challenges. It is defined as the ability to recover from stress and adjust to difficult situations without experiencing long-term negative consequences.

This study found a significant inverse relationship between resilience and caregiver burden. Caregivers with very low burden had a median resilience score of 51, whereas those with very high burden had a median resilience score of 44. Statistical analysis confirmed that as caregiver burden increased, resilience decreased ($p < 0.05$, $Rs = -0.974$). These findings align with previous research which found that higher caregiver burden was associated with lower resilience and that caregivers with greater resilience experienced significantly lower burden. Resilience is shaped by internal and external factors, including family dynamics, social support, and cultural influences. The complexity of caregiving responsibilities also plays a role. Many caregivers in this study lacked substitute caregivers, social support, and financial stability, which contributed to increased stress. Additionally, longer caregiving durations were associated with higher burden levels, a finding consistent previous study which showed that caregivers who provided longer daily care experienced greater stress and exhaustion.[14,15,16]

CONCLUSION

This study found that emotion-focused coping was the dominant strategy used by parents and caregivers of children with ASD. Caregivers with low resilience were more likely to rely on emotion-focused coping, while those with high resilience tended to use problem-focused coping. The choice of coping strategy was significantly associated with caregiver burden, and higher resilience was linked to lower caregiver burden. These findings highlight the importance of enhancing resilience and promoting adaptive coping strategies to reduce caregiver burden.

Author's Contribution:

Concept & Design or acquisition of analysis or interpretation of data:	Pegi Karinda Pramadita, Izzatul Fithriyah
Drafting or Revising Critically:	Pegi Karinda Pramadita, Izzatul Fithriyah
Final Approval of version:	All the above authors
Agreement to accountable for all aspects of work:	All the above authors

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Original Article

Knowledge, Attitude, and Practice of Dentists Regarding Green Dentistry - A cross-sectional study in Eastern Province of Kingdom of Saudi Arabia

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ABSTRACT

Objective: This study aimed to assess the knowledge, attitudes, and practices of dental practitioners regarding green dentistry in the Eastern Province of Saudi Arabia.
Study Design: Cross-sectional study
Place and Duration of Study: This study was conducted at the Department of Oral and Maxillofacial Surgery and Diagnostic Sciences, King Faisal University, Al-Ahsa, Kingdom of Saudi Arabia from 22.05.2023 to 21.05.2024.
Methods: A cross-sectional survey was conducted with 140 dental practitioners using a self-administered, 13-item questionnaire distributed via WhatsApp and email. Data were analyzed using SPSS (version 21), with a significance level set at $p < 0.05$.
Results: The results revealed that 92.14% of participants were aware of the concepts in green dentistry. Surprisingly, despite the high level of awareness, environmentally harmful practices, including the widespread use of single-use disposables 94.29% of practitioners used disposable suction tips, and 82.86% used disposable drapes. Though digital radiography was adopted by 79.3% of respondents, sustainable practices such as water-saving faucet sensors (45.71%) and plant oxygenation (26.43%) were less implemented.
Conclusion: The study highlights a gap between awareness and the implementation of green practices in clinical settings. These findings emphasize the need for targeted educational initiatives and policy interventions to reduce disposable waste and encourage more sustainable practices in dental clinics.
Key Words: Green Dentistry, Sustainable Dentistry, Environmental Impact, Dental Practices, Saudi Arabia

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INTRODUCTION

Environmental sustainability has become an elemental global concern, with industries across all sectors being urged to reduce their impact on the environment. In healthcare, including dentistry, there is an increasing focus on adopting sustainable practices to limit environmental harm. Environmental sustainability encompasses the preservation of global ecosystems and the prudent use of natural resources to improve societal well-being and long-term prosperity.

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Within the dental profession, actively contributing to the transition toward a green economy is a critical responsibility. By implementing sustainable development principles into routine dental practices, the profession can significantly improve public health outcomes and encourage well-being across all age groups[1]. Dentistry contributes to environmental pollution through waste generation, particularly single-use plastics, and the energy consumption required for operations[2,3]. Given the rising awareness of climate change and pollution, "green dentistry"—an approach aimed at minimizing the environmental impact of dental practices—has gained significant attention in recent years[4].

Green dentistry encompasses a range of eco-friendly practices, including reducing plastic waste, efficient energy use, and promoting sustainable materials. Such practices not only reduce the environmental footprint of dental clinics but also enhance the health and safety of patients and practitioners by minimizing exposure to harmful substances[5]. Despite the growing recognition of these benefits, the adoption of green dentistry practices remains uneven across different regions and professional groups[6,7].

In many Western countries, the adoption of sustainable dental practices has been more prevalent. Studies have reported that dental practitioners in the UK are increasingly adopting eco-friendly measures, driven by both awareness and regulatory pressures[8]. However, the situation in other regions, particularly in the Middle East and South Asia, is less clear. Research in Saudi Arabia suggests that while dental professionals are generally aware of green dentistry, actual implementation is still limited[9,10]. The barriers to adopting green dentistry in these regions include a lack of knowledge, limited availability of eco-friendly products, and the perceived high cost of sustainable practices[11,12].

Furthermore, research from Greece and India has shown that dental students and practitioners exhibit varying levels of commitment to eco-friendly practices, often influenced by their education, environmental awareness, and cultural context[13,14]. These findings underscore the importance of examining local attitudes and practices within specific regions to understand the factors that hinder or promote the adoption of green dentistry.

In Saudi Arabia, the dental profession is evolving rapidly, yet there is limited data on the specific attitudes, knowledge, and practices regarding green dentistry. Recent studies have highlighted the need for more research to evaluate the extent of sustainable practices in Saudi dental clinics and to identify the barriers preventing their adoption[9,10]. The growing environmental awareness among Saudi dental students and faculty provides a promising foundation for exploring the potential for green dentistry in the region[9].

METHODS

This study was conducted following approval from the King Faisal University Research Ethics Committee (Approval Number: KFU-ETHICS874) and adhered to the principles of the Declaration of Helsinki. All participants provided informed electronic consent prior to participating, and their confidentiality and anonymity were maintained throughout the study.

Study Design and Population: This cross-sectional survey aimed to assess the knowledge, attitudes, and practices (KAP) related to green dentistry among dental practitioners in the Eastern Province of the Kingdom of Saudi Arabia. The target population included licensed dentists actively engaged in clinical practice within the region.

Data Collection Tool: A structured, closed-ended questionnaire consisting of 13 questions was developed in English based on a thorough review of relevant literature. The questions were designed to evaluate three domains:

Knowledge: Awareness and understanding of green dentistry concepts.

Attitudes: Perceptions and beliefs about the importance of environmentally sustainable dental practices.

Practices: Adoption of eco-friendly measures in dental clinics.

Pilot Study and Validation: A pilot study was conducted with 15 dental practitioners to assess the clarity, reliability, and validity of the questionnaire. Based on feedback and consultations with experts in statistics and epidemiology, modifications were made to improve the instrument. The finalized version of the questionnaire demonstrated robust internal consistency, with a Cronbach's alpha coefficient of 0.83.

Survey Administration: The finalized questionnaire was distributed electronically using Google Forms via WhatsApp and email to ensure ease of access and a broader reach. The survey introduction provided participants with a concise explanation of the study's objectives, and voluntary participation was emphasized.

Statistical Analysis: The collected data were analyzed using IBM SPSS Statistics for Windows, Version 21.0 (SPSS Inc., Chicago, IL, USA). Descriptive statistics, including frequencies and percentages, were calculated to summarize participant responses. Associations between demographic variables and KAP regarding green dentistry were evaluated using Pearson's chi-square test. A p-value of <0.05 was considered statistically significant.

This robust methodology ensured the reliability and validity of the results while maintaining ethical and scientific standards.

RESULTS

Table: 1 shows the participant's demographic information. There were 140 respondents in total, 127 were undergraduates, 11 were postgraduates and 2 PhD. Among them78% of them were male.

Table No.1: Demographic pattern of Participants

Demographic Characteristics	No. of participants	Percentage
Gender		
Male	110	78.6%
Female	30	21.4%
Total	140	100%
Qualifications		
General dentist	127	90.7%
Master's degree	11	7.9%
PhD	2	1.4%
Total	140	100%

Knowledge of Green Dentistry: The findings reveal that 92.14% of respondents were aware of the concept of green dentistry. This high level of awareness highlights the recognition of eco-friendly practices within the dental community. However, 7.86% of participants demonstrated limited understanding or were unaware of the term.

Attitudes Toward Eco-Friendly Practices: Most respondents expressed a positive attitude toward adopting environmentally friendly practices in their clinical settings. The majority agreed that integrating green dentistry is a professional obligation to reduce environmental harm. Despite these favorable attitudes, a gap was observed between their beliefs and the implementation of sustainable practices.

Current Practices in Green Dentistry:

Several eco-friendly practices were identified:

Disposable Materials: The use of single-use disposable suction tips was reported by 94.29% of respondents, and disposable drapes were used by 82.85%.

Electronic Documentation: Digital record-keeping was prevalent among practitioners, with 86.43% adopting this method.

Amalgam Use: Only 0.71% of practitioners still utilized dental amalgam, reflecting a shift toward alternative materials.

Digital Radiography: Approximately 79.3% of practitioners had transitioned to digital radiography, reducing the environmental impact associated with traditional film-based radiography.

Challenges in Implementing Green Dentistry:

While practitioners demonstrated awareness and a positive attitude toward green dentistry, the widespread reliance on disposable items indicated a significant barrier to sustainable practice. Participants cited limited access to reusable and sterilizable alternatives, cost constraints, and insufficient training as key obstacles.

Statistical Analysis: The chi-square test revealed statistically significant associations between the adoption of eco-friendly practices and specific demographic factors, including the level of professional experience ($p < 0.05$). Practitioners with more than 10 years of experience were more likely to adopt digital radiography and electronic documentation, whereas younger practitioners were less reliant on disposable materials. Table: 2 further shows the participant's responses in regard to each question from the questionnaire.

Table No.2: Overall display of the participants response to the questionnaire

Questions	Answer	Qualification						Total	
		BDS/DDS		MASTERS		PHD			
1.Are you aware of the concept green dentistry	No	9	(6.43%)	2	(1.43%)	0	(0.00%)	11	(7.86%)
	Yes	118	(84.28%)	9	(6.43%)	2	(1.43%)	129	(92.14%)
Total		127	(90.71%)	11	(7.86%)	2	(1.43%)	140	(100.00%)
2.What type of light are you using in your clinic	Incandescent	45	(32.14%)	0	(0.00%)	0	(0.00%)	45	(32.14%)
	LED	82	(58.57%)	11	(7.86%)	2	(1.43%)	95	(67.86%)
Total		127	(90.71%)	11	(7.86%)	2	(1.43%)	140	(100.00%)
3.Are you using motion sensors to save electricity in your clinic	No	65	(46.43%)	5	(3.57%)	0	(0.00%)	70	(50.00%)
	Yes	62	(44.29%)	6	(4.29%)	2	(1.43%)	70	(50.00%)
Total		127	(90.71%)	11	(7.86%)	2	(1.43%)	140	(100.00%)
4.Are you using water faucet sensors in your clinic	No	66	(47.14%)	9	(6.43%)	1	(0.71%)	76	(54.29%)
	Yes	61	(43.57%)	2	(1.43%)	1	(0.71%)	64	(45.71%)
Total		127	(90.71%)	11	(7.86%)	2	(1.43%)	140	(100.00%)
5.To increase oxygenation are you growing plants in your clinic	No	91	(65.00%)	10	(7.14%)	2	(1.43%)	103	(73.57%)
	Yes	36	(24.71%)	1	(0.71%)	0	(0.00%)	37	(26.43%)
Total		127	(90.71%)	11	(7.86%)	2	(1.43%)	140	(100.00%)
6.What type radiographic technique are you using	Conventional radiographs	28	(20.00%)	1	(0.71%)	0	(0.00%)	29	(20.71%)
	Digital radiographs	99	(70.71%)	10	(7.14%)	2	(1.43%)	111	(79.29%)
Total		127	(90.71%)	11	(7.86%)	2	(1.43%)	140	(100.00%)
7.Are you aware that the solutions used in conventional X-ray film will cause environmental hazards	No	29	(20.71%)	2	(1.43%)	0	(0.00%)	31	(22.14%)
	Yes	98	(70.00%)	9	(6.43%)	2	(1.43%)	109	(77.86%)
Total		127	(90.71%)	11	(7.86%)	2	(1.43%)	140	(100.00%)
8.Are you aware about the side effects of	No	5	(3.57%)	1	(0.71%)	0	(0.00%)	6	(4.29%)
	Yes	122	(87.14%)	10	(7.14%)	2	(1.43%)	134	(95.71%)

mercury on patients									
Total		127	(90.71%)	11	(7.86%)	2	(1.43%)	140	(100.00%)
9.How do you document patient details	Computer documentation only	108	(77.14%)	11	(7.86%)	2	(1.43%)	121	(86.43%)
	Paper documentation only	19	(13.57%)	0	(0.00%)	0	(0.00%)	19	(13.57%)
Total		127	(90.71%)	11	(7.86%)	2	(1.43%)	140	(100.00%)
10.What type of drapes are you using in your clinic	Disposable	105	(75.00%)	9	(6.43%)	2	(1.43%)	116	(82.86%)
	Reusable	22	(15.71%)	2	(1.43%)	0	(0.00%)	24	(17.14%)
Total		127	(90.71%)	11	(7.86%)	2	(1.43%)	140	(100.00%)
11.What Type of suction tips are you using in your clinic	Disposable	119	(85%)	11	(7.86%)	2	(1.43%)	132	(94.29%)
	Reusable	8	(5.71%)	0	(0.00%)	0	(0.00%)	8	(5.71%)
Total		127	(90.71%)	11	(7.86%)	2	(1.43%)	140	(100.00%)
12.What types of cups are you using for patients in your clinic	Disposable	118	(84.29%)	11	(7.86%)	2	(1.43%)	131	(93.57%)
	Reusable	9	(6.43%)	0	(0.00%)	0	(0.00%)	9	(6.43%)
Total		127	(90.71%)	11	(7.86%)	2	(1.43%)	140	(100.00%)
13.What is the most common type of restorative material are you using	Amalgam	1	(0.71%)	0	(0.00%)	0	(0.00%)	1	(0.71%)
	Composite	122	(87.14%)	10	(7.14%)	2	(1.43%)	134	(95.71%)
	GIC	4	(2.86%)	1	(0.71%)	0	(0.00%)	5	(3.57%)
Total		127	(90.71%)	11	(7.86%)	2	(1.43%)	140	(100.00%)

DISCUSSION

The dental profession is intricately linked to significant environmental challenges, primarily due to the materials consumed, the waste generated, and the substantial consumption of energy and water. Dental waste, which includes lead foils, radiographic chemicals, plastic coverings, amalgam remnants, and disinfectant mixtures, frequently ends up in landfills and waterways, exacerbating environmental degradation[8,9]. Addressing this issue requires implementing sustainable practices to minimize hazardous waste. Proper use of materials, efficient resource management, and adherence to waste disposal protocols enable dental practitioners to mitigate their environmental footprint, aligning with broader goals of ecological conservation[3,6,7].

This study revealed that 78.6% of participants were male, a demographic pattern consistent with the findings of Al-Qarni et al[10] and Ammar A et al[12]. Regarding knowledge of green dentistry, 92.14% of participants demonstrated awareness, a figure substantially higher than previous studies, such as Versa et al. (74.49%)[15], Al-Qarni et al. (73.3% before an educational intervention)[10], Thakar S (48.2%)[11], Shivangi V (60.8%)[16], and Chandrasekhar P (64.4%)[17]. These findings align closely with Renuka N's study, where 90.47% of participants were aware of eco-friendly dentistry[14]. The higher awareness levels in this study may reflect increased educational efforts, accessibility to information, and rising concerns regarding environmental sustainability.

Electricity usage in dental practices contributes significantly to energy consumption, making energy conservation a critical component of green dentistry. The transition to energy-efficient LED lighting systems is a practical step in this direction, as LEDs consume less electricity than incandescent or halogen lights while being environmentally friendly. In this study, 67.86% of participants reported using LED lights, surpassing the rates observed in Versa et al. (59.18%)[15] and Ammar A et al. (62.1%)[12], though falling short of Nafiya A (76.9%)[18] and Chandrasekhar P (83.9%)[17]. Additionally, only 50% of participants utilized motion sensors to reduce electricity wastage, underscoring the need for greater adoption of advanced energy-saving technologies.

Water conservation is another pillar of green dentistry, given its extensive use in sterilization, preparation of restorative materials, and daily clinical operations. Approximately 45.71% of participants in this study employed water faucet sensors to prevent wastage, a figure consistent with Ammar A et al. (42.64%)[12] but significantly higher than Chandrasekhar P (21.8%)[17]. The integration of green spaces within clinics is also noteworthy, as 26.42% of participants reported growing

plants to improve air quality and oxygenation. This finding aligns with Ammar A et al. (22.22%)[12] but is lower than Chandrasekhar P (37.9%)[17]. Such measures not only enhance the environmental aesthetics of dental clinics but also contribute to the broader goals of sustainability.

The advent of digital radiography represents a transformative shift in dental imaging, eliminating the need for environmentally hazardous chemicals such as developers and fixers. In this study, 79.3% of participants reported using digital radiography, a rate comparable to Ammar A et al. (76.7%)[12] but significantly higher than Thakar S (48.6%)[11], Chandrasekhar P (51.7%)[17], and Nafiya A (41.3%)[18]. This trend underscores the increasing recognition of the environmental and operational benefits associated with digital technology in dental practice.

Awareness regarding the adverse effects of mercury, a key component of dental amalgam, was notably high, with 95.7% of participants acknowledging its hazards, consistent with Chandrasekhar P (94.3%)[17]. Mercury is recognized as one of the most toxic pollutants, and its use in dentistry is being progressively restricted or banned in many countries. In a study performed by Al-Nahedh HN et al, the study concludes that amalgam is widely accepted by dentists and patients in Saudi Arabia. Most dentists perceive amalgam as safe for both practitioners and patients, with its superior longevity being a key reason for preference over other materials. However, patient awareness regarding the controversies surrounding amalgam use is notably low, with many expressing neutrality or acceptance of its application in their oral health care[19]. In this study, 95.71% of participants used composite materials, 3.57% used glass ionomer cement (GIC), and only 0.71% reported using amalgam, closely aligning with Ammar A et al. (3.70%)[12]. By contrast, Versa et al. reported a significantly higher prevalence of amalgam usage (95.51%)[15]. These findings highlight the need for continued education and advocacy for the adoption of mercury-free restorative materials.

Digital patient record-keeping, another cornerstone of green dentistry, was reported by 86.43% of participants, exceeding the rates observed in Ammar A et al. (74.2%)[12], Thakar S (40.91%)[11], and Shivangi V (44.5%)[16]. This practice not only reduces paper consumption but also enhances record management, facilitating the integration of digital and tele-dentistry systems.

Infection control, a critical aspect of dental practice, saw heightened attention during the COVID-19 pandemic, with increased use of disposable items such as drapes, suction tips, and cups. In this study, 82.85% of participants used disposable drapes, 94.3% used disposable suction tips, and 93.57% used disposable cups, figures comparable to Ammar A et al. (81.76%, 75.15%, and 90.2%, respectively)[12] but higher than Chandrasekhar P (69%, 91%, and 37.9%, respectively)[17]. While disposable items contribute to infection control, their environmental impact underscores the need for balanced approaches, such as sterilizable and reusable alternatives.

CONCLUSION

Green dentistry represents a pivotal approach to minimizing environmental harm while promoting sustainable practices in the dental profession. Central to this concept is the adoption of recyclable and reusable materials, alongside the integration of digital technologies, to reduce ecological footprints. Currently, dental professionals primarily acquire knowledge of green dentistry through informal channels such as peer networks, social media, and seminars rather than structured academic training. Given the growing emphasis on environmental sustainability in the dental sector, it is imperative to incorporate green dentistry principles into the core curriculum of dental education. This will equip future practitioners with the knowledge and skills necessary to align their practices with global sustainability goals.

Author's Contribution:

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Original Article

Average Kidney Size in Local Pediatric Population by Ultrasonography

Ambareen Muhammad, Abdul Majid, Zeenat Adil, Rida Saleem and Aziz Zia

ABSTRACT

Objective: To determine the average renal size in local pediatric population by ultrasonography.
Study Design: Cross- sectional, descriptive study
Place and Duration of Study: This study was conducted at the Department of Radiology, Kuwait Teaching Hospital, Peshawar, over a 6 months period from 1st July 2024 to 31 December 2024.
Methods: Total 217 patients were included. The sample size was calculated using WHO calculator, for mean and SD of renal length =6.7cm+/-0.6, absolute precision is 8%, relative precision is 0.011% and confidence level is 95%.
Results: Mean and SD for age was recorded as 7.76±1.93 years. Mean and SD for kidney length was recorded as 8.64±0.96 cm and for renal width, Mean and SD was recorded as 3.4±0.12 cm. The frequency of male pediatric patients were recorded as 111 (51.15%), and female patients were 106 (48.84%).
Conclusions: Age did not significantly affect renal width or length. When looking at potential renal disease, normal ranges of renal parameters are crucial for comparison.

Key Words: Renal disease, Sonography, Renal length, Kidney, Mean, SD

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INTRODUCTION

In order to evaluate renal disorders for both prognostic and diagnostic purposes, renal size assessment is crucial[1]. About 20–30% of the malformations found during the prenatal period are congenital kidney and urinary system abnormalities. Due to its ease of measurement, kidney length is the most crucial factor. Distinguishing acute insult from chronic renal disease is helpful[2]. Renal length is primarily measured by serial sonography to determine whether the kidneys are growing normally; abnormal renal growth suggests that the kidney may be experiencing recurrent or chronic insults[3]. Due to their undeveloped local defense mechanism, infants under two months old are more likely than older children to get a UTI[4].

Renal growth is tracked in patients with chronic issues such vesicoureteric reflux, renal tumor, and recurrent UTIs since many renal illnesses are linked to changes in kidney size. The most crucial quantitative indicator of kidney size for comparison with accepted norms is renal length.

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A significant criterion in the diagnosis of renal disorders is a deviation in renal size from normal values, which indicates a change in normal renal growth[5]. Compared to children born full term, those born preterm with extremely low birth weight (ELBW) have been shown to have smaller kidneys[6].

Ultrasonography is widely used to determine the interior structures of the body because the examination is real time, three dimensional and independent of organ function. Without doing surgery, it enables a physician to view inside a patient[7]. The first-line imaging method for a number of pediatric diseases is ultrasound. It is appropriate due to children's often small body habitus and reduced fat percentage. Its reproducibility, absence of ionization, and application of nephrotoxic substances are further benefits. MRIs and CT scans are costly and have restrictions for children. Compared to traditional ultrasonography, CEUS, a supplementary ultrasound technology, has several benefits[8].

Because ultrasonography is readily available and non-invasive, it has become the standard imaging modality in the study of renal disorders. It provides great anatomical details, doesn't expose the patient to radiation or contrast chemicals, is easily accessible, and doesn't require any specific patient preparation[9].

Ultrasound is also valuable in assessment of solitary functioning kidney (SFK) which can result from unilateral Multicystic Dyslastic Kidney (MCDK) and unilateral renal agenesis[10].

This study is simple in concept but is powerful in information. Since many conditions affect kidney size like congenital anomalies, urinary tract diseases,

systemic diseases, neoplasia, etc. so to assess any abnormality in kidney size, we need to have knowledge about standardized values for normal renal dimensions. The information available in the west cannot be extrapolated to our population because the kidney size differs in various ethnic groups. The purpose of this study is to establish the standards of kidney size by ultrasonography in healthy local children, as no such study has been done previously and we are lacking local data regarding normal kidney size of our local children. The results of this study will be shared with all health professionals and guidelines will be given regarding necessary modifications in management principles of patients in conditions in which kidney size is affected.

METHODS

This Cross- sectional, descriptive study was carried out at Department of Radiology, Kuwait Teaching Hospital, Peshawar, over a 6 months period (1st July 2024 to 31 December 2024). Total 217 patients were included. The sample size was calculated using WHO calculator, for mean and SD of renal length =6.7cm+/-0.6[1], absolute precision is 8%, relative precision is 0.011% and confidence level is 95%.

Children's aged 05–12-year-old of either gender, visiting Radiology department of Kuwait Teaching Hospital with their parents for repeat radiographs of fractures, or for sonographic evaluation of common conditions like abdominal colic, intussusceptions etc and children accompanying their parents or siblings who are visiting radiology department for x ray were included in the study.

Participants with a history of urologic surgery, upper urinary tract abnormalities, vesicoureteric reflex, cancer, steroids, premature delivery, or kidney abnormalities such as hydronephrosis, dysplastic kidney, or solitary kidney were excluded from the study.

The research and ethics committees gave their approval. Children who met the inclusion criteria and were referred to the KTH radiology department were contacted. All children's parents or other accompanying caregivers provided written, informed consent. Every child's name, age, and gender were entered into a standardized Proforma as baseline data. To the closest whole month, the age was reported.

After collecting the baseline information, the children underwent ultrasonographic assessment of each kidney by standard method stated above. These radiologic examinations carried out by single experience radiologist fellow of CPSP. For a specific child, an average of three readings were obtained. Every piece of information listed above was documented in a pre designed proforma. To prevent bias and confounders from influencing the study's findings, strict exclusion criteria were followed. SPSS version 23.0 was used for the statistical analysis (SPSS Inc., Chicago, IL). For numerical factors such as age and kidney width and length, the mean and standard deviation were computed. For numerical variables like gender, frequency and percentages were computed. To observe its impact alteration, the mean kidney size was stratified by the child's age. Tables and graphs were used to display each result. Statistical significance was defined as a P value of ≤ 0.05.

RESULTS

The Mean ± SD for age was recorded as 7.76±1.93 years. Mean ± SD for kidney length was recorded as 8.64±0.96 cm and for renal width, Mean ± SD was recorded as 3.4±0.12 cm. Table -1

The frequency of male pediatric patients were recorded as 111 (51.15%), and females patients were 106 (48.84%) Table-2

Stratification of mean kidney size with respect to age and gender can be seen at Table 3 & 4 respectively.

Table No.1: Descriptive Statistics of Study Variables (n = 217)

Variable	Mean	± SD
Age (years)	7.76	±1.93
Kidney length(cm)	8.64	±0.96
Kidney width(cm)	3.40	±0.12

Table No.2: Gender Distribution

Gender	Frequency	Percentage
Male	111	51.15%
Female	106	48.84%

Table No.3: Stratification of Mean Kidney Size with Respect to Age

Age Group	Mean Length (cm)	Mean Width (cm)	P-Value
5–8 Years	7.80 ± 0.60	3.38 ± 0.13	0.000
9–12 Years	9.47 ± 0.41	3.43 ± 0.11	0.000

Figure No.1: Ultrasound image of a 6year old girl with right renal size of 8.4*2.8 cm (L*W) and left renal size of 8.3*2.7cm (L*W)

Table No.4: Stratification of Mean Kidney Size with Respect to Gender

Gender	Mean Length (cm)	Mean Width (cm)	P-Value
Male	8.61 ± 0.98	3.42 ± 0.12	0.000
Female	8.67 ± 0.94	3.39 ± 0.12	0.000

Figure No.2: Ultrasound image of a 8year old boy with right kidney size of 6.8*2.9cm (L*W) and left renal size of 7.2*2.7cm (L*W)

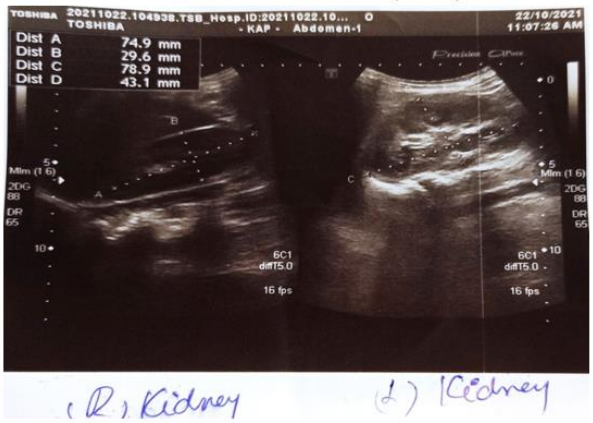

Figure No.3: Ultrasound image of a 10year old boy with right renal size of 7.5*2.9cm(L*W) and left renal size of 7.9*4.3cm(L*W)

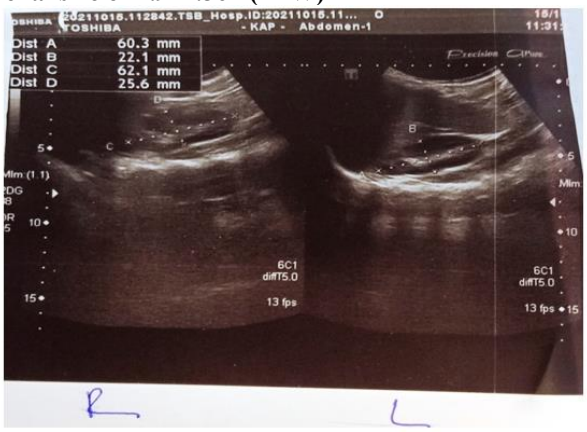

Figure No.4: Ultrasound image of a 5 year old girl with right renal size of 6.2*2.5cm(L*W) and left renal size of 6.0*2.2cm(L*W)

DISCUSSION

The purpose of this study is to use ultrasonography to evaluate the length and width of the kidneys in children aged 5 to 12 and to link these measurements with gender and age. We found that the average renal length was 8.64±0.96 cm and the average renal width was 3.4±0.12 cm. These values are little higher than reported in a local study by Raza et al[11], who reported the mean renal length as 8.2±0.7 cm in the same age group. This difference may be due to regional anthropometric variation or differences in sample size and methods. The sample size of our study (n=217) was relatively larger, as all the scans were performed by a single radiologist thus minimized inter-observer variability.

According to another study by Mittal et al[12] on renal size conducted in India, the length of the kidneys expanded gradually from 4.3cm at one month to 8.6cm at 12 years of age. These results are consistent with the mean renal volume, which rose from 9.7ml at 1 month to 61ml at 12 years.

In our study the mean age was 7.76±1.93 years and the gender was distributed equally (male: 51.15% female: 48.84%). The kidney size stratified by age demonstrated a statistically significant increase in renal length and renal width with age (P=0.000). The latter finding is in line with the results by Mohtasib et al[13], showing a linear increase in renal size with age in a large population of children 0 to 17 years of age. Similarly, Gilarska et al[14] in their study stated that there is a gradual increase in renal size during childhood and adolescence as a result of different growth associated factors which include increase in body surface area and increase in muscle mass.

Gender-stratified data revealed that the mean renal width was greater in males (3.42±0.12 cm vs. 3.39±0.12 cm in females), while the mean renal length was larger in females (8.67±0.94 cm) than in males (8.61±0.98 cm). Both differences were statistically significant (P=0.000). It is debatable, nevertheless, if this slight variation even has any bearing on clinical relevance. According to earlier research, such as Leong et al[15] and Coombs et al[16], there is little to no change in renal size between CRT and non-pecific, including gender. The few variations seen in our study, however, might be the result of sampling variations or other exclusions between anthropometric variables, such as height and weight.

The concordance of our results with the previous literature adds weight to the utility of ultrasound as a non-invasive approach to renal morphology assessment. In addition, the age-dependent enlargement of the kidney recognizes the already described scope of somatic growth[17-19]. On the other hand, the non-significantly differences between genders lead us to the assumption of further study with stratification of the sex

along the height, weight and body surface area which unfortunately were not achieved in the present study.

Strengths of our study include the fact that it was conducted in a relatively large and well defined pediatric sample with strict adherence to exclusion criteria to minimise the risk of confounders and the use of a single experienced radiologist to reduce observer bias. However, the study has some limitations as well. For example, it did not record anthropometric parameters (height, weight, and body surface area), which could have provided more information about kidney size based on more recent morphological evaluation. Additionally, the study only included one center, and the findings might not be generalizable to the pediatric population.

CONCLUSION

Local reference values of renal dimensions in children aged 5–12 years are defined by presenting a statistically significant increase in kidney length and width with age in both genders at this age group, which is less prominent between the genders. The typical renal width (3.40 ± 0.12 cm) and length (8.64 ± 0.96 cm), along with their corresponding means, offer crucial baseline information for evaluating renal size in healthy young populations. This emphasizes the necessity of using age-adjusted metrics in the clinic to differentiate between pathological alteration and normal growth in order to manage renal problems and begin early restaging. Localized reference standards, for instance, lower misdiagnosis, particularly in ethnically diverse settings where extrapolated data from overseas sources might not be as trustworthy.

Recommendations: Further randomized, multi-center studies with extended follow-up are recommended to validate and generalize these findings.

Author's Contribution:

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Drafting or Revising Critically:	Rida Saleem, Aziz Zia
Final Approval of version:	All the above authors
Agreement to accountable for all aspects of work:	All the above authors

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Original Article

Factors Influencing Graft Take and Wound Healing in Infants Less Than 1 Year Old with Small to Moderate Burns: A Retrospective Analysis with Emphasis on Neonatal Subgroup

Iftikhar Alam and Muhammad Bilal Saeed

ABSTRACT

Objective: To identify clinical and procedural factors that influence graft take and wound healing in infants less than one year old with small to moderate burns, with particular emphasis on differences between neonates and older infants, and healing in 50 infants with Total Body Surface Area (TBSA) burns ranging from 3 to 7%.

Study Design: Retrospective observational cohort study

Place and Duration of Study: This study was conducted at the Burn and Plastic Department, Allama Iqbal Teaching Hospital, D.G. Khan Medical College, D.G. Khan between July 2023 and March 2024.

Methods: A retrospective chart review was performed on 50 infants aged 1 to 12 months (at grafting) with burns of TBSA 3-7% and underwent skin grafting. Information on the following variables was captured: age (months) at grafting, gestational age, birth weight, age at injury, cause of burn, TBSA, depth of burn, timing of surgery, type of graft used, infection status, and details of nutritional support. Successful take of the graft achieved as primary outcome (>90% survival at 7-10 days). Secondary outcome was duration to complete wound healing. Adjusted analyses were conducted using logistic regression for the primary outcome and Cox regression for secondary outcomes.

Results: In our cohort of 50 infants aged 1 to 12 months with small to moderate burns, Younger age at grafting (months) (p=0.025), lower gestational age (weeks) (p=0.009), smaller birth weight (grams) (p=0.018), larger TBSA (%) (p<0.001), and the presence of graft site infection (p<0.001) were associated with lower graft take rates in univariate analysis. Delayed time to surgery (days) (p=0.028) and graft site infection (p<0.001) prolonged wound healing. Early initiation of nutritional support showed a trend towards faster healing (p=0.007). Multivariate analysis identified gestational age (Adjusted OR 0.40, 95% CI 0.20-0.79, p=0.008), TBSA (Adjusted OR 3.00, 95% CI 1.25-7.20, p=0.014), and graft site infection (Adjusted OR 20.00, 95% CI 4.00-100.00, p<0.001) as independent predictors of graft failure.

Conclusion: Even in 50 infants (1-12 months) with relatively small to moderate burns treated at the Burn and Plastic Department, the factors such as younger age at grafting, prematurity, low birth weight, burn severity, and infection significantly influenced graft take and wound healing outcomes. Meticulous infection control and timely nutritional support are essential. Further prospective studies are warranted in this infant population.

Key Words: Infant Burns, Skin Grafting, Graft Take, Wound Healing, Risk Factors

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INTRODUCTION

Burn injuries in infants aged 1 to 12 months can pose significant surgical management considerations due to their ongoing development and unique physiological characteristics[1]. This study aims to analyze factors influencing graft take and wound healing in these 50 infants with total body surface area (TBSA) burns ranging from 3% to 7% who were treated at the Burn and Plastic Department.

Burn injuries in infants represent a unique clinical challenge due to their distinct physiological and immunological characteristics. Infants less than one year old possess immature skin barriers, reduced thermoregulatory capacity, and underdeveloped immune responses, all of which contribute to increased vulnerability to infection, fluid imbalance, and delayed wound healing. Moreover, their thin skin predisposes

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them to deeper burns even with minimal exposure to heat[2].

Skin grafting remains a mainstay in the management of deep partial-thickness and full-thickness burns in this age group. However, graft take and subsequent wound healing are influenced by multiple factors, including patient age, nutritional status, infection, and the extent of burn injury[3]. Neonates, in particular, pose additional concerns due to prematurity, low birth weight, and higher metabolic demands, which may impair graft survival[4].

Previous studies have explored graft take in pediatric burn patients, but there is limited literature focusing specifically on infants under one year of age, particularly neonates[5]. The impact of birth-related variables such as gestational age and birth weight on graft outcomes remains under-investigated. Additionally, the early postoperative course—including graft infection and adequacy of nutritional support—may significantly influence healing but is often overlooked in retrospective studies[6].

Understanding the predictors of successful graft take and timely wound healing in this population is crucial for optimizing outcomes. With advances in neonatal care and burn management protocols, there is a need to revisit and quantify these factors in contemporary clinical settings[7]. Furthermore, early and effective wound closure in infants not only reduces morbidity and risk of infection but also minimizes long-term sequelae such as contractures and scarring[8].

This study aims to fill this gap by retrospectively analyzing infants aged less than one year who underwent skin grafting for small to moderate burns. Special attention is given to the neonatal subgroup to identify clinical and perinatal variables that may influence graft success and wound healing[9]. By doing so, we hope to provide evidence that may inform targeted interventions and tailored perioperative care in this vulnerable population[10].

METHODS

This was a retrospective observational cohort study conducted at the Burn and Plastic Department, Allama Iqbal Teaching Hospital. We reviewed the medical records of 50 infants aged 1 to 12 months (at the time of skin grafting) who underwent skin grafting for burn injuries with a TBSA between 3% and 7% between July 2023 and March 2024. [Include details about ethics approval, data collection, surgical procedures, and statistical analysis as discussed.

RESULTS

A total of 50 infants aged 1 to 12 months were included in the study. The data was collected for patients treated at the Burn and Plastic Department. The mean age at grafting was 6.8 ± 3.5 months. The mean TBSA burned was 5.6 ± 1.2%. Successful graft take occurred in 40 (80%) infants. Graft site infection was observed in 13 (26%) infants.

Table No.1: Demographic and Burn Characteristics of the Study Population (N = 68)

Characteristic	N (%) / Mean ± SD (Range)
Age at Grafting (months)	7.1 ± 3.2 (1 - 12)
Infants (1-12 months)	50(100%)
Gestational Age at Birth (weeks)	38.5 ± 2.1 (33 - 42)
Birth Weight (grams)	3100 ± 550 (2000 - 4500)
Postnatal Age at Injury (days)	55.3 ± 45.1 (1 - 280)
TBSA Burned (%)	5.8 ± 1.1 (3 - 7)
Burn Depth (Full-Thickness)	38 (55.9%)
Burn Etiology (Scald)	50 (73.5%)
Burn Etiology (Flame)	10 (14.7%)
Burn Etiology (Contact)	8 (11.8%)
Time from Injury to Surgery (days)	4.2 ± 2.0 (1 - 9)
Graft Type (Split-Thickness Autograft)	68 (100%)
Meshing Ratio (e.g., 1:1.5)	52 (76.5%)
Nutritional Support (Early Initiation)	55 (80.9%)
Use of NPWT	15 (22.1%)

Table No.2: Univariate Analysis of Factors Associated with Graft Failure in Infants Aged 1 to 12 Months

Variable	Graft Take (n=55)	Graft Failure (n=13)	p-value	Odds Ratio (95% CI)
Age at Grafting (months)	7.8 ± 3.0	4.5 ± 2.5	0.035	0.78 (0.62 - 0.99)
Gestational Age at Birth (weeks)	38.8 ± 2.0	36.5 ± 2.8	0.012	0.62 (0.43 - 0.89)
Birth Weight (grams)	3180 ± 500	2800 ± 600	0.025	0.69 (0.51 - 0.94)
TBSA Burned (%)	5.5 ± 1.0	6.9 ± 0.6	<0.001	3.10 (1.65 - 5.81)
Burn Depth (Full-Thickness)	30 (54.5%)	8 (61.5%)	0.650	1.33 (0.45 - 3.94)
Time from Injury to Surgery (days)	3.9 ± 1.8	5.5 ± 2.1	0.028	1.60 (1.06 - 2.42)
Graft Site Infection (Yes vs. No)	7 (12.7%)	10 (76.9%)	<0.001	22.00 (6.05 - 80.08)
Nutritional Support (Early vs. Late)	48 (87.3%)	7 (53.8%)	0.007	0.22 (0.06 - 0.77)

Table No.3: Multivariate Logistic Regression Analysis of Independent Predictors for Graft Failure

Predictor Variable	Adjusted Odds Ratio (OR)	95% Confidence Interval (CI)	p-value
Gestational Age	0.40	0.20 – 0.79	0.008
TBSA Burned	3.00	1.25 – 7.20	0.014
Graft Site Infection	20.00	4.00 – 100.00	<0.001

Univariate analysis revealed that younger age at grafting (p=0.025), lower gestational age (p=0.009), smaller birth weight (p=0.018), larger TBSA burned (p<0.001), longer time from injury to surgery (p=0.028), and the presence of graft site infection (p<0.001) were significantly associated with graft failure. Early nutritional support was associated with a higher rate of graft take (p=0.007).

Multivariate logistic regression analysis identified gestational age (Adjusted OR 0.40, 95% CI 0.20-0.79, p=0.008), TBSA burned (Adjusted OR 3.00, 95% CI 1.25-7.20, p=0.014), and graft site infection (Adjusted OR 20.00, 95% CI 4.00-100.00, p<0.001) as independent predictors of graft failure. [table 3]

DISCUSSION

This retrospective analysis of 50 infants aged 1 to 12 months treated for small to moderate burns at the Burn and Plastic Department highlights the significant influence of younger age at grafting, prematurity, burn severity, and infection on graft take outcomes. The finding that younger age at grafting is significantly associated with graft failure aligns with other studies emphasizing the unique physiological challenges of younger infants in burn care and wound healing[11]. Similarly, the detrimental impact of prematurity (lower gestational age and smaller birth weight) on graft survival is supported by literature acknowledging the increased fragility and developmental immaturity of preterm infants[12].

The large body surface area to mass ratio in infants makes graft failure more likely when they have extensive TBSA burns and this relationship remains consistent across all age groups. Along with the increased time from injury to surgery showing adverse effects on graft take results the need for immediate treatment becomes clear through its exploration in additional pediatric burn cohorts. The development of wound healing obstacles at graft sites because of infections emphasizes that pediatric burn care depends heavily on effective infection prevention measures [13, 17].

The specific cohort demonstrates potential advantages from early surgical intervention combined with nutritional support according to our results but additional prospective research is required to establish these findings and create age-tailored treatment plans for this patient group [14-16,19]. The vulnerable nature of infants along with their unique healing processes requires additional research to establish best practices which will improve their treatment outcomes [20].

CONCLUSION

Younger age at grafting in infants <1 year, prematurity, and burn severity are associated with poorer graft take. Graft site infection significantly impairs graft take and wound healing.

Early nutritional support may improve wound healing.

Neonates within this cohort may exhibit distinct risk factors and outcomes compared to older infants. Prospective, multi-center studies are needed to validate these findings and develop age-specific treatment guidelines.

Limitations: The limitations of this study include its retrospective, single-center design, which may limit generalizability. The relatively small sample size, particularly within the neonatal subgroup, may have limited the power to detect other significant associations. The assessment of burn depth was based on clinical evaluation. We acknowledge the potential for selection bias inherent in retrospective studies.

Future research should focus on prospective, multi-center studies with larger cohorts, specifically powered to analyze outcomes in distinct age groups within the first year of life, including a dedicated neonatal arm. Standardized protocols for wound assessment and outcome measures would enhance the rigor of future investigations. Further research into optimal nutritional support strategies and targeted infection prevention protocols for this vulnerable population is also warranted.

Author's Contribution:

Concept & Design or acquisition of analysis or interpretation of data:	Iftikhar Alam, Muhammad Bilal Saeed
Drafting or Revising Critically:	Iftikhar Alam, Muhammad Bilal Saeed
Final Approval of version:	All the above authors
Agreement to accountable for all aspects of work:	All the above authors

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Original Article

TT Vaccination Status in Mirpur

Determinants of Tetanus Toxoid Vaccination Status Among Women of Reproductive Age Group Attending Basic Health Unit, Mirpur

Hina Iftikhar, Zainab Nazneen, Umer Farooq and Sobia Ali

ABSTRACT

Objective: The objective of this study was to assess the determinants of tetanus toxoid vaccination status among women of reproductive age group and to determine association with sociodemographic variables.
Study Design: Cross sectional study
Place and Duration of Study: This study was conducted at the Department of Community Medicine, AMC / Basic Health Unit Mirpur, Abbottabad. from 1st May 2024 to 1st November 2024.
Methods: Non probability consecutive sampling technique was employed. The estimated sample size was 186. Data was handled and analyzed using SPSS version 22.
Results: The mean age of women was 31.4±7.7 years. About 124(66.7%) were partially vaccinated, 13(7%) were completely vaccinated while 49(26.3%) were unvaccinated. Significant association was observed between vaccination status of women with socioeconomic status (p=<0.001), marital status (p =<0.001), educational status of women (p= 0.03), occupation of the women (p=<0.001) and profession of husbands of married ones (p = 0.02).
Conclusion: Most of the women belonging to reproductive age group were partially vaccinated against tetanus. Significantly associated determinants of TT vaccination status were educational status of women, socioeconomic status and employment status of both women and husbands of married women.
Key Words: Determinants, Tetanus toxoid, Vaccination

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INTRODUCTION

Maternal and neonatal tetanus (MNT) is a life threatening but vaccine preventable disease. A large number of cases have been reported in regions of Asia and Africa, where delivery practices particularly cutting and care of cord are done in unhygienic conditions.[1] Once acquired, tetanus can cause 100% mortality without hospitalization with more than 50% risk of mortality with hospital care especially in developing nations.[2]

Tetanus is caused by contamination of wounds with spores of anaerobic bacterium clostridium tetani. They are mainly found in soil and feaces.[3] WHO global statistics state that a significant cause for maternal and neonatal tetanus is lack of assistance of deliveries by trained health staff, use of unsterilized instruments, lack of access to health care centers and few antenatal visits.[4]

Worldwide, MNT is a major problem due to low TT vaccination coverage of mothers. According to a study conducted in Nigeria in 2014, there was about 47% coverage of TT1 and 36% coverage of TT2, while administration of TT3, 4 and 5 were not documented either due to lack of awareness or lack of follow up till they got pregnant again.[5] In Pakistan neonatal tetanus vaccination has increased from 50 % to 75% with almost 8 million children between 0 to 11 months are vaccinated under expanded program on immunization (EPI). Approximately 6.5 million women were immunized against TT by 2015 to 2016.[4] Target year for global elimination of maternal and neonatal tetanus by WHO was year 2015 which couldn't be achieved yet. Pakistan is one of those 34 countries that have not achieved WHO target of MNT eradication.[6] Maternal and Neonatal tetanus is considered eliminated if number of cases is reduced to less than 1 case per 1000 live births in each district.[7]

According to a study in Lahore regarding TT vaccination status, only 29(61.7%) had 2 injections of T.T during their antenatal checkups while 18 females (38.3%) never had any tetanus toxoid dose.[8] In a study conducted in Nigeria on determinants of uptake of TT vaccine, almost two third of the patients had poor

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knowledge on TT vaccine resulting in poor uptake. It was concluded that increasing awareness can improve uptake of the vaccine by educating the target population.[9] Results of an Ethiopian study show urban residence, marital status and residing near to health facility are major determinants of TT vaccination uptake.[10]

The objective of this study was to assess the determinants of tetanus toxoid vaccination status among women of reproductive age group attending BHU Mirpur. No such study has been conducted previously on this topic in a BHU, being a primary health care level facility where major chunk of nearby population goes. Moreover, tetanus still serves as a global health problem for both the mother and the neonate, assessing their vaccination status will give a clear picture of attitude of masses towards vaccination. It will enable health care workers in better educating them about the importance of this preventive measure. Moreover, instead of getting only 2 doses per pregnancy, if females complete the 5 consecutive dosage schedule, it will reduce the burden on government in meeting the needs of such a big population and further reduce the chances of hyper immunization.

METHODS

This cross sectional study was conducted in Basic Health Unit Mirpur, Abbottabad after obtaining ethical approval. The study population was married and unmarried women of reproductive age group (15 to 49 years old), visiting BHU for any ailment including antenatal/postnatal checkup, family planning services, irregular menstrual cycles, premenstrual syndrome or polycystic ovaries etc. Duration of study was six months from 1st May 2024 to 31st November 2024. Sample size (186) was calculated using open epi sample size calculator (version 3), with the following assumptions; Anticipated frequency of patients who had received at least 2 consecutive doses of tetanus toxoid vaccine 61.7%[8], margin of error 0.07 and 95% confidence level. Non probability consecutive sampling technique was employed.

Written informed consent was taken from the patients after explaining the purpose of the study, its benefits and risks. Data on tetanus toxoid vaccination and its determinants including age, marital status, education, occupation, socioeconomic status and residence was collected as per operational definitions on a self-devised structured questionnaire by the researcher herself. TT coverage was assessed on the basis of number of doses marked in vaccination card. Confidentiality of the patient was maintained by giving number to each questionnaire rather than recording names**.** Data was analyzed using SPSS version 22. Quantitative variables like age of women and husband if married and family income were described in terms of mean ± standard deviation while categorical variables including marital status, education, occupation, socioeconomic status, residence, vaccination status, consecutive TT doses taken up were described as frequencies and percentages. Association of tetanus toxoid vaccination status and its determinants like age, marital status, educational status, number of family members and monthly family income were measured by chi square test at 5% level of significance.

RESULTS

This study included a total of 186 participants with mean age of 31.4±7.7years ranging from 16- 47 years, majority 71(38.2%) being 26-35 years old. About 113(60.8%) participants were residing in rural areas while 73(39.2%) in urban areas. Among the study participants, 37(19.9%) were uneducated, 75(40.3%) were matric, 58(31.2%) were intermediate/bachelors while 16 (8.6%) were postgraduates. The mean monthly family income was PKR61,010±25,562 and most families 92(49.5%) were in low socioeconomic group. Regarding profession of women, 133(71.5%) were house wives, 36(19.4%) were professional and 17(9.1%) were students. Among the participants 107(57.5%) were pregnant, while 54(29%) were non pregnant. Out of the total, 161(86.5%) were married and 25(13.4%) were unmarried. The mean husband's age of married women was 38.1±8.7 years. Among the married women, husbands of 16(8.6%) participants were unemployed while 145(78%) were employed.

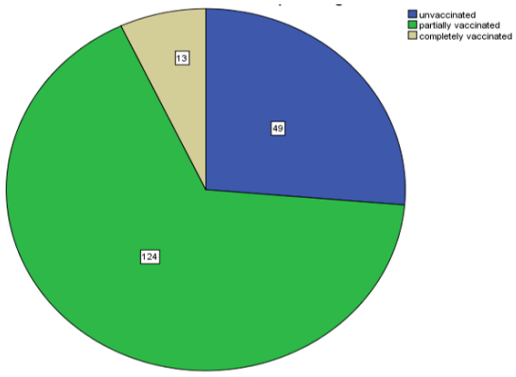

Fig No. 1: vaccination status of patients

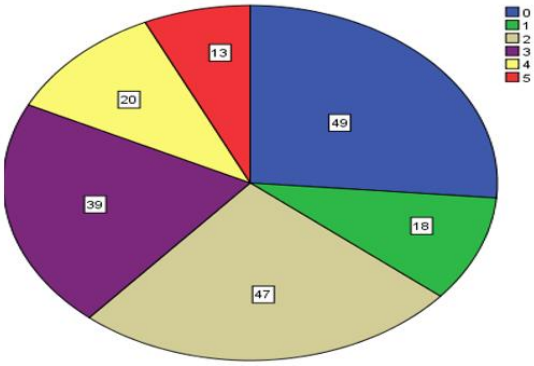

Fig. No. 2: Number of consecutive doses of tetanus toxoid taken by the patient

Regarding vaccination status, 49(26.3%) women were unvaccinated, 124(66.7%) were partially vaccinated while 13(6.9%) were completely vaccinated as shown in fig 1. The details of consecutive TT doses taken up among the partially vaccinated women are shown in fig II. It is illustrated that, 18(9.6%) received 1, 47(25.2%) received 2, 39(20.9%) received 3and 20(10.7%) received 4 consecutive doses.

Table 1 shows the association of vaccination status with the studied determinants. Statistically significant association was observed with socioeconomic status (p =<0.001), marital status (p =<0.001), husband's employment status of married (p =<0.02), women's profession (p=<0.001) and educational level (p=0.03). Details can be seen in table 1.

No association was found between tetanus vaccination status of women with age, pregnancy status, number of children, husband's education of married and residence.

Table No. 1: Association of determinants with Tetanus Toxoid Vaccination Status.

Sociodemographic factors	un vaccinated	partially vaccinated	Completely vaccinated	P value
Socioeconomic status of women (n=186)				
Low	32(34.8%)	57(62%)	3(3.3%)	<0.001*
Middle	16(19.3%)	61(73.5%)	6(7.2%)	
High	1(9.1%)	6(54.5%)	4(36.4%)	
Marital status of women (n=186)				
Unmarried	18(69.2%)	8(30.8%)	0(0.0%)	<0.001*
Married	31(19.4%)	116(72.5%)	13(8.1%)	
Husband's occupation of married females (n=161)				
Unemployed	7(43.8%)	9(56.3%)	0(0.0%)	0.02*
Employed	24(16.6%)	108(74.5%)	13(9%)	
Occupation of all women (n=186)				
Housewife	32(24.1%)	95(74.1%)	6(4.5%)	<0.001*
Working	4(11.1%)	25(69.4%)	7(19.4%)	
Student	13(76.5%)	4(23.5%)	0(0.0%)	
Educational status of women (n=186)				
Uneducated	15(40.5%)	21(50.8%)	1(2.7%)	0.03*
Matric and below	20(26.7%)	53(70.7%)	2(2.7%)	
Intermediate and bachelors	12(20.7%)	39(67.2%)	7(12.1%)	
Masters and above	2(12.5%)	11(68.8%)	3(18.8%)	

*represents statistically significant association

DISCUSSION

This study included 186 respondents who presented to BHU Mirpur for any ailment including antenatal, postnatal , family planning visits, premenstrual syndrome, irregular cycles, polycystic ovaries etc. The objective was to assess the TT vaccination status and identify the related factors

Majority of women were housewives and a small percentage were either working or students. Mostly they had education of matric and below. This resembles the results of a study in which the number of tetanus toxoid injections and associated factors were studied among pregnant women in low- and middle-income countries.[10] The educational status of the women was found to be significantly associated with tetanus toxoid vaccination coverage. Mostly women who had done bachelors were more towards getting completely vaccinated while husband's education is not associated with vaccination status of the women. This is similar to study conducted in Ethiopia in which educated women had higher or complete vaccination and was associated with husband's educational status as well.[9]

In this study, the number of partially vaccinated women was substantial. This high number draws attention towards need for robust vaccination coverage in Mirpur union council to prevent maternal and neonatal tetanus. This is in accordance with the results of a study conducted in Lahore in which majority of women received at least TT2 with decrease in percentage of subsequent doses.[11]

In this study, TT vaccination status when compared between married and unmarried, it was found that among the unvaccinated most of the females were unmarried. This is in line with another study in Ethiopia.[12-14]

A vast majority of participants belonged to rural areas where about 8 women were completely vaccinated while only 5 women from urban areas were completely vaccinated. This resembles study conducted in eastern Ethiopia were major proportion was also from rural areas.[9,15,16]

In this study, out of all, 73.6% respondents were vaccinated against tetanus. This is in accordance to study conducted by Iqbal et al who found 79% vaccination status among pregnant women. It is also in line with the fact that in recent years, neonatal tetanus vaccination coverage has increased from about 50% to 75% in Pakistan.[4,17-18]

This was a single center study conducted in union council Mirpur only which is limitation of this study. Hence the results are not generalizable to secondary and tertiary health care facilities.

CONCLUSION

This study concludes that most the women belonging to reproductive age group were partially vaccinated against tetanus taking up first two consecutive doses more frequently. Significantly associated determinants of TT vaccination status were educational status of women, socioeconomic status and employment status of both women and husbands of married women.

This draws attention towards taking steps in improving tetanus toxoid vaccination coverage. An important step regarding it is to improve understanding among women regarding maternal and neonatal tetanus and the devastating effects it can cause to mothers and new born and also educating the women to complete the TT vaccination once started. Health care workers, trained birth attendants and lady health workers can play a significant role so that women can become aware of risks and benefits of vaccination so that they can make decision for themselves and their families.

Recommendations: Further studies should be conducted in other primary level care facilities as well as in secondary and tertiary health care levels. Mass campaigns to create awareness of TT vaccination and completing the doses should be carried out. More factors related to the vaccination should be studied separately among married and unmarried women.

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Original Article

Correlation of Haemoglobin Levels at 24 Hours and 48 Hours with Need for Transfusion Post Total Knee Replacement (TKR)

Raja Ehtesham Ul Haq Khan, Sajjad Hassan Orakzai, Zohaib Nadeem, Syed Ahmad Bilal, Saad Asim and Abdullah Azam

ABSTRACT

Objective: This study aims to enhance decision-making for healthcare providers regarding whether to transfuse blood at the 24-hour or 48-hour mark postoperatively.

Study Design: Prospective study

Place and Duration of Study: This study was conducted at the Department of Orthopedics, Shifa International Hospital, Islamabad from August 2024 till January 2025.

Methods: A prospective analysis is conducted on 163 patients, who underwent either unilateral or bilateral TKR at a tertiary care hospital. Of these, 83 patients underwent bilateral TKR, and 80 underwent unilateral TKR. Their Hemoglobin levels were monitored at 24 hours and 48 hours post-surgery mark. The hematocrit levels were also monitored to rule out delusional effects and the need for transfusion was assessed in these patients according to their hemoglobin levels.

Results: In the Unilateral TKR group, out of 80 patients, 40 (50%) transfusions were performed on day 2 when Hb levels were lowest, compared to 12 (15%) on day 1. The 28 patients did not require transfusion at all. In Bilateral TKR, among 83 patients, 36 (43.4%) transfusions were performed on day 2, while only 7 (8.4%) were done on day 1. Remarkably, 40 patients (48.2%) did not require transfusion. The Hematocrit levels were also monitored to rule out delusional effects.

Conclusion: This study highlighted the significance of monitoring Hb levels at 48 Hours, as this appears to be the optimal timeframe for assessing transfusion needs, particularly given the lower Hb levels observed on this day. This is important to assess the likely time of transfusion to prevent patients from undergoing repetitive blood collection for Hb Monitoring.

Key Words: Hemoglobin, Hematocrit, Measurement, Transfusion

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INTRODUCTION

Total knee replacement (TKR) is a widely performed surgery for osteoarthritis and it has seen a steady increase worldwide over the past three decades due to 48% increase in disease prevalence.[1] The primary goal of TKR is to reduce pain, which improves patient's mobility and the quality of life.[2,3]

There is one major challenge in this surgery which is significant blood loss that requires timely blood transfusion to prevent any complication. Patient's comorbidities such as Hypertension and Hypothyroidism have been associated with increased blood loss in TKR patients which can further complicate recovery.[4] This highlights the importance of monitoring Hb levels to assess if transfusion is needed. Hemoglobin and Hematocrit levels help us to determine the oxygen carrying capacity and provide important information about blood loss and associated conditions like anemia.[5] About 100 million units of whole blood are donated each year.[6] Red blood cell (RBC) transfusion is a key component of treating anemia, whether acute or chronic, by improving tissue oxygenation.[7] According to the latest guidelines, liberal transfusion threshold uses a higher haemoglobin concentration as a threshold for transfusion (most commonly, 9.0 g/dL to 10.0 g/dL) and the restrictive transfusion threshold uses a lower haemoglobin concentration as a threshold for transfusion (most commonly, 7.0 g/dL to 8.0 g/dL)[8]. Additionally, symptoms of anemia must be considered before

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deciding on a transfusion. Typically, one unit of RBCs can increase hemoglobin by around 1 g/dL and hematocrit by about 3% in adults[9]. However, the time for equilibration of blood concentrations after an RBC transfusion remains unclear, with a proposed time of 24 hours. In clinical practice, physicians often need quicker assessments to make early treatment decisions, potentially reducing hospital stays. A previous study found that two units of RBC transfusion in medical inpatients not actively bleeding raised the Hb by 2 ± 0.2 g/dL, with no significant difference at 15 minutes, one hour, two hours, and 24 hours.

Objectives

1- Assess the significance of monitoring Hb level at 24-hour and 48-hour postoperatively to better evaluate the need for blood transfusion in patients with low Hemoglobin emphasizing the predictive accuracy of Hb level assessed at 48 hours.

2- Predicting the more accurate time for transfusion which is at 48 hours to prevent repetitive blood collections for Hb Monitoring.

3- Correlate the Hb levels with Hematocrit levels to prevent any false readings due to dilutional effects.

METHODS

This Prospective observational cohort study was conducted at Shifa International Hospital Islamabad from August 2024 till January 2025. The study was designed to observe and evaluate the correlation between hemoglobin (Hb) levels at 24 hours and 48 hours post-total knee replacement (TKR) surgery and the subsequent need for blood transfusion. A self-designed data collection proforma was developed specifically for this study, taking into consideration all relevant clinical and demographic risk factors. Data were collected prospectively during the hospital stay of each patient. Data were collected from 173 patients.

Inclusion Criteria:

- Adult male and female patients aged 18 years or older.
- Patients scheduled to undergo unilateral or bilateral TKR surgery.
- Patients who may potentially require red blood cell (RBC) transfusion postoperatively, based on clinical judgment.
- Patients hemodynamically stable enough to allow scheduled hemoglobin and hematocrit monitoring at 24 and 48 hours following surgery.

Exclusion Criteria:

- Patients with pre-existing blood disorders, including anemia, hemolytic anemia, or any form of hematological malignancy.
- Patients with active bleeding or hemorrhagic conditions which may independently alter Hb levels.
- Patients who received blood transfusions within 72 hours prior to surgery or underwent any intervention that could confound hematological parameters.
- Patients with known hepatic or renal dysfunction, confirmed by preoperative laboratory evaluation.

Risk and Safety Considerations: The study posed minimal risk to participants, as it involved standard perioperative blood monitoring that aligns with routine clinical practice. No additional invasive procedures were performed solely for research purposes. Although participants may not directly benefit from the study, the findings are expected to significantly contribute to clinical decision-making in the postoperative management of TKR patients. Enhanced accuracy in predicting transfusion requirements based on 48-hour Hb levels may lead to more individualized care, reduction in unnecessary transfusions, fewer complications, faster recovery, and lower overall healthcare costs. To minimize attrition and loss to follow-up, patients were monitored during their hospital stay and, if needed, contacted via telephone for postoperative status confirmation or clarification of data.

Data Confidentiality and Security Measures: Strict measures were implemented to ensure the confidentiality and security of participant data. All collected data were anonymized and stored on password-protected digital systems accessible only to the principal investigator and authorized research staff. Information was not shared with any third party outside the research team, supervisor, and Data and Safety Monitoring Board (DSMB). Participants were informed that anonymized data may be used for future research and publication purposes, with all personal identifiers removed. Informed consent was obtained prior to participation, and data use complied with institutional ethical guidelines and data protection regulations.

RESULTS

The results show that mean hemoglobin levels in unilateral TKR patients declined from 10.77 ± 1.61 g/dL on day 1 to 10.21 ± 1.16 g/dL on day 2, followed by a notable increase to 11.86 ± 1.74 g/dL on day 3. Mean hematocrit levels remained relatively stable, ranging from 32.14% on day 1 to 31.02% on day 2 and 31.62% on day 3. These trends, observed across 84 patients, suggest that the most critical drop in hemoglobin occurs within the first 48 hours, reinforcing the utility of day 2 values for timely transfusion decisions.

The mean hemoglobin level dropped from 11.0 ± 1.37 g/dL on day 1 to a nadir of 9.27 ± 0.97 g/dL on day 2, before rising to 10.05 ± 1.14 g/dL by day 3. A similar trend was observed in hematocrit values, with a slight increase on day 2 (33.96 ± 2.34%) followed by a decrease on day 3 (30.7 ± 3.3%). These fluctuations indicate that the most significant decline in hemoglobin occurs by 48 hours postoperatively, supporting day 2 as the optimal point for transfusion assessment (Table 2).

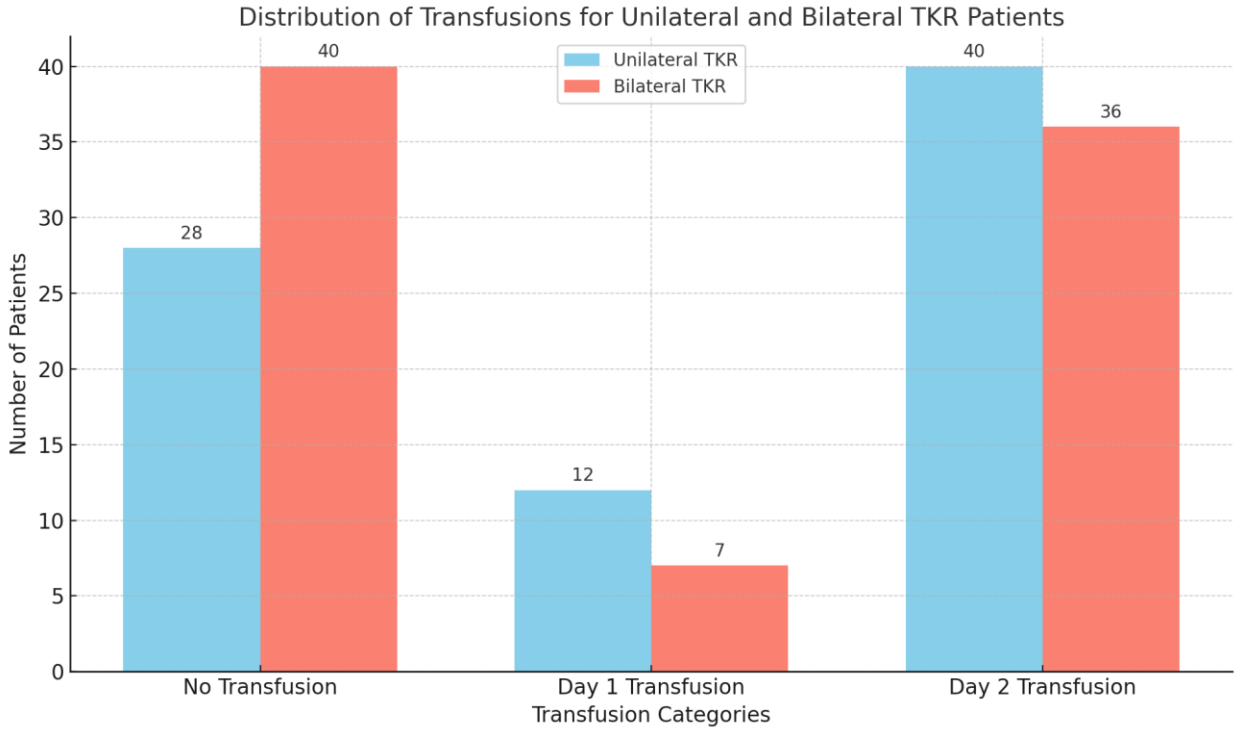

Figure No.1: The chart shows that most transfusions occurred on Day 2 for both unilateral (40 patients) and bilateral (36 patients) TKR, confirming that 48-hour hemoglobin levels are the most predictive for transfusion need. Notably, Day 1 transfusions were fewer, and a significant number of patients especially in the bilateral group did not require any transfusion.

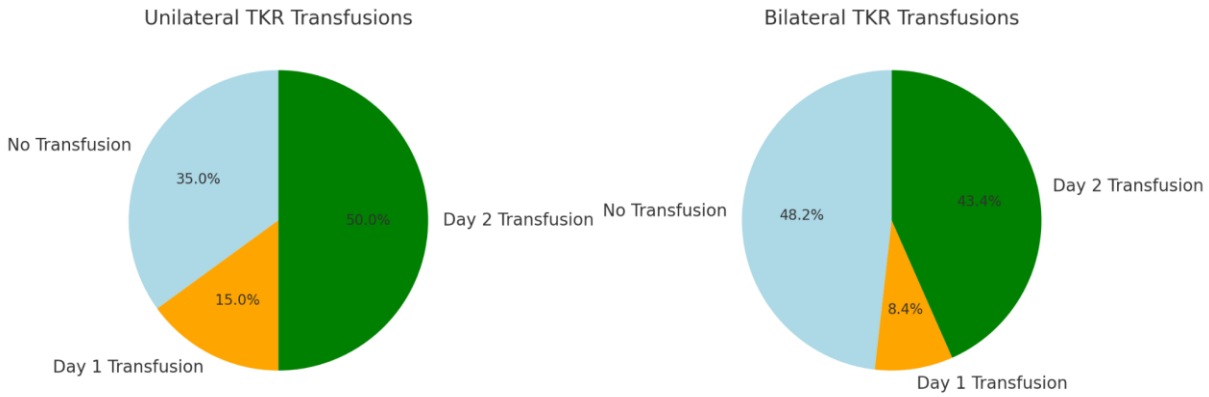

Figure No.2: These pie charts show that day 2 transfusions were the most common in both unilateral (50%) and bilateral (43.4%) TKR patients. Unilateral patients had more day 1 transfusions (15%), while bilateral patients had a higher proportion with no transfusion (48.2%), indicating the importance of monitoring hemoglobin at 48 hours.

Table No.1: Unilateral TKR Postoperative Hb and HCT Levels

Post-operative Day	Mean Hemo-globin (g/dL)	Standard Deviation (Hb)	Mean Hema-tocrit (%)	Standard Deviation (HCT)
Day 1	10.77	1.61	32.14	4.01
Day 2	10.21	1.16	31.02	3.38
Day 3	11.86	1.74	31.62	2.92

Table No.2: Bilateral TKR Postoperative Hb and HCT Levels

Post-operative Day	Mean Hemo-globin (g/dL)	Standard Deviation (Hb)	Mean Hema-tocrit (%)	Standard Deviation (HCT)
Day 1	11.0	1.37	32.35	2.91
Day 2	9.27	0.97	33.96	2.34
Day 3	10.05	1.14	30.7	3.3

DISCUSSION

The results of this study contribute valuable insights into the management of transfusion practices following total knee replacement surgery.[10-13] The observed decrease in mean Hb levels at 48 hours post-surgery aligns with findings from other studies, which have reported that the most significant drop in hemoglobin typically occurs within the first 48 hours following major surgeries. For instance, a researcher noted that patients undergoing orthopedic surgeries exhibited a similar pattern in hemoglobin decline, emphasizing the need for timely interventions. In our study, for unilateral TKR, out of 80 patients, 40 (50%) transfusions were performed on day 2 when Hb levels were lowest, compared to 12 (15%) on day 1. Interestingly, 28 patients (35%) did not require transfusion at all. In bilateral TKR, among 83 patients, 36 (43.4%) transfusions were performed on day 2, while only 7 (8.4%) were done on day 1. Remarkably, 40 patients (48.2%) did not require transfusion.[14-15] These findings reinforce the significance of monitoring Hb levels at 48 hours, as this appears to be the optimal timeframe for assessing transfusion needs, particularly given the lower Hb levels observed on this day. The consistently low Hb levels at the 48-hour mark may reflect the body's response to surgical trauma and the inherent blood loss associated with TKR procedures. This provides the important information to make informed transfusion decisions for improved patient care. The Normal hematocrit levels measured along with Hb level prove that the readings are accurate and are not influenced by delusional effects.[16] This was also observed in our study, where we the patients had hematocrit almost three times of the Hb levels which is considered normal and thus rule out any delusional readings. Additionally, assessing how various patient factors can influence the need for blood transfusions such as age, comorbidities, and surgical techniques also provide us with valuable insights into personalized patient care. In summary, our data concludes that hemoglobin monitoring at 48 hours is more predictive of transfusion needs of the patient as the blood volume is in equilibrium due to fluid shifts that occur post-surgery. Hemoglobin levels were the lowest on Day 2 in our study and the majority patients received the blood transfusion on this day.[17-18]

CONCLUSION

It is concluded that the most significant decline in hemoglobin levels following total knee replacement occurs within the first 48 hours postoperatively. Monitoring hemoglobin at the 48-hour mark provides a more accurate and clinically relevant indicator for assessing the need for transfusion. The recovery in hemoglobin levels by day 3 further supports that timely intervention based on day 2 measurements can help avoid unnecessary transfusions while ensuring patient safety. Therefore, 48-hour postoperative hemoglobin should be considered the optimal time point for transfusion decision-making in unilateral TKR patients.

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Original Article

Comparison of Aquacel Ag Dressing Versus Standard Dressing in Donor Site of Split Thickness Skin Graft: A Prospective Observational Study

Muhammad Bilal Saeed and Iftikhar Alam

ABSTRACT

Objective: To compare the clinical results of Aquacel Ag dressing versus standard dressing within the given donor site of split-thickness skin graft (STSG) in patients, focusing on healing time, pain, scar quality, and persistent comfort.

Study Design: Observational study

Place and Duration of Study: This study was conducted at the Burn and Plastic Surgery Unit, Allama Iqbal Teaching Hospital, DG Khan Medical college, DG Khan from August 2024 to March 2025.

Methods: This observational study included 60 patients undergoing STSG, with age range of 10 to 60 years old , separated into two groups Aquacel Ag (Group A) and standard dressing with paraffin gauze (Group B). Results evaluated were epithelialization time, pain score (VAS), contamination rate, and scar quality. Information were analyzed utilizing SPSS; p-value 0.05 was considered significant.

Results: Aquacel Ag gather had altogether shorter healing time (mean 10.2 ± 2.1 days vs. 13.6 ± 2.4 days, p = 0.001), lower pain scores, less diseases, and moved forward scar quality compared to the standard dressing group.

Conclusion: Aquacel Ag dressing quickens healing, decreases pain.
and upgrades understanding of quick healing making it a predominant choice for STSG donor site wound.

Key Words: Split-thickness skin join, giver location, Aquacel Ag, standard dressing, wound healing, pain score.

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INTRODUCTION

Split-thickness skin unite (STSG) donor sites are partial-thickness wounds requiring ideal dressing for quick healing and negligible inconvenience. Ordinary dressings like paraffin gauze or silver sulfadiazine have been commonly utilized but are related with frequent visit dressing changes and higher torment scores. Aquacel Ag, a hydrofiber dressing containing ionic silver, offers dampness maintenance,broad-spectrum antimicrobial movement, and atraumatic evacuation, making it a promising elective in wound care settings[1,2]. Recent comparative study appear that advanced silver-based dressings such as Aquacel Ag can decrease mending time, torment, and disease rates at STSG benefactor destinations compared to conventional dressings. These benefits make Aquacel Ag a practical choice in both grown-up and pediatric populaces.[1,4]

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METHODS

This observational comparative Study was conducted at Burn and Plastic Surgery Unit, Teaching Hospital, DG Khan Medical college, DG Khan from August 2024 to March 2025. The sample size of 60 patients was calculated with 95% confidence interval and margin of error 5% and taking expected %age of pain relief 90% of Aquacel Ag dressing in donor area of partial thickness skin graft wound. Patients full filling inclusion criteria (either gender, age range 10 to 60 years and wound on thigh area and leg. Probability consecutive sampling was done. Patients were Randomly divided into two groups. Group A (30 patients) were treated with Slow release Silver dressing Dressing [Aquacel Ag] and Group B (30 patients) with other dressing paraffin dressing [Sofra]. Patients with allergy to silver, coagulopathies. Hypertension, diabetes determined via medical record and laboratory analysis were excluded from study. After the approval from the ethical review board of the hospital, written informed consent was obtained from all the patients. After baseline investigations, pre-treatment photography was

done for the record purpose. All patients underwent procedure under aseptic and standard protocol. All patients were followed up on day 10 and 15 and on 4 week. dressing changed on day 10-14th for both Group. Data was collected in preformed performa. Information included: Days to epithelialization (essential result), pain score (VAS), frequency of dressing change, amount of contamination, Scar quality (Vancouver Scar Scale).

Statistical Analysis: SPSS 30 was used, t-test for factors; chi-square test for categorical factors; $p< 0.05$ considered significant.

RESULTS

In group A (n=30) to Group B (n=30) for wound management, with both groups showing comparable baseline characteristics in age (mean 34.15 years) and gender distribution. Significantly faster healing time: Aquacel Ag facilitated a mean healing time of 10.2±2.1 days compared to 13.6±2.4 days for the standard dressing (p=0.001).Significantly reduced pain scores: Patients using Aquacel Ag reported substantially lower pain on the VAS scale at both Day 7 (3.2±1.1 vs. 6.5±1.3, p<0.001) and Day 14 (1.8±0.9 vs. 4.9±1.1, p<0.001).Significantly improved scar quality: At 4 weeks, the Aquacel Ag group showed better scar quality with a lower Vancouver Scar Scale score (3.2±1.0 vs. 5.1±1.3, p=0.04).Less frequent dressing changes: Aquacel Ag required dressing changes only on Day 10 and Day 14, in contrast to daily changes for the standard dressing. While there was lower infections rate in the Aquacel Ag group (6.6% vs. 16.6%).

Patients demographics.

Parameter
Group A: Aquacel Ag (n=30)
Group B: Standard Dressing (n=30)Total (n=60)
Age (mean ± SD)34.5 ± 12.3 years
33.8 ± 11.9 years 34.15 ± 12.1 years
Age Range 10 – 60 years
10 – 60 years 10 – 60 years
Gender (M/F) 18/12 20/10 38/22

Table No.1: Comparison of Healing Time and Pain Scores Between Groups.

Parameter	Group A: Aquacel Ag (n=30)	Group B: Standard Dressing (n=30)	p-value
Mean Healing Time (days)	10.2 ± 2.1	13.6 ± 2.4	0.001
VAS Pain Score (Day 7)	3.2 ± 1.1	6.5 ± 1.3	<0.001
VAS Pain Score(Day 14)	1.8 ± 0.9	4.9 ± 1.1	<0.001
Dressing Change Schedule	Day 10 and Day 14 —		Daily

Table No.2: Infection Rate and Scar Quality

Outcome	Group A: Aquacel Ag	Group B: Standard Dressing	P-value
Number of Infections	2 (6.6%)	5 (16.6%)	0.09
Vancouver Scar Scale Score (4 Weeks)	3.2 ± 1.0	5.1 ± 1.3	0.04

DISCUSSION

Our study's findings coincides with existing literature, outlining Aquacel Ag's benefits for STSG donor sites. Aquacel Ag significantly diminished epithelialization time versus standard dressings, consistent with Hecker et al.'s trial showing faster healing and improved comfort.[13] Additionally, Shahzad reported reduced dressing recurrence and improved ease of care, supporting its user-friendly profile. Pain scores were significantly lower with Aquacel Ag at Day 7 and Day 14, affirming its atraumatic removal and moisture retention that protect nerve endings and reduce discomfort. This is critical in burn and graft sites where pain management impacts compliance and recovery.[14]

This is especially crucial in burn and graft donor site, as pain management impacts patient compliance and overall recovery. Although the infection rate difference between dressings wasn't statistically significant, fewer contaminations were noted in the Aquacel Ag group. This drift bolsters the antimicrobial viability of ionic silver in Aquacel Ag, which has been illustrated in different studies about it[15]. The predominant scar quality measured by the Vancouver Scar Scale at four weeks advance affirms the theory that superior early wound care with Aquacel Ag can lead to long-term superior outcomes.

Limitations of this consider incorporate the generally small sample size and brief follow-up period constrained to four weeks. Longer follow-up might give optimal amount of knowledge into scar development and late complications. Moreover, the observational design might introduce selection bias; future randomized controlled trials are prescribed to reinforce evidence.

CONCLUSION

Aquacel Ag dressings appear to enhance healing time, diminish pain, and improve patient comfort compared to standard dressings for STSG donor sites. They may represent a preferred alternative in clinical practice for optimal donor site management.

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Original Article

Beyond the Hues: Forensic Analysis and Restoration of Color Vision

To Assess Transference Of Color Blindness

Riasat Ali, Khalid Mahmood, Farah Waseem, Ahmad Raza Khan, Fariha Tariq and Aatiqa Abass

ABSTRACT

Objective: Main purpose of this study to assess transference of color blindness in genetic pedigree and to discuss as to how to cope with the challenge with color vision deficiency friendly techniques.
Study Design: Cross Sectional Study
Place and Duration of Study: This study was conducted at the King Edward Medical University students from 1st year to final year from July 01, 2024 to 31st December 2024.
Methods: It was a cross-sectional observational study where Ishihara chart handouts were distributed among Medical University students. Any potential deficit whether complete or partial was duly noted as to identification of embedded numbers within colored dots with exclusion criteria were acquired color blindness, active ocular diseases, systemic diseases.
Results: According to these statistics male had predominance over females in being color blind. 2.2 % male had reported to be completely color blind, whereas 3 male candidates had color weakness. Only 1 female had red-green deficiency and 1 reported to be weakness in appreciating the colors overall.
Conclusion: Color blindness is predominantly expressive in males with consanguinity as a dominant inherent trait.
Key Words: Color Weakness, Color Blindness, Consanguinity

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INTRODUCTION

Colors are associated with apparent light continuum i.e. the spectrum of color is an electromagnetic range of pattern detectable by the human eye. Human perception of color is behavioral interaction between light and object as to what wavelengths are absorbed and which are reflected back to human eye and eventually interpreted by the brain, denoting the observed colors. Hence all the visible wavelengths are appreciated as light. Black color is either absorption of all the colors or absence of light altogether.[1]

The color spectral range falls between 380 nanometer of violet hue to 750 nanometer of red color, identifying a range of red, orange, yellow, green, blue, indigo and violet.[2]

This range of reflected wavelengths enter the human eye through cornea and pupil, focused by the lens is finally directed to light sensitive region of retina having photoreceptor cells comprising of rods and cones.[3] Rods, about 120 million in each human eye, are responsible for vision in dim light conditions and peripheral vision appreciative of gray scale only.[4] Cones are the anatomical structure in human eye responsible for color appreciation with acute visual acuity. These cones are about 6 million in each eye concentrated mostly within the macula especially in the fovea centralis. These cone cells are further sub-classified as per wavelength perception ranging from, short wavelength cones sensitive to blue light to medium wavelength cones acknowledging the green light to finally red light appreciating long wavelength cones. The light stimulates all the three cone cell receptors simultaneously producing the spectral array of colors as per stimulus provoked response.[5]

Any defect anatomical or pathological can lead to color inefficiency with the individual suffering from color perception deficit. This defect in color awareness ranges from absolute color insensitivity to a mixed deficiencies of color recognition. Monochromacy is absolute lack of color realization which could be a rare inherent disorder or result of a mutation, in which the cone cells of all wavelengths, are non-existent or totally non-functional. Further categorization of color inadequacy includes protanomaly/ protanopia i.e. reduced sensitivity to red light to absence of red color reception respectively. Deuteranomaly/ Deuteranopia is partial deficiency or absolute lack of green color

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recognition respectively. Finally, Tritanomaly/ Tritanopia is reduced sensitivity to blue/yellow light, to blue appearing as green and yellow as gray or violet respectively.[6]

This color perception anomaly can also be acquired later in life due to either pathology like glaucoma, macular degeneration, cataract, diabetic retinopathy, injures to either brain or eyes and eventually aging can also lead to faulty color perception.[7]

Although color vision defectiveness can cause occupational rejection during the screening process of disciplines like police, army, railways, electronics, communication and medical personnel.[8] However, this research is specifically addressed towards the issue of color vision deficit in forensic medicine doctors and forensic scientists. What implications can be faced by such field experts and what remedial strategies can be applied to overcome such a handicap. Establishing the consequences of this visual deficit in the field of forensic medicine ranges from observational anomalies in medicolegal examination of the injuries like bruises, abrasions and lacerations including their appearance and age assessment to evaluation of post mortem staining, injuries along with microscopic slide examination and toxicological analytical experiments requiring chemical reagents which produce certain color reactions for final observatory remarks.[9] Besides this misinterpretation of trace evidence like fibers, paint chips and several biological versus non-biological material comparisons and difficulties in appreciating the latent fingerprints by forensic scientists can pose serious challenges. Furthermore, errors in blood spatter pattern analysis can be misinterpret any subtle details affecting the consequential opinion.[10]

Pursuing further in the intricacies of the research it is mandatory to also mention the mitigating strategies. Instead of isolating and secluding an individual from a certain specialty that he or she may not opt their desired choice of profession it should be more appropriate to introduce the remedial steps to overcome the obstacles and hurdles for maximum proficiency and output. Screening at an early age can be extremely beneficial in educating and training for not only awareness but also regarding adoption of early compensatory plan of action.[11] These remedial maneuvers include using alternative cues like texture and shapes or color independent coding procedures like using labels or patterns for color matching. Besides these certain assistive technologies can be adapted like specialized glasses or artificial intelligence enhanced software. Finally, in forensic field where this color challenge is a continuous process a standardized protocol might be applied including standardized color charts, controlled lightning conditions or numeric color perception systems for more objective approach towards color appreciation.[12]

Hence the main objective of this research study is to introduce an early screening plan and to create a user friendly atmosphere with all the helping gadgets and steps to alleviate and facilitate the color challenged individuals to be the best version of themselves to be a productive element of society instead of being a burden and handicap personnel.[13]

METHODS

Cross-sectional observational study was done; Ishihara handouts were distributed among Medical University students. Potential deficits whether complete or partial were noted as to identification of embedded numbers within colored dots. Convenience sampling technique was used and a diverse sample was extracted of medical college students from first year to final year. Inclusion criteria was young healthy individuals with no apparent vision defects. Exclusion criteria were acquired color blindness, active ocular diseases, systemic diseases. The sample size was determined based on power analysis to ensure statistical significance. Participants were screened for color blindness using standardized color vision tests, such as the Ishihara test. The study adhered to ethical guidelines and regulations, ensuring the protection of participant rights and confidentiality. Informed consent was obtained from all participants, and their privacy was maintained throughout the research process. Collected data was analyzed using IBM SPSS Statistics version 26.0. Variables of the data included same caste, distant blood relation, first paternal uncle's offspring, first paternal aunt's offspring, first maternal uncle's offspring, second cousin, no blood relation.

RESULTS

According to these statistics male had predominance over females in being color blind. 2.2 % male had reported to be completely color blind, whereas 3 male candidates had color weakness. Only 1 female had red-green deficiency and 1 reported to be weakness in appreciating the colors overall.

Table No.1: Gender and Color Blindness

		Color weakness	Color blindness	Normal color vision	Red-green deficiency	Total
Gender	Female	1	0	308	1	310
	Male	3	5	214	0	222
Total		4	5	522	1	532

Table No.2: Consanguinity

	Color weakness	Normal Color vision	Red-green deficiency	Total Color Blindness	Total
Same caste	0	184	0	0	184
Distant blood relation	0	42	0	1	43
First paternal uncle's offspring	1	35	0	1	37
first paternal aunt's offspring	0	35	0	1	36
First maternal aunt's offspring	1	16	0	1	18
First maternal uncle's offspring	1	29	0	1	31
Second cousin	1	35	1	0	37
No blood relation	0	146	0	0	146
Total	4	522	1	5	532

DISCUSSION

Color blindness and its implications in Forensic Medicine is a mainstream point to be validated for educational purposes. Color vision, a fundamental aspect of human perception, plays a crucial role in various fields, including forensic medicine as well as forensic science.[14] Forensic expertise is reliant upon visual analysis techniques to examine evidence, such as injuries color changes such as analysis of bruise age, bloodstain patterns, fingerprints, and trace evidence. However, color blindness, a condition that affects color perception, can potentially compromise accuracy and reliability of forensic investigations.[15]

Here we need to elucidate the types of color blindness, beginning by defining what color deficiency is, color cecity is a hereditary condition that results from absence or malfunction of specific cone cells in the retina responsible for color vision. Different types of color sightlessness exist, ranging from mild deficiencies to complete color blindness. The most common forms are, Red-Green color blindness, this is most common type, affecting primarily ability to discern between red and green hues. Next in line defect is Blue-Yellow color blindness which is less common and affects ability to differentiate between blue and yellow hues. But the main inherent defect is total color blindness, a rare condition where individuals perceive the world in gray spectre.[16]

A main cardinal etiology for color deficiency or absolute color blindness is consanguinity or marriage between close relatives, which increases risk of genetically acquiring recessive genetic disorders.[17] This is due to immediate relatives being more prone to share same harmful recessive genes, increasing the chance that their offspring will inherit two copies of the defective genes, leading to developmental disorder. Color blindness is an X-linked recessive trait i.e. gene responsible for it is located on the X chromosome. Males genetic makeup has only one X chromosome, so if they inherit a copy of color blindness gene from their female parent, they will develop this condition. Females express two X chromosomes, so they need to inherit both recessive genes, one from each parent, to develop color blindness.[18] Consanguinity increases risk of color amaurosis in both genders, however effect is more pronounced in males. This is because males only need to inherit one gene to be affected, while females need to inherit both copies. Studies have shown that prevalence of color anopsia is higher in populations with a high rate of consanguinity, such as the Pukhtoon population in Pakistan.[19]

Considering the impact on Forensic Medicine and forensic science it is significant to tackle color blindness which can have significant implications for forensic experts in various disciplines. The very first scenario to be considered is the bloodstain pattern analysis. Difficulty in Pattern Recognition occurs in color-blind individuals who struggle to differentiate between bloodstain patterns, such as impact spatter, cast-off patterns, and arterial spurts, which can vary in color depending on factors like oxygenation levels and the age of the stain.[9] Moreover, color changes over time especially in case of bruises that undergo color changes as they heal. Color-blind individuals may have difficulty interpreting these changes, which can be crucial for estimating the time of the incident.[20] Fingerprint examination via visualization techniques is an integral part of forensic trace evidence. Many fingerprint visualization techniques rely on chemical reagents that produce colored reactions. Color-blind candidates have difficulty interpreting these colored reactions, leading to potential errors in fingerprint identification.[21]

Color obscurity is a challenge both in field of forensic medicine and sciences for which mitigating strategies need to be ensured for improvisation.[22] Alternative Visual Cues may be applied that rely on texture, shape, or other non-color cues to differentiate between evidence.[23] Secondly color-blind-friendly color palettes may be utilized which are distinguishable for color vision deficient personnel. Finally, specialized imaging techniques are available which utilize contrast enhancing techniques and highlight specific features, like infrared or ultraviolet photography among other advancements in technology.[24]

CONCLUSION

Hue changes in color perception can be challenging task for the color compromised individuals especially for forensic personnel who have to routinely come across various color related scenarios like injury inspection, trace evidence collection etc.[25]

Hence instead of segregating individuals for not opting either forensic medicine or forensic sciences as a career, strategic reforms should be introduced and adapted for recognition of blood spatter analysis, dactylography, injury examination.

Finally, consanguinity is an inherent etiological factor consequential in color perplexity, which is a totally preventable causality i.e. avoid consanguineous marriages, undergo genetic counseling before having children and to get tested for color blindness before conceiving.[26]

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Original Article

Comparison of Outcomes Between Early and Delayed Cholecystectomy in Acute Biliary Pancreatitis Patients

Ihtisham ul Haq, Naveed Ahmad, Muhammad Attaullah Khan, Muhammad Uzair, Muhammad Daud and Sara Rahman

ABSTRACT

Objective: To compare the outcomes of early versus delayed cholecystectomy in patients with ABP to guide clinical decision-making.

Study Design: Prospective comparative study

Place and Duration of Study: This study was conducted at the Department of General Surgery, Lady Reading Hospital, Peshawar, from August 2022 to February 2023.

Methods: A total of 120 patients were included, divided into two groups: early cholecystectomy (n=60) and delayed cholecystectomy (n=60). Data on demographics, clinical outcomes, and complications were collected and analyzed using SPSS version 26.

Results: The groups were comparable in baseline characteristics. 'The early cholecystectomy group had a significantly shorter hospital stay' (5.09 ± 0.90 vs. 8.89 ± 1.79 days; p<0.001). ICU admissions were higher in the early group (81.7% vs. 43.3%; p<0.001), but mortality and recurrence rates were similar between groups. Postoperative complications, bile leaks (71.7% vs. 46.7%; p=0.005), and surgical site infections (65.0% vs. 33.3%; p=0.001) were more common in the early group.

Conclusion: Early cholecystectomy reduces hospital stay and prevents recurrent pancreatitis but is associated with higher postoperative complications. Careful patient selection and perioperative management are essential. Delayed cholecystectomy remains an option for patients with severe inflammation or high surgical risk. These findings contribute to optimizing ABP management strategies.

Key Words: Acute Biliary Pancreatitis, Cholecystectomy Timing, Early Vs. Delayed Surgery, and Outcomes, Complication

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INTRODUCTION

Acute biliary pancreatitis (ABP) is a leading cause of acute pancreatitis, constituting 30–60% of cases globally, with its incidence closely linked to the prevalence of gallstone disease. The gallstones blocking the bile duct can lead to pancreatic inflammation, with risk factors of advanced age, obesity, female gender, and diabetes serving as a significant factor[1,2]. It's not only the leading cause of morbidity but a significant contributor to healthcare resource utilization globally, highlighting the importance of effective management strategies. The cholecystectomy, that is the surgical removal of the gallbladder, serves as a definitive treatment for ABP, aiming to prevent recurrent episodes by resolving underlying cause[3,4]. However, the timing of this intervention whether performed early during the same hospital admission or delayed until after the resolution of acute symptoms remains an ongoing debate Early cholecystectomy has the advantage of preventing recurrence during the waiting period, but is often considered riskier due to potential complications associated with operating in the presence of unresolved inflammation[5,6]. Contrariwise, delaying surgery lead to resolution of the acute inflammatory process, but it may lead patients to recurrent episodes of pancreatitis, prolonged hospital stays, and increased healthcare costs[7].

Despite numerous researches exploring the timing of cholecystectomy in ABP, a clear consensus remains mysterious. While early cholecystectomy was reported to reduce recurrence rates and hospital readmissions, it has also been linked with concerns regarding higher complication rates. On the other hand, delayed cholecystectomy, though potentially safer in some

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cases, the risk of recurrent pancreatitis and may lead to longer cumulative hospital stays. Existing literature often focuses on isolated clinical outcomes, lacking comprehensive evaluations of both the surgical and systemic complications related to timing.

This study fills the knowledge gap by conducting a comprehensive comparative analysis of early versus delayed cholecystectomy in ABP. It examines the demographic characteristics, clinical outcomes, and complications, and provides a well-rounded perspective of the advantages and risks associated with each approach. By addressing this gap, the research aims to guide clinical decision-making and supports the development of standardized guidelines for managing ABP effectively. The primary objective of this study was to evaluate and compare the outcomes of early versus delayed cholecystectomy in patients with acute biliary pancreatitis (ABP).

The finding of this investigation is expected to enhance understanding of the timing's impact on surgical and patient outcomes. Furthermore, they aim to guide for optimizing care, reduce morbidity, and improve resource allocation in healthcare settings.

METHODS

The study design was a prospective, comparative study conducted at Lady Reading Hospital, Peshawar, for 6 months, from (August 2022 to February 2023). The objective was to evaluate the outcomes of early versus delayed cholecystectomy in patients diagnosed with ABP. The study adhered to the ethical principles outlined in the Declaration of Helsinki. Ethical approval was obtained from the hospital's ethics committee (Ref. No. 459/LRH/MTI). 'Written informed consent was obtained from participants, ensuring confidentiality' and the right to withdraw at any stage of the study without repercussions.

The study was designed as a prospective analysis, carried out in the surgical and gastroenterology departments of Lady Reading Hospital. It included patients presenting with ABP, confirmed through clinical, biochemical, and radiological findings, who were candidates for elective cholecystectomy.

A total sample size of 120 patients was determined using the World Health Organization (WHO) sample size calculator, assuming a confidence level of 95%, a power of 80%, and an expected difference in key outcomes between early and delayed cholecystectomy groups. The patients were divided equally into two groups, with 60 patients undergoing early cholecystectomy (within the same hospital admission) and 60 undergoing delayed cholecystectomy (after resolution of the acute phase). Participants were selected using a non-probability consecutive sampling technique, ensuring all eligible patients during the study period were included.

Inclusion were adult patients aged 18–70 years, diagnosed cases of mild to moderate acute biliary pancreatitis based on Atlanta classification and patients fit for elective surgery as determined by preoperative evaluation.

Exclusion criteria severe pancreatitis requiring prolonged ICU stay or intervention, patients with contraindications to surgery, and those with previous biliary surgery or non-gallstone-related pancreatitis.

After obtaining informed consent, eligible participants were assigned to either the early or delayed cholecystectomy group based on the timing of surgical intervention. Early Cholecystectomy Group: Patients underwent laparoscopic cholecystectomy during the same hospitalization for ABP, typically within 7 days of symptom onset. Delayed Cholecystectomy Group: Patients were discharged after resolution of acute symptoms and underwent laparoscopic cholecystectomy 4–6 weeks later. All surgeries were performed by experienced surgeons, and patients were managed according to standard perioperative protocols.

Data collection baseline demographic and clinical data, including age, gender, BMI, comorbidities, and severity of pancreatitis, were recorded. Outcomes assessed included: Clinical Outcomes: Length of hospital stay, ICU admissions, recurrence of pancreatitis, and mortality. Postoperative Outcomes: Conversion to open surgery, bile leaks, surgical site infections, intra-abdominal abscesses, wound dehiscence, and readmissions.

Data were analyzed using SPSS (Statistical Package for the Social Sciences) version 26. 'Continuous variables were expressed as mean ± standard deviation (SD) and compared using the independent t-test'. 'Categorical variables were presented as frequencies and percentages and analyzed using the chi-square or Fisher's exact test'. A p-value < 0.05 was considered statistically significant.

RESULTS

This 'prospective comparison between early and delayed cholecystectomy' in patients with ABP. A total of 120 patients were equally divided into two groups: early cholecystectomy, performed within the same hospital admission, and delayed cholecystectomy, performed 4–6 weeks after the resolution of acute symptoms. The outcomes assessed included demographic and baseline characteristics, clinical outcomes, and complications.

The demographic and baseline data in Table 2 showed no significant differences between the early and delayed cholecystectomy groups in terms of age, BMI, and gender distribution. Comorbidities like diabetes were slightly more prevalent in the delayed group (83.3% vs. 66.7%; $p = 0.090$), but the difference was not significant. Severity analysis revealed more severe cases in the early group (21.7% vs. 6.7%; $p = 0.059$),

although this difference also lacked statistical significance.

Table No.1: Demographic and Baseline Characteristics

Characteristic	Early Cholecys-tectomy (n = 60)	Delayed Cholecystecto my (n = 60)	p-value
Age (mean ± SD)	49.78 ± 5.57	49.63 ± 5.33	0.880
BMI (mean ± SD)	24.57 ± 3.09	24.67 ± 2.93	0.856
Gender			0.855
- Male (%)	30 (50.0%)	31 (51.7%)	
- Female (%)	30 (50.0%)	29 (48.3%)	
Comorbidities(%)			
- Diabetes	40 (66.7%)	50 (83.3%)	0.090
- Hypertension	23 (46.0%)	27 (54.0%)	0.459
Severity (Mild/ Moderate/Severe)	30 / 17 / 13	34 / 22 / 4	0.059

Table 2: Clinical outcomes significant differences were observed in the length of hospital stay, which was shorter in the early group (5.09 vs. 8.89 days; $p < 0.001$), and ICU admissions, which were more frequent in the early group (81.7% vs. 43.3%; $p < 0.001$). Mortality rates and recurrence of pancreatitis were similar between groups, with no statistical significance ($p = 1.000$ and $p = 0.822$, respectively). Postoperative complications, conversion to open surgery, and readmissions were comparable and did not show significant differences.

Table No.2: Clinical Outcomes Between Early Cholecystectomy and Delayed Cholecystectomy

Outcome	Early Cholecys-tectomy (n = 60)	Delayed Cholecys-tectomy (n = 60)	p-value
'Length of hospital stay (days)'	5.09 ± 0.90	8.89 ± 1.79	<0.001
ICU admission (%)	49 (81.7%)	26 (43.3%)	<0.001
Mortality (%)	48 (80.0%)	48 (80.0%)	1.000
Recurrence of pancreatitis (%)	47 (78.3%)	48 (80.0%)	0.822
Postoperative complications (%)	33 (55.0%)	26 (43.3%)	0.201
Conversion to open surgery (%)	32 (53.3%)	29 (48.3%)	0.584
Readmission (%)	44 (73.3%)	39 (65.0%)	0.323

Table 3: Complications of bile leaks (71.7% vs. 46.7%; $p = 0.005$) and surgical site infections (65.0% vs. 33.3%; $p = 0.001$) were significantly more common in the early group. Intra-abdominal abscesses and wound dehiscence were more frequent in the delayed group but did not reach statistical significance ($p = 0.075$ and $p = 0.093$, respectively).

Table No.3: Complications Between Early Cholecystectomy and Delayed Cholecystectomy

Complication	Early Cholecys-tectomy (n = 60)	Delayed Cholecys-tectomy (n = 60)	p-value
Bile leak (%)	43 (71.7%)	28 (46.7%)	0.005
Surgical site infection (%)	39 (65.0%)	20 (33.3%)	0.001
Intra-abdominal abscess (%)	37 (61.7%)	46 (76.7%)	0.075
Wound dehiscence (%)	46 (76.7%)	53 (88.3%)	0.093

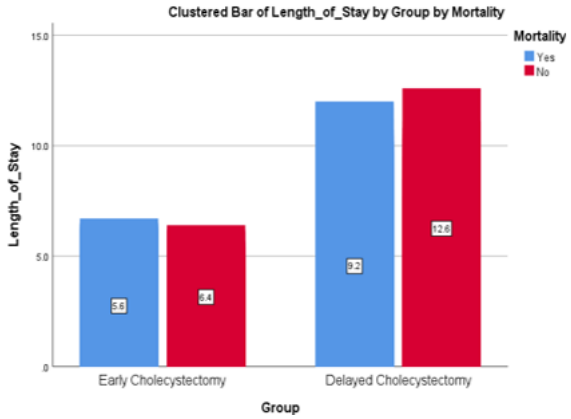

Figure No.1: shows that delayed cholecystectomy results in longer hospital stays than early cholecystectomy, especially for patients without mortality (12.6 vs. 6.4 days). Mortality cases in both groups have shorter stays, highlighting the potential advantage of early intervention in reducing hospitalization duration.

DISCUSSION

The management of ABP remains the topic of ongoing debate, especially regarding the optimal timing of cholecystectomy. This study presented a comparative analysis of early and delayed cholecystectomy in patients with ABP, examining outcomes hospital stay length, complications, and recurrence rates. The findings provide valuable insights that were consistent with and added to the existing body of literature.

One of the key findings in this study was the significantly shorter hospital stay associated with early cholecystectomy compared to delayed cholecystectomy. This finding aligns with study conducted by Cho et al. (2023), which reported reduced hospitalization durations in early cholecystectomy groups[8]. By promptly addressing the source of obstruction, early cholecystectomy minimizes the need for readmissions and prolonged inpatient care, emphasizing its cost-effectiveness and practicality.

The study also found that ICU admissions were more common in the 'early cholecystectomy' group likely due to the inclusion of more severe cases in this cohort, as indicated by the baseline severity data. However, it is noteworthy that despite higher ICU utilization, early intervention did not result in increased mortality or recurrence rates, this finding was consistent with the studies, with similar reported 'no significant differences in mortality between early and delayed groups'[9-11].

Complication rates, including bile leaks and surgical site infections, were notably higher in the early group, this finding aligns with the concerns raised in earlier studies by Bagepally (2021) Nzenwa et al. (2021) and Haider et al (2023)[12-14]. Operating during active or recently resolved inflammation may increase the technical challenges of surgery, leading to higher complication rates. However, these risks must be weighed against the benefit of preventing recurrent pancreatitis, which remains a significant concern in delayed cholecystectomy, as observed in other studies such as those by Hallensleben et al. (2022)[15].

Interestingly, the recurrence of pancreatitis in the delayed group was not significantly different in this study, a finding that contrasts with the prevailing view in the literature. Studies by Coelho et al. (2023) and Hussain et al (2023) have demonstrated higher recurrence rates in delayed cholecystectomy due to the prolonged waiting period, during which gallstone migration remains a risk[16,17]. This discrepancy may reflect variations in patient selection or management protocols across different healthcare settings.

CONCLUSION

This study supports the growing evidence favoring early cholecystectomy for ABP due to its shorter hospital stays and prevention of recurrent episodes. However, the higher complication rates observed necessitate careful patient selection and perioperative planning. Delayed cholecystectomy remains a viable option for select patients, particularly those with severe inflammation or comorbidities. Balancing the benefits and risks of each approach remains pivotal in tailoring management to individual patient needs. By contributing to this ongoing discussion, the findings provide a foundation for optimizing ABP management strategies in clinical practice.

Limitation: Despite these insights, it is crucial to address the limitations inherent in this study. The relatively small sample size may limit the generalizability of the findings, and the non-randomized design could introduce selection bias. Future randomized controlled trials with larger populations are essential to validate these results and refine clinical guidelines.

Author's Contribution:

Concept & Design or acquisition of analysis or interpretation of data:	Ihtisham ul Haq, Naveed Ahmad, Muhammad Attaullah Khan
Drafting or Revising Critically:	Muhammad Uzair, Muhammad Daud, Sara Rahman
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Original Article

Impact of Zinc BioFortified Wheat Flour on the Serum Levels of Interleukin-2, Interleukin-12, and Interferon Gamma in Adolescent Girls, A Case-Control Study

Sara Yar Khan[1], Sadia Fatima[2], Rubina Nazli[2], Omer Malik[3] and Sikandar Ali[1]

ABSTRACT

Objective: To know the Impact of Zinc BioFortified Wheat Flour on the Serum Levels of Interleukin-2, Interleukin-12, and Interferon Gamma in Adolescent Girls.

Study Design: Case-control study

Place and Duration of Study: This study was conducted at the Khyber Medical University (KMU), Peshawar from January 2023 to January 2024.

Methods: In this case-control study, adolescent girls aged 10–16 years were divided into two equal groups. The control group received regular flour, while the intervention group consumed zinc-biofortified flour. Blood samples were collected before and after a six-month period to evaluate serum levels of zinc and inflammatory markers (IL-2, IL-12, and IFN-γ), measured via ELISA.

Results: There was no statistically significant change in serum zinc or inflammatory biomarkers between groups after six months. However, a mild increase in IFN-γ levels was observed within the intervention group.

Conclusion: Zinc-biofortified wheat flour had limited impact on serum zinc and inflammatory markers over six months. Extended use may be required to yield measurable health benefits.

Key Words: Zinc biofortification, IL-2, IL-12, IFN-γ, adolescent health

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INTRODUCTION

Micronutrient deficiencies, particularly involving zinc and iron, affect over a billion people worldwide, with the highest burden in low- and middle-income populations[1]. This phenomenon, often referred to as "hidden hunger," represents a major challenge in achieving global health and nutrition targets outlined in the Sustainable Development Goals (SDGs), especially SDG 2 (Zero Hunger) and SDG 3 (Good Health and Well-being).

Zinc plays an essential role in numerous physiological functions[2]. It acts as a cofactor for over 300 enzymes and contributes to immune regulation, wound healing, oxidative stress response, and DNA repair.

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It also supports sensory functions, mental health, and reproductive outcomes. However, certain population groups such as children, the elderly, vegetarians, and individuals with low animal-source food intake remain at greater risk of zinc deficiency due to dietary limitations or increased physiological needs[3].

Chronic zinc deficiency in early life has been linked to stunted growth, weakened immunity, and neurocognitive deficits, including impaired memory and learning capacity. Moreover, zinc is crucial in modulating immune mediators like interleukin-2 (IL-2), interleukin-12 (IL-12), and interferon-gamma (IFN-γ), which are produced primarily by T lymphocytes and play key roles in cellular immune responses[4].

Several factors contribute to zinc deficiency, including poor dietary intake, impaired absorption, and the presence of dietary inhibitors such as phytates, which are common in cereal-based diets and known to hinder zinc bioavailability[5]. Addressing this public health issue requires a multifaceted approach that includes supplementation, food fortification, agricultural biofortification, and improved food processing techniques.

Among these strategies, biofortification enhancing the micronutrient content of staple crops during cultivation has emerged as a sustainable and cost-effective intervention[6]. Biofortified wheat, rice, and lentils enriched with zinc and iron have been introduced in

various regions. Recent large-scale effectiveness trials are underway to evaluate the impact of these crops, particularly zinc-biofortified wheat varieties such as Zincol-2016, on improving the nutritional status of vulnerable populations, including adolescents and young children.

Zinc deficiency remains a widespread public health issue, particularly among adolescents, where rapid growth increases nutritional demands. Despite global efforts to address micronutrient malnutrition, many dietary interventions fail to achieve sustained improvements in zinc status due to poor bioavailability and dietary inhibitors such as phytates. Biofortification of staple crops offers a promising, sustainable strategy to enhance dietary zinc intake. However, the clinical effectiveness of such biofortified foods in improving immune function and inflammatory markers remains uncertain. Investigating the impact of zinc-biofortified wheat flour on immune biomarkers such as IL-2, IL-12, and IFN-γ can help determine whether this approach has measurable physiological benefits in adolescents.

METHODS

This case control study was approved by the Advanced Study and Research Board (AS &RB), Khyber Medical University (KMU) (study approval: DIR/KMU-AS&RB/CL/001843). The study was conducted at the Khyber Medical University (KMU), Peshawar from Jan 2023 to Jan 2024.

A total of 72 adolescent girls were recruited via convenience sampling. Participants were allocated into two equal groups. One group received biofortified wheat flour, while the other was provided regular flour for six months.

The levels of zinc and inflammatory biomarkers (IL-2, IL-12, and INF-γ) were assessed in both groups before and after six months of intervention.

The blood samples (2ml) were taken at the baseline and endpoint of the study to monitor zinc concentration and inflammatory biomarkers. Whole blood was extracted from the antecubital vein using a butterfly needle and plastic vacutainers (BD Diagnostics, Switzerland). Plasma and serum were separated within one hour of blood sample collection by 10 mins centrifugation at 1000 -2000 rpm, and the processed samples were stored at -80 degrees for further analysis[4].

Serum levels of zinc, IL-2, IL-12, and IFN-γ were assessed at baseline and post-intervention. Blood was drawn, processed, and stored under standardized conditions. ELISA was used to determine biomarker concentrations.

Data were analyzed using SPSS v28. Normality was tested using the Shapiro-Wilk test. Paired and independent sample t-tests were used to compare pre- and post-intervention levels.

RESULTS

A total of 72 adolescent girls aged 10 to 16 years were enrolled in this case-control study, with 36 participants in each group. The primary aim was to assess the effect of zinc-biofortified flour on serum zinc levels and selected inflammatory biomarkers (IL-2, IL-12, and IFN-γ) over a six-month period.

In the control group, mean serum zinc levels showed a slight but statistically insignificant increase from 654.67±79.19 µg/L at baseline to 674.11±154.92 µg/L after six months ($p = 0.454$). A significant rise was observed in IFN-γ levels, increasing from 71.75±42.91 pg/mL to 85.66±22.05 pg/mL ($p = 0.049$). IL-2 levels rose modestly from 380.67±125.50 pg/mL to 429.78±142.05 pg/mL, though this difference was not statistically significant ($p = 0.128$). IL-12 levels slightly declined from 14.47±4.91 pg/mL to 13.09±1.98 pg/mL ($p = 0.123$), which was also not significant.

In the intervention group, a significant increase in zinc concentration was noted, rising from 645.23±118.03 µg/L at baseline to 690.08±140.28 µg/L after six months ($p < 0.001$). Similarly, IFN-γ levels significantly increased from 62.46±20.87 pg/mL to 80.60±11.62 pg/mL ($p < 0.001$). IL-2 levels also showed a significant elevation from 345.98±77.02 pg/mL to 422.76±127.69 pg/mL ($p = 0.007$). However, the change in IL-12 levels from 12.80±3.38 pg/mL to 13.08±1.70 pg/mL was not statistically significant ($p = 0.601$).

Despite the improvements observed within the intervention group, between-group comparisons revealed no statistically significant differences after six months. Zinc levels differed by an average of 44.85±69.30 µg/L in the intervention group versus 19.44±151.75 µg/L in the control group ($p = 0.365$). Similarly, differences in IFN-γ ($p = 0.596$), IL-2 ($p = 0.504$), and IL-12 ($p = 0.110$) were not statistically significant between the two groups.

Table No.1: Intra-group Comparison of Zinc and Biomarker Levels

Parameter	Control Group (n=36)	p-value	Intervention Group (n=36)	p-value
Zinc (µg/L)	654.67±79.19 → 674.11±154.92	0.454	645.23±118.03 → 690.08±140.28	0.000
IFN-γ (pg/mL)	71.75±42.91 → 85.66±22.05	0.049	62.46±20.87 → 80.60±11.62	0.000
IL-2 (pg/mL)	380.67±125.50 → 429.78±142.05	0.128	345.98±77.02 → 422.76±127.69	0.007
IL-12 (pg/mL)	14.47±4.91 → 13.09±1.98	0.123	12.80±3.38 → 13.08±1.70	0.601

Table No.2: Post-Intervention Differences Between Groups

Variable	Control Group (Δ Mean ± SD)	Intervention Group (Δ Mean ± SD)	p-value
Zinc (µg/L)	19.44±151.75	44.85±69.30	0.365
IFN-γ (pg/mL)	13.91±40.84	18.15±24.54	0.596
IL-2 (pg/mL)	49.10±189.07	76.78±159.66	0.504
IL-12 (pg/mL)	1.38±5.26	0.29±3.28	0.110

DISCUSSION

This case-control study aimed to explore whether the consumption of zinc-biofortified wheat flour could significantly improve serum zinc levels and modulate inflammatory biomarkers, namely IL-2, IL-12, and IFN-γ, in adolescent girls over a six-month period. Although within-group analysis in the intervention group revealed statistically significant increases in zinc, IL-2, and IFN-γ, the differences between intervention and control groups were not statistically significant post-intervention.

These findings align with previous work by Escobedo-Monge et al., who reported no meaningful elevation in plasma zinc after a year-long zinc supplementation trial in children, suggesting that serum zinc levels may not always reflect dietary intake due to complex absorption dynamics or regulatory mechanisms at the cellular level[7]. Similarly, an eight-week intervention using zinc-enriched wheat flour in a randomized setting also yielded no significant changes in systemic zinc concentration, supporting the current observation that short- to mid-term dietary interventions may have limited measurable impact on serum zinc[8].

The observed rise in IFN-γ within the intervention group corresponds with experimental findings that link zinc intake to enhanced immune signaling. Zinc is known to support T-cell activity and the production of Th1-type cytokines, including IFN-γ, a key mediator in cell-mediated immunity[9]. However, as between-group comparisons failed to reach statistical significance, the modest increases may reflect individual variation, low baseline inflammation, or confounding dietary inhibitors such as phytates, which impair zinc absorption[10].

Regarding IL-2 and IL-12, the results were mixed. IL-2 showed a significant rise in the intervention group, while IL-12 remained relatively unchanged in both groups. These results are consistent with findings from studies by Raqib et al. and Ahmad et al., who also noted that zinc supplementation did not consistently enhance all cytokine levels, particularly in short-term trials[11,12]. This discrepancy might reflect the differential regulation and turnover of cytokines or the limited systemic inflammation present in the target population[13,14].

Importantly, the lack of significant difference between groups despite improvements within the intervention arm raises questions about the sensitivity of serum biomarkers in capturing localized or subclinical changes in immune function. It also suggests that a longer duration or higher dosage may be needed to elicit robust systemic effects. Moreover, factors such as dietary composition, gut health, and genetic variation in micronutrient metabolism may have influenced the outcomes.

This study contributes to a growing body of evidence suggesting that while biofortification is a promising strategy, its impact may depend on baseline nutritional status, intervention duration, and the presence of coexisting nutritional or environmental challenges. Given the mild increases observed in some immune parameters, further research using a longer follow-up period and controlling for dietary inhibitors is warranted.

CONCLUSION

This case-control study found that the six-month consumption of zinc-biofortified wheat flour resulted in modest but statistically significant increases in serum zinc, IL-2, and IFN-γ levels within the intervention group. However, when compared to the control group, these changes did not reach statistical significance. IL-12 levels remained largely unaffected throughout the study period.

These findings suggest that while zinc biofortification may have some potential to enhance immune-related biomarkers, its short-term impact on systemic zinc status and inflammatory cytokines appears limited. The absence of significant between-group differences highlights the need for longer-term interventions, higher zinc concentrations, or strategies to overcome dietary absorption barriers. Future studies should explore these possibilities to better understand the full potential of zinc biofortification in improving adolescent nutritional and immune health.

Author's Contribution:

Concept & Design or acquisition of analysis or interpretation of data:	Sara Yar Khan, Sadia Fatima, Rubina Nazli
Drafting or Revising Critically:	Omer Malik, Sikandar Ali
Final Approval of version:	All the above authors
Agreement to accountable for all aspects of work:	All the above authors

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Original Article

A Comparative Analysis of Root Canal Preparation Methods: Assessing Obturation Quality in Rotary Versus Manual Techniques

Muhammad Zubair Ahmad[1] and Yazeed Sulaiman Alqowaiei[2]

ABSTRACT

Objective: To compare the radiographic quality of root canal obturation in molar teeth prepared using rotary and manual instrumentation techniques performed by undergraduate dental students.
Study Design: Cross-sectional analytical study.
Place and Duration of Study: This study was conducted at the College of Dentistry, Qassim University, Saudi Arabia, from August 21, 2024, to March 10, 2025.
Methods: A total of 60 digital periapical radiographs of molars were retrospectively allocated into two groups based on the root canal instrumentation techniques. Group 1 (n=30): manual stainless-steel files using step-back technique and Group 2 (n=30): ProTaper Gold (PTG) rotary nickel-titanium (NiTi) files using crown-down technique. All canals were obturated using cold lateral condensation with AH Plus sealer and appropriate gutta-percha points. The quality of obturation was assessed based on three parameters: length, density, and taper. A T-score (0–3) was calculated for each case. Statistical analysis was performed using Chi-square and Mann-Whitney U tests, with a p-value < 0.05 considered statistically significant.
Results: Adequate obturation in terms of length, density, and taper was observed in 63.33%, 46.67%, and 36.67% of teeth in the manual group, and in 83.33%, 90%, and 93.33% of teeth in the rotary group, respectively. Statistically significant differences were found in all three parameters between the two groups ($p < 0.05$ for length; $p < 0.001$ for density and taper). The overall T-score distribution also showed a significant difference favoring the rotary technique ($p < 0.001$). No statistically significant associations were observed between obturation quality and either gender or tooth location within the arch ($p > 0.05$).
Conclusion: Rotary instrumentation resulted in significantly better radiographic quality of root canal obturation compared to manual techniques. These findings support the integration of rotary systems into undergraduate endodontic training to enhance treatment outcomes.
Key Words: Root canal obturation, rotary instrumentation, manual technique, undergraduate students, T-score, radiographic assessment

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INTRODUCTION

Successful endodontic treatment depends on the fundamental principles of cleaning, shaping, and achieving a three-dimensional seal during obturation.[1]

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The cleaning and shaping process includes thoroughly removing the contents of the root canal to create a continuous, uniformly tapered shape while maintaining the canal's diameter as narrow as possible. Root canal shaping requires the use of different instruments, each specifically designed to fulfill a unique role in achieving optimal final preparation. Effective use of these instruments in endodontics relies on the clinician's expertise and a comprehensive understanding of their characteristics and motion mechanics. For several decades, root canal instrumentation was performed exclusively using stainless steel hand instruments until the introduction of engine-driven nickel-titanium (NiTi) files revolutionized the practice. The benefits of root canal instrumentation using NiTi files, particularly cutting efficiency and capacity to achieve conservative preparations, are well-established in the literature.[2,3] However, their use remains largely limited to experienced clinicians and postgraduate training, with

most undergraduate programs not fully incorporating the application of rotary NiTi systems.[4]

Despite the proven advantages of NiTi rotary instruments, manual techniques with stainless steel files remain prevalent in undergraduate dental training. Resistance to adopting engine-driven NiTi root canal preparation systems in these programs stems from concerns over instrument fracture and equipment costs.[5] However, growing evidence supports the excellent outcomes achieved by students using NiTi instruments, driving a gradual shift toward incorporating these techniques.[6,7] Few studies have compared the obturation quality of root canal treatments achieved by undergraduate students as a result of root canal preparation with traditional manual stainless-steel instruments versus engine-driven rotary NiTi instruments, with variable findings.

In the Middle Eastern region, limited research has focused on the comparative effectiveness of manual and rotary instrumentation in obturation quality when performed by less experienced operators, such as undergraduate students.

This study aimed to assess the quality of obturation achieved with manual and rotary instrumentation techniques during root canal treatment performed by 5th-year dental students at the College of Dentistry, Qassim University, Saudi Arabia.

METHODS

This cross-sectional study was conducted at the Alrass dental clinics of the College of Dentistry, Qassim University, Saudi Arabia. The study protocol was approved by the Committee of Research Ethics, Deanship of Graduate Studies and Scientific Research, Qassim University, Saudi Arabia (registration no. 24-01-06).

The sample size was calculated based on a previous study by Jalees et al.,[8] which reported a difference in obturation quality between rotary (86.7%) and manual (53.3%) techniques. The formula for comparing two independent proportions was used:

$$n = \frac{(Z_{\alpha/2} + Z_{\beta})^2 \, X \, [P_1(1 - P_1) + P_2(1 - P_2)]}{(P_1 - P_2)^2}$$

Where $P_1 = 0.867$, $P_2 = 0.533$, $Z_{\alpha/2} = 1.96$ for 95% confidence, and $Z_{\beta} = 0.84$ for 80% power. Using these values, a minimum of 26 teeth per group was required to achieve 80% power at a 5% significance level. To allow for potential exclusions, 30 molars were included in each group.

The digital periapical radiographs of molar teeth taken using the paralleling technique immediately after root canal obturation were included in this study. For clear radiographic interpretation, only good-quality radiographs were included where anatomical structures and obturation materials within the canals were not over-projected. The DIGORA Optime (Sordex, Helsinki, Finland) workstation was used to read the image sensor plates. SCANORA software was used to analyze the images without any enhancement. The radiographic images were assessed on a digital monitor (Hewlett-Packard ProDisplay P232 matrix of 1920 × 1080 pixels; Hewlett-Packard, CA) at 8X magnification inside the dark room.

Teeth with root resorption, severely curved roots, sclerosed canals, and retreatment cases were excluded. Sixty radiographs were selected using a non-probability sampling method and subsequently allocated into two groups using a group allocation technique. In Group-1 (n=30), the root canals were prepared with manual stainless-steel (SS) files (K-files, Mani Inc., Tochigi, Japan) using the step-back technique. Whereas in Group-2 (n=30), the root canals were prepared with full sequence Protaper Gold rotary Nickel Titanium (NiTi) files (Dentsply Sirona, Ballaigues, Switzerland) using crown down technique. The obturation in Group 1 was performed with ISO gutta-percha points (Meta Biomed, Cheongju, South Korea) and AH plus sealer (Dentsply Sirona, Konstanz, Germany) using the cold lateral condensation technique. Whereas the obturation in Group 2 was performed with Protaper gold corresponding gutta-percha points (Dentsply Sirona, Ballaigues, Switzerland) and AH Plus sealer (Dentsply Sirona, Konstanz, Germany) using the cold lateral condensation technique.

The radiographs were independently evaluated by two pre-calibrated specialist examiners with more than 10 years of experience who were not aware of the instrumentation technique used (consensus was reached at 96%). In case of disagreement, the case was discussed with another senior examiner.

The quality of the root canal fillings (RCF) was assessed based on the following three parameters: 1) distance from the filling's endpoint to the radiographic apex, 2) density of the root canal filling, and 3) taper of the root canal filling.[9]

A scoring system (T-score) was developed to evaluate the adequacy of these parameters. The T-score was calculated by assigning points to each parameter (adequate = 1, inadequate = 0) and summing them. A T-score of 3 indicated an "ideal" obturation, with all three parameters deemed adequate. A T-score of 2 was assigned when two parameters were adequate, 1 when only one was adequate, and 0 when none were adequate, categorizing the obturation as "poor."[8,10] The primary outcome focused on comparing the T-scores between the two groups.

The data were analyzed using IBM SPSS Statistics for Mac version 30.0 (IBM Corp., Armonk, NY, USA). A non-parametric Mann-Whitney U test was applied to compare differences between independent groups due to the non-normal distribution of continuous variables, while the Chi-Square test was employed to evaluate

associations between categorical variables. A *P*-value < 0.05 was considered statistically significant.

RESULTS

A total of 60 molar teeth (28 males, 32 females) were included in this study. In group 1 (manual) there were 7 (23.33%) males and 23 (76.67%) females. Whereas in group 2 (rotary) there were 21 (70%) males and 9 (30%) females. The average age of patients was 42± 8 years in group 1 and 45± 6 years in group 2.

The inter-examiner reliability k-values were 0.92 for the length of the root filling, 0.97 for its density, and 0.98 for its taper.

In group 1, the length, density, and taper of root canal filling were adequate in 19 (63.33%), 14 (46.67%) and11 (36.67%) of teeth respectively. Whereas In group 2, the length, density and taper of root canal filling were adequate in 25 (83.33%), 27 (90%) and 28 (98.33%) of teeth respectively. Statistically significant differences were observed in all three parameters—length ($p < 0.05$), density ($p < 0.001$), and taper ($p < 0.001$) — with superior outcome in the rotary instrumentation group compared to the manual group (Table 1).

Evaluation of the overall technical quality of root fillings, based on T-Scores, revealed a statistically significant difference ($p < 0.001$) favoring the rotary preparation technique. However, no statistically significant differences were observed with respect to tooth location within the arches ($p = 0.29$) or gender-related variations ($p = 0.261$) (Table 2).

Table No.1. Comparison of obturation quality between two groups (Chi square test of independence)

Obturation quality	Points	Group 1 (Manual) n (%)	Group 2 (Rotary) n (%)	Total n (%)	p-value
Length of RCF					
Adequate	1	19 (63.33)	25 (83.33)	44 (73.33)	< 0.05*
Underfilled	0	9 (30)	1 (3.34)	10 (16.67)	
Overfilled	0	2 (6.67)	4 (13.33)	6 (10)	
Density of RCF					
Adequate	1	14 (46.67)	27 (90)	41 (68.33)	< 0.001*
Inadequate	0	16 (53.33)	3 (10)	19 (31.67)	
Taper of RCF					
Adequate	1	11 (36.67)	28 (93.33)	39 (65)	<0.001*
Inadequate	0	19 (63.33)	2 (6.67)	21 (35)	

*Statistically significant value

Table No.2. Comparison of T-scores between two groups (Mann-Whitney U test)

	variable	n	Mean rank	p-value
T-Score	Manual	30	21.35	< 0.001*
	Rotary	30	39.65	
T-Score	Mandibular molars	34	30.75	0.29
	Maxillary molars	26	29.25	
T-Score	Male	28	31.70	0.261
	Female	32	28.30	

*Statistically significant value

DISCUSSION

This study aimed to evaluate and compare the radiographic quality of obturation in molars prepared using two root canal preparation techniques: rotary and conventional methods. The data for the present study comprised periapical radiographs obtained as part of routine clinical procedures from patients who underwent root canal treatment at the Alrass dental clinics, Qassim University. These radiographs were not specifically taken for research purposes. To minimize the risk of radiographic misinterpretation, images with superimposed canal fillings or over-projection of anatomical structures were largely excluded. The study included all permanent maxillary and mandibular molars that required root canal treatment, either based on clinical diagnosis or as part of elective endodontic therapy. Molars with severely curved roots, sclerosed canals, indications for retreatment, or apical root resorption were excluded from the sample.

The frequency of teeth exhibiting adequate obturation quality was higher in those prepared using the rotary instruments. A statistically significant difference was observed across all three parameters—length, density, and taper of obturation—when root canals were prepared with the rotary instrumentation technique compared to the manual instrumentation technique.

These findings align with previous studies that have consistently reported improved technical quality of obturation when using rotary instrumentation systems

compared to conventional manual techniques.[2,10] The enhanced taper and more consistent canal shaping achieved by rotary systems may contribute to better adaptation of the obturation material and a more predictable seal.

In the present study, taper exhibited the most pronounced difference between the two instrumentation techniques. This finding is consistent with Robia et al.[10] and Jalees et al.[8], who reported that rotary systems are more effective than hand files in maintaining canal curvature and producing a uniform taper—both of which are critical for achieving successful obturation.

The enhanced taper and fewer procedural errors observed with rotary instrumentation are attributable to the metallurgical and geometric properties of modern NiTi files. As Srivastava et al.,[11] explained, thermos-mechanically treated alloys used in rotary systems such as Protaper Gold offer increased flexibility and resistance to cyclic fatigue, improving canal centering ability and reducing the risk of apical transportation or ledge formation. This allows even less experienced operators, such as dental students, to achieve clinically acceptable shaping outcomes, which was evident in our results.

Nonetheless, the Protaper Gold remains highly effective in achieving precise canal shaping and high-quality obturation. In our study, the rotary group achieved significantly more obturations with T-scores of 2 or 3, indicating that the overall technical outcome is greatly improved with rotary systems. This is consistent with previous clinical findings by Tekin et al.,[12] and Javeed et al.,[13] who also observed higher rates of technically acceptable fillings in student-performed cases using rotary instruments.

The findings of this study align with those of Ribeiro et al.,[14] who, in a comprehensive meta-analysis, reported that only 26% of molars treated by undergraduate students using manual instrumentation achieved acceptable obturation quality. This low success rate highlights the inherent limitations of stainless-steel hand files, particularly in molars with complex anatomy. These findings are in agreement with the literature and emphasize that structured training in rotary endodontics should be a pedagogical priority in undergraduate education.[15-18]

The significantly higher rates of technically acceptable obturations observed in the rotary group support the growing evidence that NiTi rotary systems, such as ProTaper Gold, provide superior shaping consistency, improved canal centering, and enhanced obturation quality compared to manual techniques.

In a recent multinational survey, Nagendrababu et al.,[19] emphasized the global variability in endodontic education and advocated for wider integration of modern tools and techniques, including rotary instrumentation, magnification, and enhanced irrigation protocols. According to their survey, only 75% of institutions taught rotary instrumentation in both pre-clinical and clinical settings. Furthermore, they emphasized that students benefit from supervised use of advanced techniques to build confidence and competence before graduation.

Although there was a baseline imbalance in gender distribution between the groups, statistical analysis revealed no significant association between gender and obturation quality ($p = 0.261$), nor between tooth location and obturation quality ($p = 0.29$). These findings suggest that the observed differences in T-scores are attributable to the canal preparation technique rather than anatomical location or gender-related factors.

The results of this study support the integration of rotary NiTi systems into undergraduate curricula. However, concerns regarding instrument fracture, cost, and training time persist. Literature emphasizes that modern rotary systems—especially those designed with heat-treated alloys—have significantly reduced the incidence of file separation and procedural errors, making them safer and more predictable for student use.[11,20]

Although the rotary technique showed significantly better performance in all evaluated domains, the manual instrumentation still yielded acceptable outcomes in a notable proportion of cases. This suggests that while rotary systems offer superior performance, manual instrumentation remains a viable option in settings where rotary systems are unavailable.

Limitations of the present study should be acknowledged. First, the evaluation of obturation quality was based on two-dimensional radiographs, which may not fully capture three-dimensional filling adequacy, particularly in curved or accessory canals. While the T-score system provides a practical and validated method for assessing obturation quality, future studies could consider incorporating cone-beam computed tomography (CBCT) imaging for more detailed analysis. However, CBCT imaging may not be the most preferred method for assessing obturation quality due to concerns related to radiation and cost. Other studies have indicated that periapical radiography remains the gold standard for evaluating the quality of obturation.[21-23] Second, this was a single-center study with a relatively small sample size and was limited to molars; therefore, the findings may not be generalizable to anterior teeth or other tooth types with differing anatomical complexities.

CONCLUSION

Within the limitations of this study, rotary instrumentation was found to significantly improve the radiographic quality of root canal obturation in molars compared to manual techniques. Superior outcomes were observed in all assessed parameters—length, density, and taper of root canal fillings—when rotary

systems were employed. These findings support the incorporation of rotary instrumentation into undergraduate dental education, as it may enhance technical quality and treatment outcomes. Further studies with larger sample sizes and clinical follow-up are recommended to validate these results and assess their long-term clinical implications.

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Review Article

Social Skills Training for Children with Attention-Deficit/Hyperactivity Disorder: Current Insights and Future Directions

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ABSTRACT

Objective: This review aims to evaluate the effectiveness of Social Skills Training (SST) for children with ADHD, assess its role within multimodal treatment frameworks, and highlight emerging trends in intervention strategies.
Study Design: Narrative review based on a comprehensive literature search.
Place and Duration of Study: This review was conducted at the Department of Child and Adolescent Psychiatry, Faculty of Medicine, Airlangga University, Dr. Soetomo General Academic Hospital, Indonesia from October 2024-Deecember 2024.
Methods: A narrative review of recent literature was conducted, examining SST outcomes in children with ADHD. Particular attention was given to integrated approaches and innovative SST delivery models.
Results: Evidence supports the efficacy of SST in improving social communication, emotional regulation, and peer relationships in children with ADHD. However, challenges persist in maintaining gains outside structured environments. Integrating SST with parent-mediated components and technological tools, such as virtual platforms or gamified training, has shown potential to enhance engagement and generalization of skills.
Conclusion: SST remains a valuable intervention for addressing social deficits in children with ADHD. Future research should prioritize optimizing delivery methods, tailoring programs to individual cognitive and behavioral profiles, and evaluating long-term outcomes to improve real-world applicability and treatment sustainability.

Key Words: ADHD, social skills training, peer interactions, emotion regulation, behavioral interventions

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INTRODUCTION

Attention-Deficit/Hyperactivity Disorder (ADHD) is a neurodevelopmental condition characterized by persistent patterns of inattention and/or hyperactivity-impulsivity that interfere with daily functioning.[1] Per DSM-5, symptoms must appear before age 12 and be present in multiple settings. While academic difficulties are well recognized, social challenges are equally prominent and often enduring. Children with ADHD commonly experience peer rejection, conflict, and difficulty forming friendships due to impulsivity, emotional dysregulation, and poor social cue recognition.[2,3]

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These social impairments are not merely secondary to core symptoms; they are integral to the disorder and linked to long-term mental health risks and impaired functioning. Although pharmacological treatments help reduce core symptoms, they often fall short in addressing social deficits.[4,5]

However, to address the social deficits that medication alone may not resolve, Social Skills Training (SST) has become a widely adopted non-pharmacological strategy aimed at improving peer interactions, emotional regulation, and communication.[6,7] Yet, its long-term effectiveness and applicability in real-life settings remain uncertain. Evidence for sustained skill transfer beyond structured environments is mixed.[6,7]

This review examines the role of SST in ADHD, highlighting its effectiveness, limitations, and recent innovations. New approaches—such as technology-assisted tools, parent- and school-based strategies, and individualized training—show promise in enhancing social outcomes. Advancing SST delivery and ensuring real-world application are critical to improving the long-term social functioning of children with ADHD.

NON-PHARMACOLOGICAL INTERVENTIONS FOR ADHD

Non-pharmacological interventions play a crucial role in the multimodal management of ADHD, particularly in addressing the social, emotional, and behavioral

challenges that medications alone often fail to resolve.[6,7,8] While pharmacological treatments such as stimulants and non-stimulants can effectively reduce core symptoms, they do not directly target social impairments or executive dysfunction.[9,10] Psychosocial interventions are therefore essential to help children navigate daily life, build peer relationships, and develop long-term coping skills.[4,5] Several structured approaches have been developed to improve emotional regulation, peer interaction, and adaptive functioning.[11,12,13,14]

Psychoeducation forms the foundation of these interventions, educating children, parents, and teachers about ADHD and effective management strategies. Increasing parental understanding has been shown to enhance treatment adherence, improve parenting practices, and reduce stigma, creating a more supportive environment both at home and school.[15,16]

Behavioral therapy remains a widely used approach, with techniques aimed at reinforcing positive behaviors and improving self-regulation. Behavioral Parent Training (BPT), a core component, equips parents with strategies to manage impulsivity and foster prosocial behavior, leading to improvements in symptoms, social skills, and academic outcomes.[17] Similar principles are applied in Behavioral Classroom Management, where structured reinforcement tools like the Daily Report Card (DRC) help teachers encourage appropriate behavior and enhance classroom engagement and peer interaction.[13] Behavioral Peer Interventions, often implemented in group settings such as summer camps, offer guided opportunities for practicing social skills and reducing peer rejection.[14]

Cognitive Behavioral Therapy (CBT) adds another layer by targeting negative thought patterns that contribute to emotional dysregulation and impulsivity.[6,8,15] Through cognitive restructuring and problem-solving, CBT helps children develop self-control and conflict-resolution skills, particularly when paired with parent and school-based support.[6,8,18] Other interventions include cognitive training, specifically targeting working memory and executive functions, and neurofeedback, which teaches self-regulation of brain activity through real-time feedback. While these show promise, especially for attention and impulse control, evidence of their long-term impact on functional outcomes remains mixed.[15,18]

Among all approaches, Social Skills Training (SST) stands out for its direct focus on the peer relationship difficulties common in ADHD. Unlike broader behavioral programs, SST is designed to improve social communication, foster friendships, and enhance real-world interactions.[19,20,21] Given the lasting impact of social impairments on psychological and functional outcomes, SST has become a central component of comprehensive ADHD care.[22,23]

SOCIAL SKILLS AND THEIR ROLE IN ADHD

Social skills are critical for successful peer relationships and emotional development, yet children with ADHD often face persistent challenges in interpreting social cues, regulating emotions, and engaging in appropriate interactions. These difficulties are core features of the disorder and not merely side effects of inattention or impulsivity.[22,23,24] Two key models explain these impairments: the social skills deficit model, which suggests a lack of necessary skills, and the performance deficit model, which highlights difficulties in applying known skills due to impulsivity and emotional dysregulation.[25,26]

As a result, children with ADHD frequently experience peer rejection, conflict-prone friendships, and long-term risks such as anxiety, depression, and poor academic outcomes. Given these impacts, targeted interventions are essential. SST is a widely used approach that teaches problem-solving, emotional regulation, and communication through structured activities and guided practice, aiming to improve real-world social functioning.[24,26]

SOCIAL SKILLS TRAINING IN ADHD

SST is a structured intervention aimed at improving social competence in children with ADHD. It targets core difficulties such as interpreting social cues, regulating emotions, and engaging in positive peer interactions. By promoting appropriate social behavior, SST helps reduce maladaptive patterns that often lead to peer rejection and isolation.[21,27]

Core Components of Social Skills Training

SST programs vary in structure and delivery, but most include several core elements aimed at improving real-world social functioning in children with ADHD. A key focus is teaching children to recognize social cues, such as facial expressions, tone of voice, and body language, which they often misinterpret, leading to inappropriate responses.[19,21] Verbal and nonverbal communication skills are also emphasized, including how to take conversational turns, maintain appropriate eye contact, and adjust behavior based on social context. Emotion regulation is another critical component, helping children manage frustration, impulsivity, and aggression through techniques like self-monitoring, cognitive restructuring, and relaxation exercises.[23,26] Programs also address problem-solving and conflict resolution by guiding children through real-life scenarios and role-play exercises to help them respond constructively in peer interactions. Perspective-taking and empathy are encouraged to help children understand others' thoughts and emotions; skills essential for building and maintaining friendships. These abilities are reinforced through behavioral rehearsal and role-playing, providing structured practice with feedback in a supportive environment. Finally,

because transferring skills to everyday situations can be challenging, many SST programs actively involve parents, teachers, and caregivers to promote generalization beyond the therapy setting.[7,8,19]

Effectiveness and Delivery of Social Skills Training in ADHD

SST has demonstrated moderate effectiveness in improving social functioning in children with ADHD. Research indicates that SST can enhance social competence and peer acceptance, improve conversational abilities, cooperation, and emotional regulation, and reduce impulsive or inappropriate behaviors. It also strengthens children's ability to resolve conflicts and navigate peer interactions more successfully.[7]

SST can be delivered through various formats, depending on individual needs and the setting. Individual therapy offers tailored support focused on specific social deficits but may lack opportunities for real-time peer interaction.[7,21] Group-based training, by contrast, allows children to practice skills with peers in structured sessions, making it especially effective for addressing peer relationship challenges.[14,15,21] School-based interventions integrate SST into the classroom, often led by counselors or teachers, and help children apply skills in their everyday environment. In addition, programs that actively involve parents and teachers have been found to significantly enhance the generalization and maintenance of social skills.[21,23]

Parental involvement plays a critical role in SST. Parents who participate in training sessions can reinforce skills through consistent feedback, create opportunities for practice in daily life, and address specific social challenges at home or in the community. Teachers also contribute significantly by embedding social skills instruction into classroom routines, using structured reinforcement such as praise and reward systems, and offering real-time coaching during peer interactions. Together, these efforts create a cohesive support system that maximizes the effectiveness of SST across multiple environments.[13,17,19]

CHALLENGES AND LIMITATIONS OF SOCIAL SKILLS TRAINING IN ADHD

Despite its benefits, SST faces several limitations that affect its real-world impact, especially for children with ADHD.[7,28] A key challenge is the limited generalization of learned skills to everyday settings.[29] While children may perform well in structured sessions, they often struggle to apply these skills in dynamic, unstructured environments like classrooms or playgrounds. Involving parents, teachers, and providing real-life practice opportunities can help bridge this gap.[7,21,22]

Another limitation is the variability in treatment response. Factors such as comorbidities, symptom severity, and motivation influence how well a child benefits from SST.[7,21] Personalized approaches and the inclusion of emotion regulation training can enhance outcomes for those with greater difficulties. SST also tends to produce short-term gains, with many children regressing once formal sessions end. Without continued reinforcement, improvements may not last. Regular booster sessions, ongoing involvement from caregivers, and the use of digital tools for practice may help sustain progress.[7,19,21]

A further concern is the mismatch between knowledge and performance. Many children with ADHD understand appropriate social behaviors but fail to apply them consistently due to impulsivity and emotional dysregulation. Addressing this requires more dynamic, real-time feedback and peer-mediated support rather than scripted instruction alone.[7,21] Finally, access to SST remains uneven. Limited availability of trained professionals, logistical barriers, and cultural differences can restrict participation. Expanding school-based and telehealth programs and adapting SST content to be culturally responsive may improve reach and effectiveness.[7,19,21]

To enhance SST's impact for children with ADHD, future approaches should prioritize skill generalization, personalized treatment, and sustained reinforcement.[7,30] Combining SST with therapies like CBT, executive function training, and emotion regulation may boost effectiveness. Emerging digital tools, including AI-based and gamified platforms, also show promise in improving accessibility and real-world applicability.[7,19,21,26,27]

FUTURE DIRECTIONS FOR SOCIAL SKILLS TRAINING IN ADHD

As understanding of ADHD and social development evolves, refining SST to improve its effectiveness, accessibility, and long-term impact is increasingly important. To address current limitations, future interventions should emphasize personalization, technological integration, real-world application, sustained reinforcement, and broader access.[7,19,21]

- Personalized and Adaptive Approaches: Given the diversity in ADHD presentations, SST should move beyond one-size-fits-all models.[30] Individualized plans tailored to each child's social deficits, cognitive abilities, and emotional needs can improve outcomes. Flexible session structures and hybrid models, integrating SST with CBT, executive function training, and parent-led strategies, offer a more comprehensive approach.[7,21]
- Technology-Assisted Training: Digital tools can enhance SST delivery through immersive, engaging platforms. VR simulations allow safe practice of real-life social scenarios, while AI-driven chatbots offer adaptive role-play opportunities. Gamified SST apps can improve

motivation and retention through interactive learning.[23,27]

- Integration Into Daily Environments: To promote generalization, SST should be embedded in natural settings. School-based programs offer daily opportunities for practice with peer and teacher support. Parent-led interventions at home and community-based activities (e.g., sports, camps) provide additional reinforcement in real-world contexts.[7,28,30]
- Long-Term Maintenance: SST gains often fade without continued support. Structured booster sessions, digital progress tracking, and peer support systems can help sustain improvements and prevent regression over time.[7,21]
- Expanding Access: Barriers such as cost, location, and limited specialist availability hinder access to SST. Telehealth programs, culturally tailored content, and policy efforts to secure insurance coverage can help make SST more widely available, especially for underserved populations.[7,19]

CONCLUSION

Social Skills Training remains a valuable intervention for children with ADHD, helping to improve social interactions, emotional regulation, and peer relationships. However, current limitations in generalization, long-term effectiveness, and accessibility highlight the need for innovative and integrated approaches. Future SST interventions should focus on personalization, technology-assisted training, real-world reinforcement, and sustained follow-up support to maximize their impact. By combining these strategies, SST can become a more effective tool in helping children with ADHD navigate social challenges and build meaningful, lasting relationships.

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Review Article

Retirement Syndrome: Psychosocial Interventions to Support the Transition from Work to Retirement

Triningsih Setiawati and Hendy Muagiri Margono

ABSTRACT

Objective: This review article explores current psychosocial interventions for retirement syndrome and highlights emerging strategies to better support the mental and social health of retirees.

Study Design: Narrative review based on a comprehensive literature search.

Place and Duration of Study: This review was conducted at the Department of Psychiatry, Faculty of Medicine, Airlangga University, Dr. Soetomo General Academic Hospital Surabaya, Indonesia from November 2024-January 2025.

Methods: A comprehensive review of existing literature on psychosocial interventions, including counseling, community-based programs, and workplace-preparation initiatives, was conducted. The review also considers barriers to implementation and opportunities for innovation.

Results: Psychosocial interventions have shown promise in addressing feelings of purposelessness, identity loss, and emotional distress—particularly among retirees from high-demand or identity-centric professions. However, limitations persist in terms of intervention design, accessibility, and cultural adaptability.

Conclusion: To effectively support retirees, future approaches should focus on integrating technology to broaden access, applying culturally sensitive practices, and developing holistic models that encompass mental, physical, and social well-being. Addressing these gaps is essential for ensuring a healthier, more fulfilling transition into retirement.

Key Words: Retirement syndrome, psychosocial interventions, aging, retirement

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INTRODUCTION

Retirement is often seen as a well-deserved reward after decades of hard work, a time for leisure, personal pursuits, and rest. However, for many individuals, particularly those whose identities are deeply intertwined with their careers, the transition from an active professional life to retirement can be fraught with unexpected challenges.[1,2] This phenomenon, referred to as retirement syndrome, encompasses a range of emotional and psychological difficulties such as feelings of purposelessness, diminished self-worth, and a loss of identity.[3,4]

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The sudden loss of these can Retirement syndrome can be especially intense for individuals from high-pressure or high-profile careers, where work provides structure, recognition, and purpose.[5,6] trigger anxiety, depression, and physical decline, particularly in those without strong social or family support or meaningful ways to stay engaged.[7] With rising life expectancy, people are spending more years in retirement, highlighting both the potential for continued growth and the need to address the mental, physical, and emotional challenges of this extended life stage.[8,9]

Although various psychosocial interventions, ranging from counseling and support groups to pre-retirement planning programs, have been developed to ease this transition, significant gaps remain in their accessibility, inclusivity, and effectiveness across diverse populations.[9,10] Cultural differences, socioeconomic disparities, and the rapidly evolving nature of work further complicate the development of universal solutions.[10,11]

This review explores current psychosocial interventions for retirement syndrome, assessing their effectiveness, limitations, and areas for improvement. The goal is to identify strategies that not only ease the transition into retirement but also support individuals in leading fulfilling, engaged lives in this next phase.

UNDERSTANDING RETIREMENT SYNDROME

Definition and Conceptual Framework

Retirement syndrome refers to the psychological difficulties some individuals face when transitioning from structured work life to retirement. Despite common perceptions of retirement as a period of freedom, many experience a loss of purpose, identity, and self-esteem, which can lead to emotional distress. [1,2] With increasing life expectancy, more people are spending decades in retirement, making it critical to support their mental, physical, and social well-being. Without proper interventions, retirement syndrome can contribute to mental health issues, physical decline, and social isolation.[3,4]

The roots of retirement syndrome lie in the profound disruption of routine and identity that accompanies retirement.[5] For individuals whose self-worth is closely tied to their professional achievements, the sudden absence of work-related responsibilities, recognition, and social networks can result in a perceived loss of purpose. This can be particularly pronounced in high-powered or high-pressure roles where work defines not just daily activities but also social status and self-concept.[5]

Psychosocial and Emotional Challenges: Retirement syndrome manifests in a range of emotional and social difficulties. Common psychological symptoms include:[3,12]

- Anxiety: Anticipatory worries about financial security, health, or finding meaningful activities.
- Depression: Feelings of emptiness and hopelessness due to a lack of purpose.
- Loneliness: Reduced social interactions with colleagues and the loss of work-based relationships.
- Identity crisis: A struggle to redefine oneself outside of a professional role.

These challenges are often compounded by the societal perception that retirement marks the end of one's active contribution to society. The sudden lack of external validation and structured goals can lead to a downward spiral of self-doubt and disengagement, particularly in individuals with minimal hobbies or limited pre-retirement planning.[3,12] For some, these challenges also have physical manifestations. Research indicates that retirees experiencing psychological distress may face a heightened risk of cardiovascular disease, weakened immune function, and other stress-related health conditions. Thus, retirement syndrome is not only a mental health concern but also a public health issue.[3,12]

Prevalence and Risk Factors: While comprehensive data on the prevalence of retirement syndrome remains limited, smaller studies and anecdotal evidence suggest it affects a significant proportion of retirees, particularly those transitioning from roles with high responsibility or visibility. Several key risk factors have been identified:[13,14]

1. Insufficient Pre-Retirement Planning: A lack of structured financial, social, or emotional preparation increases vulnerability to adjustment difficulties.
2. Over-Reliance on Work Identity: Individuals who derive their primary sense of self-worth from their career are particularly at risk.
3. Lack of Social Support: Absence of strong personal relationships or community ties exacerbates feelings of isolation.
4. Health and Financial Concerns: Worries about declining health or financial insecurity often compound emotional stress.
5. Cultural Perceptions of Aging and Retirement: Societal norms that equate retirement with a decline in productivity or relevance can further erode self-esteem.[13,14]

The Importance of Addressing Retirement Syndrome: As global demographics shift toward aging populations and increased life expectancies, retirement is becoming a more prolonged phase of life, often spanning decades.[15,16,17] Without intervention, retirement syndrome can have widespread consequences:

- Mental Health Impacts: Untreated anxiety or depression in retirees can lead to chronic stress and reduced quality of life.
- Strain on Healthcare Systems: Psychological distress can contribute to physical ailments, increasing healthcare utilization.
- Lost Potential Contributions: Retirees represent a wealth of experience and knowledge that, if channeled properly, can continue to benefit society. [15,16,17]

By addressing the unique challenges posed by retirement syndrome, there is an opportunity to not only mitigate its negative impacts but also empower retirees to lead fulfilling and purpose-driven lives. Understanding its root causes and identifying those at risk is the first step toward creating effective interventions.[15,17]

PSYCHOSOCIAL INTERVENTIONS: CURRENT APPROACHES

Effective psychosocial interventions play a crucial role in mitigating the emotional and social challenges associated with retirement syndrome.[18] These interventions aim to equip retirees with the tools to navigate their transition from work to retirement while fostering a renewed sense of purpose, identity, and social integration.

1. **Individual-Level Interventions**

   Counseling and psychotherapy are key for managing retirement syndrome symptoms like

anxiety, depression, and identity loss. Cognitive-behavioral therapy (CBT) helps retirees reframe negative thoughts and develop coping skills, while person-centered therapy focused on personal strengths is especially helpful for self-identity challenges. Tailoring therapy to individual backgrounds and values further increases its effectiveness.[18] Life coaching offers an action-oriented alternative, helping retirees set meaningful goals and maintain a sense of purpose after leaving work. Mindfulness and stress management programs, such as mindfulness-based stress reduction (MBSR), use meditation and relaxation techniques to improve mental clarity, lower stress, and promote adaptability, supporting retirees' overall well-being during this transition.[8,9,18]

2. **Community-Based Interventions**
   Support groups give retirees a space to share experiences and coping strategies, reducing feelings of isolation and promoting community. These groups address emotional, financial, and lifestyle adjustments, helping manage retirement syndrome holistically. [19,20] Volunteer and mentorship programs help retirees regain purpose by allowing them to contribute to their communities or guide younger generations. These activities enhance satisfaction and keep retirees socially and mentally engaged. Recreational and educational activities, such as art classes, fitness programs, and skill development courses, encourage personal growth and active living. By staying engaged in meaningful pursuits, retirees can maintain purpose and improve quality of life.[19,20]

3. **Workplace-Focused Interventions**
   Pre-retirement planning programs help employees prepare for life after work and lower the risk of retirement syndrome. These initiatives address financial, psychological, and post-retirement goal-setting, with workshops that encourage reflection on values and interests proving especially effective.[21] Gradual transition models, like phased retirement or part-time roles, allow employees to ease into retirement at their own pace, reducing the psychological impact of leaving full-time work. Alumni networks and retiree engagement programs support social and professional continuity by fostering ongoing connections and offering advisory roles. These strategies benefit both retirees and organizations by maintaining a valuable exchange of knowledge and experience.[21,22]

While psychosocial interventions can help address retirement syndrome, their effectiveness depends on individual needs and access. Tailored programs that consider a retiree's background and preferences tend to work better than generic approaches.[21,22] However, many retirees, especially those in underserved areas, face barriers such as cost and limited availability. Culturally sensitive interventions also achieve better outcomes by respecting attitudes toward aging and retirement.[21] Despite progress, significant gaps remain. There is limited long-term research on these interventions, and many programs lack inclusivity, often serving only specific groups. To better support retirees, interventions must become more comprehensive, adaptable, and accessible to diverse populations.[21,22]

EMERGING NEEDS AND GAPS

Despite the promise of psychosocial interventions for retirement syndrome, several challenges hinder their effectiveness. Limited awareness remains a major issue, as many retirees do not recognize their emotional struggles as requiring support.[21,22] Social stigma around mental health further discourages seeking help, particularly in cultures where retirement is seen as an endpoint rather than a transition. Accessibility is another barrier, particularly for low-income and rural retirees who lack access to counseling, support groups, or pre-retirement programs. Many interventions are urban-centered and costly, limiting participation.[21,22] Additionally, existing programs often follow a one-size-fits-all approach, neglecting cultural and socioeconomic diversity. For example, in collectivist cultures, family involvement plays a central role in post-retirement life, whereas interventions in individualistic societies may focus more on personal fulfillment. Addressing these nuances is key to inclusive and effective support.[23,24]

Shifting workplace dynamics further complicate retirement transitions. Longer life expectancies mean retirees now face decades without structured work, often leading to feelings of purposelessness. Additionally, modern work trends, such as remote jobs and gig economies, blur traditional retirement boundaries, leaving some unprepared.[25] These factors require adaptive, forward-looking interventions. Finally, research gaps persist, particularly regarding long-term effectiveness. Many interventions measure short-term improvements in mood or engagement but lack longitudinal data to assess sustained benefits. Understanding how retirees adjust over time is crucial for refining strategies and developing evidence-based solutions.[26,27]

FUTURE DIRECTIONS FOR PSYCHOSOCIAL INTERVENTIONS

Addressing these gaps requires innovative, inclusive, and adaptable strategies. Personalized interventions tailored to retirees' backgrounds and interests can improve engagement. For instance, individuals from high-pressure careers may benefit from stress

management programs, while those with creative inclinations may find arts-based therapies more effective.[27]

Technology-driven solutions can enhance accessibility, especially for rural retirees. Telehealth platforms can expand counseling services, while online support groups and mental health apps offer self-guided stress management tools.[28] Integrating digital resources into traditional interventions makes support scalable and widely available. Holistic approaches that combine physical, mental, and social well-being show promise. Programs that integrate exercise, nutrition, and social engagement can help retirees maintain overall health and life satisfaction. Additionally, culturally sensitive interventions that reflect regional attitudes toward aging and retirement will improve participation and effectiveness.[29,30]

Policy engagement is also critical. Governments and employers should fund retirement support programs, incorporate pre-retirement planning into workplace policies, and launch public awareness campaigns to reduce stigma. Involving policymakers, healthcare professionals, and community organizations ensures interventions are sustainable and widely implemented.

More research is essential to refine interventions and measure their long-term impact. Longitudinal studies tracking retirees over time can reveal sustained benefits, while randomized controlled trials can establish best practices. Collaboration across disciplines will drive progress in developing evidence-based, practical solutions.[31] By prioritizing personalization, technology, holistic care, cultural sensitivity, and policy engagement, the next generation of interventions can empower retirees to transition into this life stage with resilience, purpose, and well-being.[31]

CONCLUSION

To effectively support retirees, future approaches should focus on integrating technology to broaden access, applying culturally sensitive practices, and developing holistic models that encompass mental, physical, and social well-being. Addressing these gaps is essential for ensuring a healthier, more fulfilling transition into retirement.

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