

NARRATIVE REVIEW

Quantifying Satisfaction: An Analysis of Family Planning Services for Married Women (15–49) in Karachi's Private Clinics

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Citation: Shamsi WH., Quantifying Satisfaction: An Analysis of Family Planning Services for Married Women (15–49) in Karachi's Private Clinics. J Women Child Health. 2025 Sept 19;2(3):12–19. doi: <https://doi.org/10.62807/jowach.v2i3.2025.4-12>.

A B S T R A C T



Background:

Client satisfaction is a vital component of quality reproductive healthcare, influencing both contraceptive uptake and continued use. In Pakistan, despite growing reliance on the private health sector, limited research has explored client perspectives, especially among married women in urban settings. This study aims to assess satisfaction levels among married women of reproductive age (15–49 years) receiving family planning (FP) services at private clinics in Karachi.

Methods:

A cross-sectional client exit survey was conducted across six private FP clinics located in different urban areas of Karachi. A total of 600 married women (100 per clinic) were interviewed using a structured questionnaire that captured socio-demographic data, FP method uptake, and satisfaction levels on an 11-point Likert scale. Descriptive statistics were computed, and non-parametric tests—including the Kruskal-Wallis and Mann-Whitney U tests—were applied to compare satisfaction across clinics.

Results:

The findings revealed high overall satisfaction with FP services. Nearly 89% of respondents rated their satisfaction between 8 and 10, with DHA receiving the highest rating (100% scored 10), and Korangi displaying the most variation in satisfaction. Statistically significant differences were observed across clinics (Kruskal-Wallis $H = 223.91$, $p < 0.001$). DHA significantly differed from all other clinics ($p < 0.001$ in each pairwise comparison), indicating exceptional service quality. Korangi also differed significantly from most clinics, suggesting inconsistencies in service delivery. Non-significant differences were found between PECHS, Gulshan, New Karachi, and Nazimabad in some comparisons, implying a relatively uniform standard of service among these sites.

Conclusion:

While client satisfaction with private FP services in Karachi is generally high, substantial differences exist between clinics. Clinics such as DHA and New Karachi exemplify best practices, whereas facilities like Korangi require targeted improvements. These results underscore the importance of continuous quality monitoring and using client feedback to inform policy and programmatic decisions.

Keywords: Client satisfaction, family planning, Karachi, clinics, reproductive health, cross-sectional survey.

Layman Summary

This study looked at how satisfied married women in Karachi are with family planning services from six private clinics. Researchers interviewed 600 women and found that while most were happy—especially at clinics like DHA and New Karachi—some clinics, like Korangi, had mixed reviews. Women rated their satisfaction from 0 to 10, and the scores varied significantly between clinics. These results show that while many clinics provide excellent care, others need improvement. Ensuring all women receive high-quality, respectful, and informative services can help increase the continued use of family planning and improve overall community health.

ISSN: 3006-760X (Online)

Available at: [Link](#)

Editor: Shazia Alam. Peer Review History: JOWACH recognizes the benefits of transparency in the peer review process; therefore, we keep all of the content of peer review and author responses in our repository.

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Statement: All relevant data are within the manuscript. We do not have a hyperlink to publicly accessible archived datasets, but if needed, we can send the raw data to you. Funding: No funding. Competing interests: The authors have declared that no competing interests exist.

INTRODUCTION

Family planning is recognized as one of the most health-promoting and cost-effective activities in public health and development. It has the potential to reduce poverty and hunger, avert around 30% of maternal deaths and 10% of child deaths[1]. Estimates indicate that if all women having unmet need used a modern contraceptive method, 52 million unintended pregnancies could be averted each year and the number of unsafe abortions would decline by 15 million[2]. Expanding access to family planning services can effectively meet the need for contraception and thus save and improve women's and children's lives and greatly contribute in achieving Sustainable Development Goals[3,4]. However, increasing access alone would not bridge this gap. In fact, lack of sufficient focus on quality of services may also explain the slow progress in achieving Sustainable Development Goals (SDGs) in many developing countries[5]. Quality of care has long been recognized as an important factor that influences contraceptive acceptance, uptake and continued utilization[6]. Moreover, satisfied clients are more likely to continue contraceptive use, return to the same provider and recommend the services to others in their community[7]. In contrast, poor quality of care, long waiting time and inadequate information about contraception impedes women's use of FP services[8]. Thus, providing client-centred quality services is critical for effectively meeting couples' family planning and reproductive health needs and enhancing program sustainability.

Research evidence shows that good quality of care in family planning programs results in positive outcomes such as higher clients' satisfaction, increased knowledge, and more effective and longer use of contraceptives[6]. Studies have demonstrated that client satisfaction with services is a key determinant of uptake and continued utilization of family planning services while dissatisfaction with the quality of services – with the exception of desire to become pregnant – is the main reason for contraceptive discontinuation[9]. Recent recommendations from World Health Organization (WHO) brought quality of care back to the forefront of family planning policy and programs and it is also the cornerstone of the WHO' right-based approach to family planning[10].

Country Context

The country lags far behind on almost all development indicators, particularly with regards to maternal and child health[11]. Total fertility rate is 3.8 and on average, Pakistani women still have to bear one child more than they desire. Contraceptive prevalence rate has risen slowly, from 30% in 2007 to 35% in 2013. However, this increase is mainly due to increase in traditional and short term method usage. Moreover, a staggering 20% of couples have an unmet need for family planning despite their desire to space or limit births. There is a stark disconnect between the type of contraceptive method being used and the purpose behind it. Sadly, the care provided to women at the public and private health facilities is poor. Two-thirds of the women are not informed about possible side effect, even more are not informed what to do in case of experiencing side effects. And, importantly 70% of the public sector and 75% of the private sector clients are not informed about wide range of contraceptive methods. Not surprisingly, this results in high rates of unintended pregnancies and unsafe abortions. In addition, a huge number of women (37%) discontinue contraceptive use within a year of initiating contraceptive use mainly due to health concerns[12].

Rationale of the research

Despite global and national efforts to expand family planning (FP) services, Pakistan continues to struggle with high fertility rates, low contraceptive prevalence, and significant disparities in reproductive health access—especially in urban low-income settings. A critical yet often overlooked component of reproductive health programs is client satisfaction, which serves as a proxy for service quality and a predictor of method continuation.

Most existing studies in Pakistan have either focused on public sector services or have lacked granular, client-level data from diverse urban centers. Furthermore, the demographic group of married women aged 15–49—particularly those in their early reproductive years—represents a key population for long-term FP outcomes, yet remains underexamined in private clinical settings.

This study aims to fill that gap by systematically evaluating client satisfaction and contraceptive method uptake across six distinct private health facilities in Karachi. The private sector plays a growing role in reproductive health service delivery, and understanding how clients experience and evaluate these services is crucial for quality improvement, policy formulation, and scaling successful service delivery models.

By comparing satisfaction levels and method preferences across socioeconomic and geographic boundaries, this research seeks to generate actionable insights that can guide resource allocation, training, and community engagement strategies within FP programs in Pakistan and similar urban environments.

OBJECTIVES OF THE RESEARCH

To assess the socio-economic and demographic characteristics of clients served by private clinics, explore the family planning services they opt for, and measure their level of satisfaction with the services received."

LITERATURE REVIEW

Client satisfaction has increasingly emerged as a central metric in evaluating the effectiveness and sustainability of family planning (FP) programs. Research underscores that the quality of care—including counseling, method availability, privacy, and provider attitude—plays a pivotal role in influencing contraceptive adoption and continuation[13,14]. Clients who receive respectful, informative, and timely services are more likely to continue using contraception and recommend the services to others[7].

In many developing countries, including Pakistan, the gap between contraceptive awareness and actual use has been attributed not only to cultural barriers but also to low service quality in both public and private sectors. For instance, a study by Tumlinson et al. (2013) highlighted that inadequate information about contraceptive options and poor provider-client communication were among the top reasons for dissatisfaction and discontinuation.

The World Health Organization (2014) has emphasized a rights-based approach to family planning, placing client satisfaction at the center of service delivery reforms. High-quality services that are accessible, acceptable, and responsive to client needs have been linked with improved health outcomes and reduced unmet need for contraception.

In the context of Pakistan, the Pakistan Demographic and Health Survey (PDHS) 2012–13 revealed that 37% of women discontinue contraceptive use within the first year—often citing dissatisfaction or health concerns. Furthermore, more than 70% of women reported not receiving adequate counselling about method side effects, underscoring the urgent need for improved service delivery standards.

Despite the growing role of private sector clinics in urban reproductive healthcare, there remains limited empirical research examining their performance from the perspective of client satisfaction. This study builds on international frameworks and local evidence to evaluate how well private FP clinics in Karachi meet the expectations of their clients, particularly among young married women—a key demographic for future contraceptive sustainability.

Static clinics: Static clinics are located in urban of Karachi and offer a comprehensive set of high-quality and affordable FP services including short-term, long-term, and permanent methods. These clinics are run by a team of eight individuals including a service provider (medical doctor), two paramedics, a counselor, a receptionist, a center manager, an office attendant, and a driver. The facility is comprised of five to six rooms including the reception area, counseling room, waiting hall, procedure room, changing area, and recovery room. Every visiting client follows a defined path to see the primary care provider. The average client flow is two per day with a range of one to 10 clients daily.

RESEARCH METHODOLOGY

Research Design:

The client exit interview is a cross-sectional survey, which conducted on six family planning and reproductive health clinics in Karachi. The survey is administered to clients after they have received services from these clinics.

Sampling:

A total of 600 interviews conducted in six private family planning and reproductive health clinics in Karachi. As per the sampling methodology hundred number of respondents interviewed at each clinic. All respondent married women of age 15-49 will be interview in study. The sample size was calculated using the standard formula for estimating proportions:

$$n = (Z^2 * p * q) / d^2,$$

with $Z = 1.96$ (for 95% CI), $p = 0.5$, $q = 0.5$, and $d = 0.042$, resulting in approximately 605; thus, 600 was considered statistically adequate and logistically feasible.

To reduce selection bias, participants were recruited using a consecutive sampling approach during standard clinic hours. Only clients who had completed their visits were approached to ensure service experience was fresh in memory. Social desirability bias was mitigated by employing trained external data collectors unaffiliated with the clinics.

Questionnaire:

The study adopted a standardized questionnaire. The questionnaire administered to clients by experienced data collectors, who are not staff at those facilities. Approximately, 10-15 minutes time taken by the enumerator to fill each questionnaire. It contains the following sections 1) Interview and site information, 2) Service use, 3) Counselling, 4) Demographics, 5) Client Satisfaction.

Quality Control Measures

To ensure data quality, field teams underwent a two-day training program on research ethics, questionnaire administration, and digital data entry using ODK. Supervisors conducted real-time checks and reviewed 10% of submitted forms daily. Discrepancies or incomplete records were flagged and resolved through re-verification where needed.

Data Collection and Processing

Data were collected electronically using Open Data Kit (ODK) and exported to SPSS Version 23 for analysis. Before analysis, data underwent a rigorous cleaning process:

- Removal of incomplete or duplicate records
- Logical consistency checks (e.g., age vs. number of children)
- Coding of open-ended responses

Satisfaction ratings were treated as ordinal variables, while socio-demographic data were categorized as nominal or ordinal depending on the variable

Ethical Approval and Considerations:

Ethical approval for this study was obtained from the Research and Development Solutions Institutional Review Board (RADS-IRB), based in Islamabad, Pakistan. All participants provided informed verbal consent prior to data collection. They were informed about the purpose of the study, assured of the confidentiality and anonymity of their responses, and notified that participation was voluntary. No personally identifiable information was recorded, and respondents had the right to withdraw at any stage without consequence.

Enumerators received training on research ethics and were instructed to maintain respondent privacy and ensure data security throughout the study

Statistical Analysis and Assumptions:

Descriptive statistics (frequencies, percentages, means, and medians) were computed for demographic and service use data.

Given the non-normal distribution of satisfaction scores and their ordinal nature, non-parametric tests were used:

- Kruskal-Wallis H test to assess differences in satisfaction across all six clinics.
- Mann-Whitney U tests for post-hoc pairwise comparisons.

These tests do not assume homogeneity of variance or normality, making them suitable for analyzing Likert-scale data. A p-value of < 0.05 was considered statistically significant.

RESULTS:

The analysis targeted six clinics in different areas of Karachi, each collecting feedback from approximately 100 clients. The objective was to analyze multiple aspects of the data, including socio-demographic characteristics, FP services, satisfaction level, concerns and preferences, awareness, and outcomes, while identifying statistically significant differences using p-values. These insights aim to support evidence-based decision-making and the development of context-specific strategies tailored to each area's unique profile.

Demographics:

Table 1 showcases the socio-demographic characteristics below. The age distribution across centers showed a statistically significant difference ($p < 0.05$). Overall, most respondents (66.9%) were aged 25–34, 18.8% were aged 35 and above, and 14.2% were aged 15–24. DHA had a unique profile, with 100% of its respondents falling within the 25–34 age group, indicating a relatively younger, adult demographic. In contrast, New Karachi had the highest proportion of younger respondents aged 15–24 (41.2%), while Nazimabad had a larger share of older participants aged 35 and above (36.0%). The overall median age was 30 years, but this varied by center, with Gulshan (32 years) and Nazimabad (33 years) showing higher medians compared to both New Karachi and DHA (28 years). These differences suggest that programs targeting youth versus older adults may need to be geographically tailored.

Educational attainment also differed significantly across the centers ($p < 0.05$). The largest overall group (44.8%) had completed secondary, vocational, or technical education. However, DHA again stood out, with 100% of its respondents falling in this category and no representation in any other level. In contrast, Korangi had the highest concentration of individuals with non-formal (17.0%) or only primary education (16.0% with some primary and 25.0% with completed primary), highlighting stark educational disparities. A notable 22.1% of the total respondents had some form of tertiary or higher education, largely concentrated in Nazimabad (46.0%), New Karachi (40.2%) and PECHS (29.4%). These findings emphasize the unequal access to education across Karachi's neighborhoods and its potential impact on awareness and decision-making.

The average number of living children across all centers was 3, though individual center averages were lower. DHA had the lowest average (1), while PECHS, New Karachi, Gulshan, Nazimabad, and Korangi reported similar averages (2). Most respondents (52.2%) had 1–2 children, but a significant share (42.1%) had 3–4 children. The proportion of respondents with 5 or more children was relatively low (5.6%) but notable in Gulshan (14.9%) and PECHS (9.8%). The significant variation ($p < 0.05$) in family size reflects underlying cultural and economic influences and suggests differing needs for maternal and child health services by region.

Socioeconomic status, assessed through wealth quantiles, varied sharply across the six centers ($p < 0.05$). Most respondents (38.5%) fell into the 'rich' category overall, followed by 29.6% in the 'middle' and 23.0% in the 'richest' DHA had the highest concentration in the 'richest' category (68%), while Korangi showed the highest proportions in the 'poor' (16.0%) and 'poorest' (8.0%) categories. PECHS and New Karachi also had a relatively high representation among the wealthier groups. These patterns underline significant economic disparities, which are likely to influence access to services, health outcomes, and social behavior, necessitating center-specific interventions.

FP Method Received

The following figures illustrate the uptake of family planning methods, showing both the overall average outcomes and the individual results for each of the six clinics for better clarification. These visual representations allow for a comparison of contraceptive methods used across the clinics, highlighting significant trends and patterns.

Table.1: Socio-demographic characteristics

Socio-Demographic characteristics	PECHS N(%)	New Karachi N(%)	Gulshan N(%)	Nazimabad N(%)	DHA N(%)	Korangi N(%)	Overall Average N(%)	P-Value
Age								
15-24 years	16(15.7%)	42(41.2%)	3(3.0%)	9(9.0%)	0(0.0%)	16(16.0%)	86 (14.2%)	0.000
25-34 years	64(62.7%)	40(39.2%)	71(70.3%)	55(55.0%)	100(100%)	75(75.0%)	405 (66.9%)	
35+ years	22(21.6%)	20(19.6%)	27(26.7%)	36(36.0%)	0(0.0%)	9(9.0%)	114 (18.8%)	
Median Age								
Median age (years)	31	28	32	33	28	29	30	
Education level								
None / non-formal	4(3.9%)	0(0.0%)	6(5.9%)	0(0.0%)	0(0.0%)	17(17.0%)	27(4.5%)	0.000
Some primary	10(9.8%)	0(0.0%)	9(8.9%)	0(0.0%)	0(0.0%)	16(16.0%)	35 (5.8%)	
Completed primary	4(3.9%)	0(0.0%)	13(12.9%)	0(0.0%)	0(0.0%)	25(25.0%)	42(6.9%)	
Some secondary, vocational or technical	24(23.5%)	0(0.0%)	30(29.7%)	18(18.0%)	0(0.0%)	24(24.0%)	96(15.9%)	
Completed secondary, vocational or technical	30(29.4%)	61(59.8%)	26(25.7%)	36(36.0%)	100(100%)	18(18.0%)	271(44.8%)	
Some tertiary or higher	30(29.4%)	41(40.2%)	17(16.8%)	46(46.0%)	0(0.0%)	0(0.0%)	134(22.1%)	
Number of living children								
Average number of living children	2	2	2	2	1	2	2	0.000
Children 1 to 2	50(49.0%)	61(59.8%)	33(32.7%)	37(37.0%)	100(100%)	35(35.0%)	316 (52.2%)	
Children 3 to 4	42(41.2%)	41(40.2%)	53(52.5%)	63(63.0%)	0(0.0%)	56(56.0%)	255 (42.1%)	
Children 5 or more	10(9.8%)	0(0.0%)	15(14.9%)	0(0.0%)	0(0.0%)	9(9.0%)	34 (5.6%)	
Wealth Quintile								
Poorest	0(0.0%)	4(3.9%)	2(2.0%)	1(1.0%)	0(0.0%)	8(8.0%)	15 (2.5%)	0.000
Poor	1(1.0%)	10(9.8%)	6(5.9%)	6(6.0%)	0(0.0%)	16(16.0%)	39 (6.4%)	
Middle	21(20.6%)	27(26.5%)	30(29.7%)	51(51.0%)	0(0.0%)	50(50.0%)	179 (29.6%)	
Rich	54(52.9%)	54(52.9%)	47(46.5%)	20(20.0%)	32(32.0%)	26(26.0%)	233 (38.5%)	
Richest	26(25.5%)	7(6.9%)	16(15.8%)	22(22.0%)	68(68.0%)	0(0.0%)	139 (23.0%)	

Figure 1: Family Planning Method Uptake (Overall)

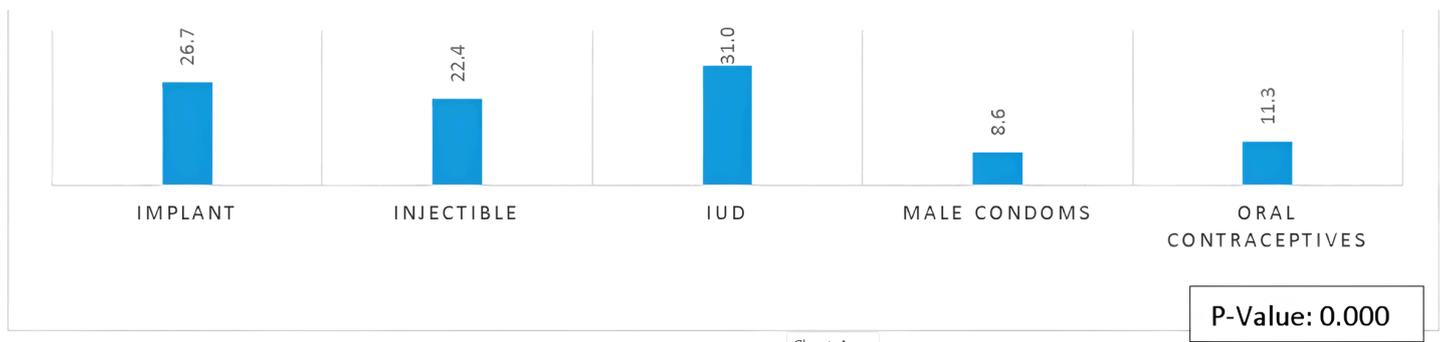


Figure 1, titled "Family Planning Method Uptake," illustrates the overall average distribution of contraceptive methods used by clients. The most commonly used method was the Intrauterine Device (IUD) at 31.0%, followed by Implants (26.7%) and Injectables (22.4%). Oral contraceptives (11.3%) and male condoms (8.6%) were less frequently used. The observed differences in family planning method uptake were found to be statistically significant ($p = 0.000$), indicating meaningful variation in preferences or availability across centers.

Figure 2 illustrates the distribution of contraceptive methods used by clients at the PECHS clinic. The most commonly used method was Injectables at 45.5%, followed by the Intrauterine Device (IUD) at 36.4%, and Oral contraception at 13.6%. Implants were used less frequently (4.5%), while male condoms were not used at all (0.0%). The differences in contraceptive method uptake at PECHS were found to be statistically significant ($p = 0.000$), indicating clear variation in client preferences or method availability.

Figure 2: Family Planning Method Uptake (PECHS)

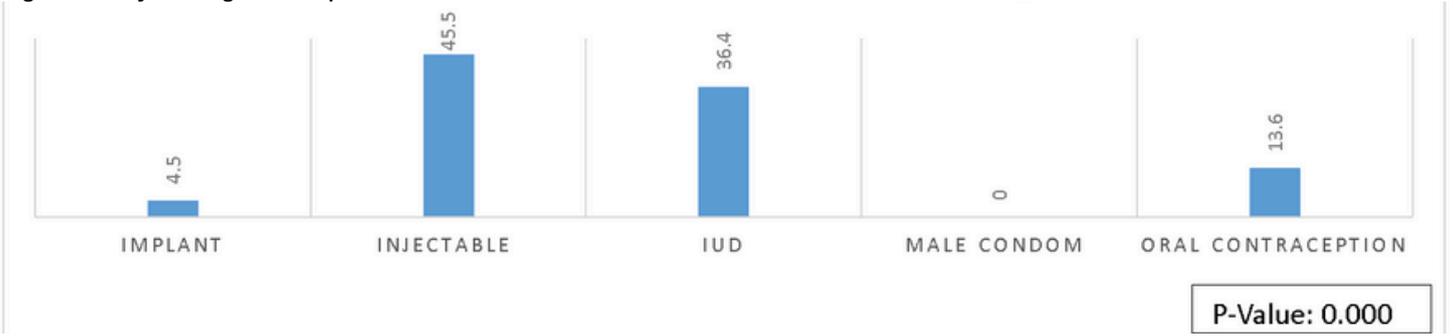


Figure 3 illustrates the distribution of contraceptive methods used by clients at the New Karachi clinic. The two most used methods are the Intrauterine Device (IUD) and Oral Contraception, each accounting for 50% of usage. Other methods, such as Implants, Injectables, and Male Condoms, were not used by any clients in the survey. The differences in contraceptive method uptake at New Karachi were found to be statistically significant ($p = 0.000$), indicating clear variation in client preferences or method availability.

Figure 4 illustrates the distribution of different contraceptive methods used by clients at the Gulshan clinic. The most used method is the Implants at 35.8%, followed by the Injectables (22.6%), the Intrauterine Device (IUD) (18.9%), and Male Condoms (17%). Less commonly used method is Oral Contraception (5.7%). The differences in contraceptive method uptake at Gulshan were found to be statistically significant ($p = 0.000$), indicating clear variation in client preferences or method availability.

Figure 5 illustrates the distribution of contraceptive methods used by clients at the Nazimabad clinic. The most commonly used method is the Intrauterine Device (IUD), which accounts for 61.6%, followed by Male Condoms at 26%. Less commonly used methods include Injectables at 12.3%, while Implants and Oral Contraception were not used (0.0%). The differences in contraceptive method uptake at Nazimabad were found to be statistically significant ($p = 0.000$), indicating clear variation in client preferences or method availability.

Figure 6 illustrates the distribution of contraceptive methods used by clients at the DHA clinic. The only method used at the DHA clinic is Implants, accounting for 100%. Other methods, including Injectables (IUDs), Male Condoms, and Oral contraceptives, were not used. The differences in contraceptive method uptake at DHA were found to be statistically significant ($p = 0.000$), indicating clear variation in client preferences or method availability.

Figure 7 illustrates the distribution of contraceptive methods used by clients at the Korangi clinic. The most used method is the Injectables which accounts for 48.5%, followed by Implants at 26%. Less commonly used methods include Intrauterine Device (IUD) at 15.2 and Oral Contraception at 12.1%, while Male condoms were not used (0.0%). The differences in contraceptive method uptake at Korangi were found to be statistically significant ($p = 0.000$), indicating clear variation in client preferences or method availability.

Figure 3: Family Planning Method Uptake (NEW KARACHI)

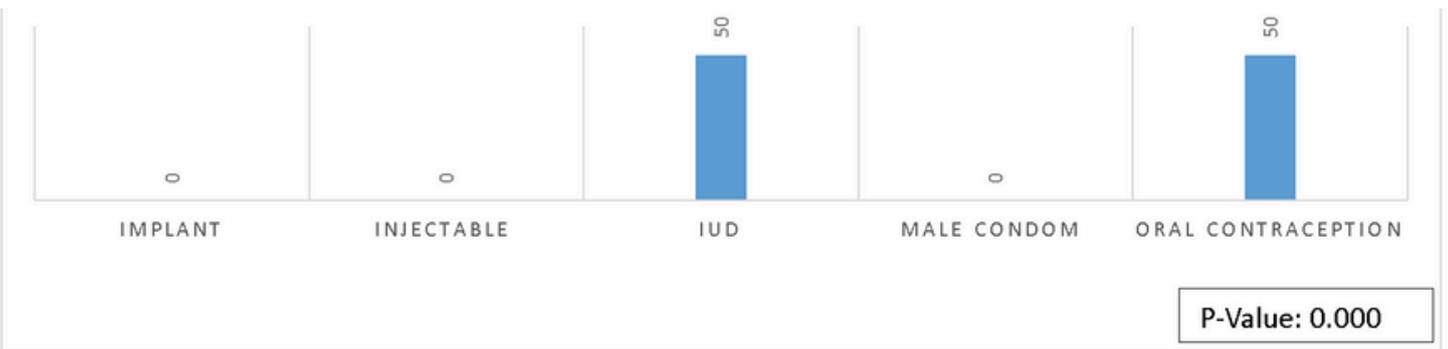


Figure 4: Family Planning Method Uptake (GULSHAN)

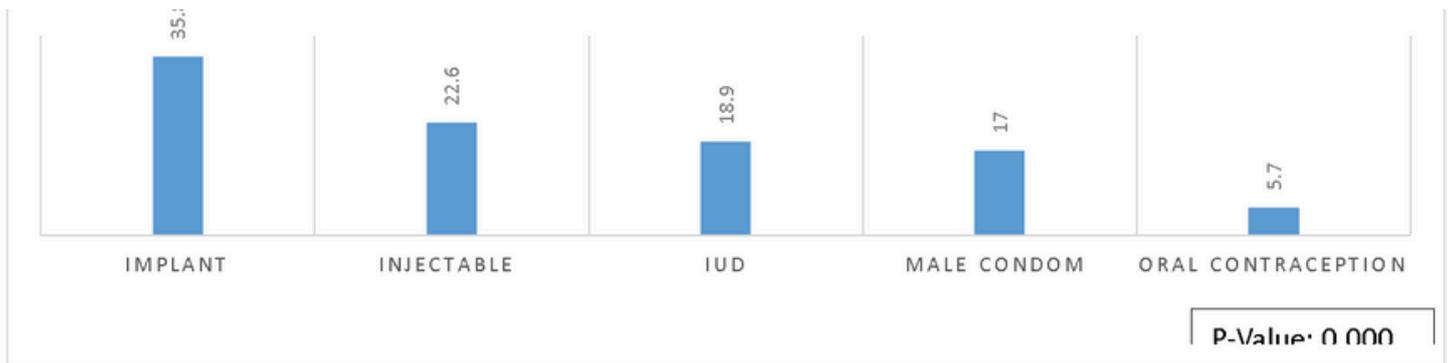


Figure 5: Family Planning Method Uptake (NAZIMABZD)

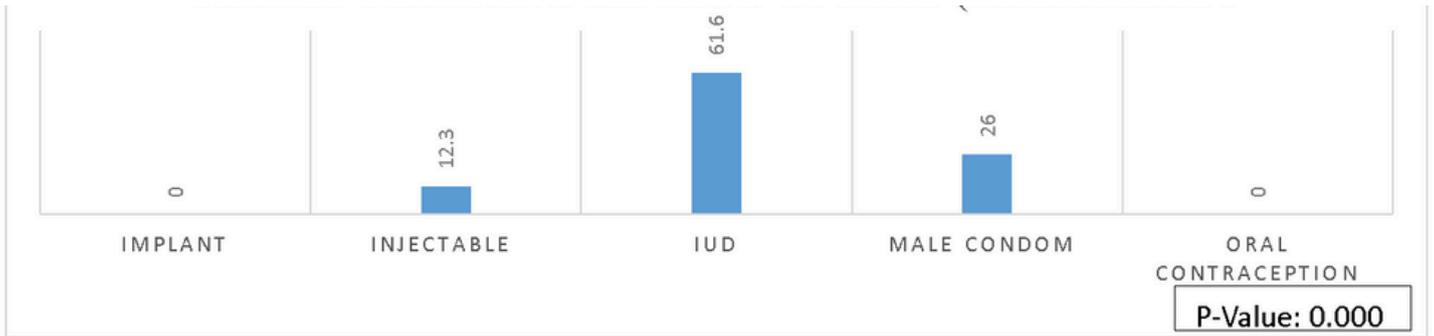


Figure 6: Family Planning Method Uptake (DHA)

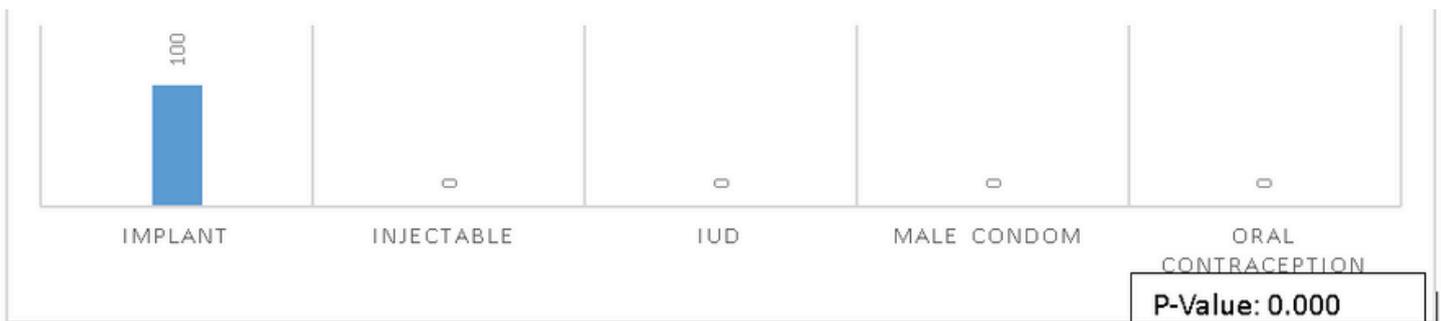
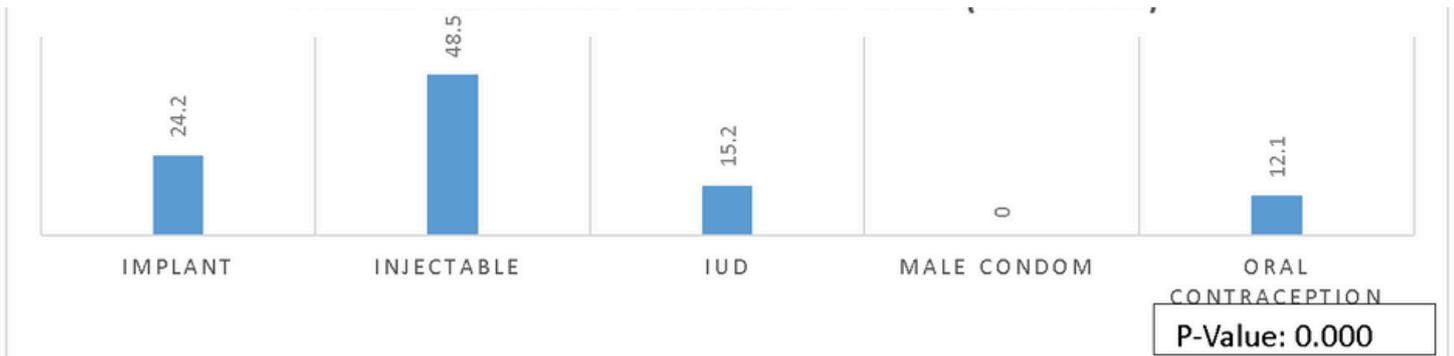


Figure 7: Family Planning Method Uptake (KORANGI)



Descriptive Analysis of Client Satisfaction Ratings Across Clinics

Table 2 summarizes the distribution of client satisfaction scores across six healthcare clinics using an 11-point Likert scale ranging from 0 (“Not at all likely to recommend”) to 10 (“Extremely likely to recommend”). Each clinic was evaluated by 100 clients, totaling 600 respondents. The data reveals substantial variation in satisfaction levels among clinics, with higher scores generally indicating greater likelihood of recommending the service.

Overall Satisfaction Trends

The aggregate data across all clinics shows a marked skew towards high satisfaction. A total of 89.1% of clients rated their satisfaction between 8 and 10, with 36.4% giving a score of 9 and 28.1% assigning a perfect 10. Lower satisfaction levels were minimally represented: only 2.5% rated their experience as 4, and the mid-range scores (5–7) were selected by a combined 8.5% of clients. This trend reflects generally favorable experiences, though clinic-specific patterns reveal more nuanced differences.

Clinic-Wise Satisfaction Distributions

- PECHS Clinic exhibited a broadly positive satisfaction distribution. The majority of clients rated the clinic highly, with 31.4% assigning a score of 8, 27.5% a 9, and 23.5% a 10. Moderate satisfaction scores (4, 6, and 7) were present but minimal, indicating that while the experience was predominantly positive, a small proportion of clients rated it slightly lower.
- NEW KARACHI Clinic received the most concentrated high scores, with 80.4% of clients rating their experience as 9 and 19.6% as 8. Notably, no clients selected any score below 8, indicating uniform satisfaction and a highly favorable perception of care quality at this location.
- GULSHAN Clinic displayed a slightly more varied pattern. While high satisfaction remained dominant—with 36.6% scoring a 9 and 27.7% a 10—clients also selected scores across the mid-range (scores 4 through 7) in smaller proportions. This suggests a generally positive experience, though some variability in service delivery may exist.
- NAZIMABAD Clinic was also rated positively, with 64.0% of clients giving a score of 9 and 27.0% giving an 8. A small proportion (9.0%) rated the clinic at 7, and no scores below 7 were recorded, indicating a high but not unanimous level of satisfaction.
- DHA Clinic was distinguished by unanimous satisfaction: 100% of respondents rated their experience a perfect 10. This outcome signifies exceptional service quality and a complete absence of dissatisfaction among surveyed clients.
- KORANGI Clinic presented the most dispersed satisfaction profile. While 49.0% of clients rated the clinic at 8 and 18.0% at 10, a noticeable proportion of clients gave lower ratings: 8.0% scored it a 4, and 16.0% selected 7. This spread indicates a wider variability in client experiences and suggests areas for potential service enhancement.

Statistical Comparison of Client Satisfaction Across Clinics

Table 3 presents the evaluation of differences in client satisfaction levels across various clinics, conducted through a series of non-parametric statistical analyses. The Mann-Whitney U test was employed for pairwise comparisons between clinics, while the Kruskal-Wallis H test assessed overall differences across all six clinics. The Kruskal-Wallis test revealed a highly significant difference in client satisfaction distributions across clinics ($H = 223.91, p < 0.001$), indicating that at least one clinic had a statistically different satisfaction profile compared to the others.

Pairwise Mann-Whitney U tests further elaborated on these differences:

- DHA exhibited statistically significant differences in satisfaction scores when compared with all other clinics, including PECHS ($p < 0.001$), NEW KARACHI ($p < 0.001$), GULSHAN ($p < 0.001$), NAZIMABAD ($p < 0.001$), and KORANGI ($p < 0.001$). This outcome is consistent with DHA's exceptional satisfaction ratings, where 100% of clients rated their experience as "10" on the scale.
- KORANGI also showed significant differences from several clinics: PECHS ($p = 0.0056$), NEW KARACHI ($p < 0.001$), GULSHAN ($p < 0.001$), NAZIMABAD ($p < 0.001$), and DHA ($p < 0.001$). These results suggest considerable variation in satisfaction levels, likely attributed to KORANGI's broader spread of scores, including lower ratings.
- Additional statistically significant differences in client satisfaction were observed among specific clinic pairs. Notably, satisfaction ratings differed significantly between NEW KARACHI and NAZIMABAD ($p = 0.0038$), indicating divergent client experiences between these two sites. A significant contrast was also found between GULSHAN and NAZIMABAD ($p = 0.0394$), suggesting measurable differences in perceived service quality. Furthermore, the comparison between GULSHAN and KORANGI yielded a highly significant result ($p < 0.001$), underscoring a substantial disparity in client satisfaction between these facilities. These findings reinforce the heterogeneity of client perceptions across clinics and highlight specific locations where targeted quality improvement efforts may be warranted.

In contrast, several clinic pairs exhibited no statistically significant difference in client satisfaction scores, suggesting comparable levels of perceived service quality. Specifically, satisfaction ratings between PECHS and NEW KARACHI ($p = 0.0991$), PECHS and GULSHAN ($p = 0.2315$), and PECHS and NAZIMABAD ($p = 0.8619$) did not differ significantly. Likewise, the comparison between NEW KARACHI and GULSHAN ($p = 0.5983$) revealed no meaningful variation in satisfaction distributions. These non-significant results indicate a relative alignment in client experiences across these clinics, pointing to a consistent standard of care among this subset of facilities.

These non-significant results imply that the distributions of satisfaction scores in these clinic pairs were similar, suggesting comparable performance in client experience.

The statistical evidence supports the conclusion that client satisfaction varies significantly across clinics, with DHA standing out for its consistently high ratings. Clinics such as KORANGI and NAZIMABAD show greater variance and lower satisfaction in comparison, highlighting potential areas for quality improvement.

Table 2. Percentages and scale of client satisfaction by Clinics

Overall Average												
Percentage	-	-	-	-	2.5%	1.0%	1.5%	6.0%	24.6%	36.4	28.1%	
Scale*	0	1	2	3	4	5	6	7	8	9	10	
PECHS												
Percentage	-	-	-	-	3.9%	-	5.9%	7.8%	31.4%	27.5%	23.5%	
Scale	0	1	2	3	4	5	6	7	8	9	10	
NEW KARACHI												
Percentage	-	-	-	-	-	-	-	-	19.6%	80.4%	-	
Scale	0	1	2	3	4	5	6	7	8	9	10	
GULSHAN												
Percentage	-	-	-	-	3.0%	5.9%	3.0%	3.0%	20.8%	36.6%	27.7%	
Scale	0	1	2	3	4	5	6	7	8	9	10	
NAZIMABAD												
Percentage	-	-	-	-	-	-	-	9.0%	27.0%	64.0%	-	
Scale	0	1	2	3	4	5	6	7	8	9	10	
DHA												
Percentage	-	-	-	-	-	-	-	-	-	-	100%	
Scale	0	1	2	3	4	5	6	7	8	9	10	
KORANGI												
Percentage	-	-	-	-	8.0%	-	-	16.0%	49.0%	9.0%	18.0%	
Scale	0	1	2	3	4	5	6	7	8	9	10	

*0 = Not at all likely, 10= Extremely likely

Table: 3 Pairwise Clinic Comparisons of satisfaction scores

Clinic 1	Clinic 2	Mann-Whitney U Statistic	p-value
PECHS	NEW_KARACHI	4164.5	0.0991
PECHS	GULSHAN	4208.0	0.2315
PECHS	NAZIMABAD	4865.0	0.8619
PECHS	DHA	1150.0	0.0001
PECHS	KORANGI	5853.0	0.0056
NEW_KARACHI	GULSHAN	4616.0	0.5983
NEW_KARACHI	NAZIMABAD	5867.5	0.0001
NEW_KARACHI	DHA	0.0	0.0038
NEW_KARACHI	KORANGI	7121.5	0.0001
GULSHAN	NAZIMABAD	5611.5	0.0001
GULSHAN	DHA	1350.0	0.0001
GULSHAN	KORANGI	6341.0	0.0001
NAZIMABAD	DHA	0.0	0.0001
NAZIMABAD	KORANGI	6413.5	0.0001
DHA	KORANGI	9100.0	0.0001
Overall (Kruskal-Wallis)		223.91	0.0001

DISCUSSION

This study provides robust evidence that client satisfaction with family planning services in Karachi’s private clinics is generally high, but not uniform. The overwhelming concentration of high scores (8–10) across the sample points to effective service delivery in most clinics. However, significant inter-clinic variability—especially between DHA and Korangi—reveals critical gaps in quality and consistency.

The results affirm the established literature, which links client satisfaction with quality of care and sustained contraceptive use [13,14]. DHA’s exceptional satisfaction ratings align with the clinic’s demographic profile, where clients were more educated and fell within a narrower age band (25–34). This suggests that both client expectations and service quality contribute to satisfaction scores. In contrast, Korangi’s lower ratings and wider score distribution may reflect disparities in education, income, and possibly provider training or infrastructure limitations.

These differences have real-world implications. Clinics receiving lower satisfaction should be prioritized for quality improvement initiatives, including enhanced counseling, method availability, and client-provider communication. Additionally, the significant variations in contraceptive method uptake further suggest that accessibility, education, and cultural factors play a role in client preferences—highlighting the importance of tailoring services to meet diverse community needs.

The use of non-parametric statistical analysis strengthens the reliability of the findings, especially given the ordinal nature of satisfaction ratings. The Kruskal-Wallis test revealed statistically significant differences across clinics, while Mann-Whitney U tests identified specific clinic pairs with meaningful contrasts. These methods ensured that conclusions were drawn based on rigorous evidence rather than assumptions.

In summary, while the private sector is performing well overall, its heterogeneity cannot be ignored. The findings advocate for ongoing client feedback mechanisms, targeted training, and localized strategies to enhance service quality across all private family planning facilities.

Study Strengths:

This study offers one of the few clinic-level analyses of client satisfaction with family planning services in Pakistan’s private sector, addressing a key gap in reproductive health research. The use of a large, geographically diverse sample (600 respondents across six clinics) enhances the generalizability of the findings within urban Karachi. Moreover, the application of non-parametric statistical tests provided robust insights into inter-clinic differences, supporting data-driven conclusions.

Limitations:

Despite its contributions, the study has several limitations. First, the cross-sectional design limits the ability to draw causal inferences between clinic characteristics and satisfaction outcomes. Second, there is potential for social desirability bias, as clients may have overstated satisfaction due to being interviewed immediately post-service. Third, the study did not assess provider characteristics or service delivery practices in detail, which may explain some variation in satisfaction. Lastly, results are specific to private sector clinics in Karachi and may not be generalizable to rural areas or public healthcare settings.

CONCLUSION

This study highlights both the strengths and weaknesses in the delivery of family planning services through Karachi’s private health sector. The consistently high satisfaction scores underscore the effectiveness of private clinics in meeting reproductive health needs, especially when services are client-centered, accessible, and respectful.

However, the significant variation in satisfaction across clinics reveals that not all facilities operate at the same standard. Clinics such as DHA and New Karachi serve as models of excellence, offering lessons in best practices that could be replicated elsewhere. On the other hand, clinics like Korangi, with more dispersed and lower satisfaction scores, should be focal points for targeted improvements.

The evidence calls for a shift from simply expanding service coverage to enhancing the quality of care delivered. This includes strengthening provider training, improving client counseling, and ensuring the availability of a full range of contraceptive methods. Importantly, satisfaction should not be treated as a one-time metric but as a continuous indicator of performance, feeding into ongoing quality assurance and programmatic planning.

Future policies should institutionalize client satisfaction assessments as part of routine monitoring and evaluation frameworks. Such efforts will not only enhance service delivery but also foster sustained contraceptive use and greater trust in health systems—critical goals for achieving Pakistan’s reproductive health and development targets.

Implications for Future Research

While this study offers valuable insights into client satisfaction with private family planning services, future research should explore long-term outcomes, such as method continuation or switching behavior. Qualitative studies are needed to understand dissatisfaction in underperforming clinics.

Investigating the role of provider behavior, client-provider interactions, and service quality could add depth to existing findings. Future studies should also consider including male partners, unmarried women, and clients from rural or low-income communities to address gaps in equity and access.

Comparative analyses between public and private sectors and the use of digital feedback tools may help identify scalable best practices. Such research would strengthen evidence-based strategies to improve reproductive health services across diverse settings in Pakistan.

Author Contributions

- Conceptualization: WHS
- Methodology: WHS
- Data Management: WHS
- Analysis: WHS
- Investigation: WHS
- Writing: WHS
- Visualization: WHS
- Supervision: RSS
- Validation: RSS
- Methodological Review: RSS
- Review & Editing: AF

Wajahat Hussain Shamsi (WHS), Rana Saba Sultan (RSS), Ambreen Fazal (AF)

Supporting Information:

The structured questionnaire used for data collection (File attached).

Acknowledgements

The authors would like to express their sincere gratitude to the participating clinics and all the clients who generously gave their time and insights during this study. Special thanks to the field enumerators for their dedication to high-quality data collection.

Already Known on This Topic

- Client satisfaction is a critical determinant of continued contraceptive use and service utilization.
- Quality of care in family planning services varies significantly across health facilities.
- In Pakistan, most studies have focused on public sector family planning services.
- Private clinics play a growing role in reproductive health service delivery in urban areas.

This Study Adds to the Literature

- Provides the first clinic-level comparison of client satisfaction across six private family planning clinics in Karachi.
- Highlights significant disparities in satisfaction scores and method uptake between clinics.
- Demonstrates the effectiveness of using non-parametric statistical tests to assess satisfaction differences.
- Offers practical insights for targeted quality improvements in underperforming clinics like Korangi.

Research adds to the currently available literature:

Client Satisfaction in Private Clinics: While most studies in Pakistan focus on public sector family planning services, this study uniquely evaluates client satisfaction in private urban clinics, addressing a critical gap in the literature.

Clinic-Level Comparison: The research offers a clinic-wise comparative analysis, highlighting inter-clinic differences in satisfaction, service quality, and contraceptive method uptake—rarely explored in prior studies.

Statistical Evidence of Service Disparities: Using robust non-parametric statistical methods (Kruskal-Wallis and Mann-Whitney U tests), the study provides quantitative evidence of satisfaction variability across socioeconomic and geographic lines.

Policy-Relevant Insights: The study identifies high-performing (e.g., DHA) and underperforming clinics (e.g., Korangi), offering actionable data for targeted quality improvement and resource allocation in Pakistan's growing private healthcare sector.

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ORIGINAL ARTICLE

Verbal Abuse and Post-Traumatic Stress Disorder Among Female Pediatric and Gynecology Healthcare Providers in Karachi: A Cross-Sectional Analysis

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ISSN: 3006-760X (Online)

Citation: Mufaddal T, Otho MS Verbal Abuse and Post-Traumatic Stress Disorder Among Female Pediatric and Gynecology Healthcare Providers in Karachi: A Cross-Sectional Analysis. JoWach [Internet]. 2025 September;2(3):13-18.

DOI: <https://doi.org/10.62807/jowach.v2i3.2025.13-18>

Available at: [Link](#)

Editor: Sana Ahmed.

Peer Review History: JOWACH recognizes the benefits of transparency in the peer review process; therefore, we keep all of the content of peer review and author responses in our repository. We do not have a hyperlink to publicly accessible peer-review history, but if needed, we can send the history to you.



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Data Availability Statement: All relevant data are within the manuscript. We do not have a hyperlink to publicly accessible archived datasets, but if needed, we can send the raw data to you.

Funding: The author(s) received no specific funding for this work.

Competing interests: The authors have declared that no competing interests exist.

Abstract

Background

Workplace violence is pervasive in healthcare, particularly in maternal and child health settings. Verbal abuse, though often minimized, may have severe mental health sequelae, including post-traumatic stress disorder (PTSD).

Methods

A secondary analysis was conducted using data from a 2023 cross-sectional survey of 414 healthcare providers from pediatric and gynecology departments in Karachi. Female respondents were analyzed separately. Key exposures included frequency of verbal abuse (daily, weekly, occasional, none), cadre (doctor, nurse, support), tenure (<3 years, 3–7 years, >7 years), and hospital type (public/private). PTSD symptoms were the primary outcome. Chi-square, logistic regression, and multivariable-adjusted models were applied.

Results

Among female providers (n=236), 72.5% reported daily or weekly verbal abuse. PTSD prevalence was 71.6%. In multivariable logistic regression, high-frequency verbal abuse was independently associated with PTSD (adjusted odds ratio [aOR]=2.9, 95% CI: 1.7–4.8, p<0.001). Nurses were at greater risk compared to doctors (aOR=1.8, 95% CI: 1.1–3.2, p=0.02). Public-sector providers showed higher PTSD prevalence than private-sector peers, though this attenuated after adjustment.

Conclusions

Verbal abuse is strongly associated with PTSD among female pediatric and gynecology healthcare providers in Karachi. Addressing this hidden form of violence is essential for safeguarding mental health and ensuring quality maternal and child health services.

Keywords: workplace violence, verbal abuse, PTSD, women's health workforce, pediatric healthcare, gynecology.

Layman Summary

Healthcare workers in Karachi, especially women in pediatric and gynecology wards, face frequent verbal abuse from patients and their families. This study shows that such abuse is not "just words", it leads to serious mental health problems like post-traumatic stress disorder (PTSD). Female nurses and doctors who experience daily or weekly verbal abuse were nearly three times more likely to suffer PTSD. This affects not only their personal health but also the care they provide to mothers and children. Improving hospital security, training staff in conflict management, and enforcing laws to protect healthcare providers could reduce this burden and help keep mothers and children safer.

INTRODUCTION

Workplace violence against healthcare providers has emerged as one of the most pervasive occupational hazards worldwide, cutting across regions, health systems, and professional cadres. The World Health Organization (WHO) estimates that between 8% and 38% of healthcare workers experience physical violence during their careers, while far higher proportions report verbal abuse, harassment, or intimidation in daily practice [1,2]. Unlike isolated incidents, these forms of aggression often occur in patterns, eroding staff morale, increasing turnover, and ultimately undermining patient care delivery. The vulnerability of healthcare personnel is particularly acute in low- and middle-income countries (LMICs), where fragile health systems, high patient loads, and weak enforcement of protective laws intersect to produce hostile environments for providers [3,4].

Among the spectrum of workplace violence, verbal abuse occupies a paradoxical position. On the one hand, it is the most common form of aggression faced by health professionals, occurring more frequently than physical assaults. On the other, it is often minimized by institutions, colleagues, and even victims themselves as “part of the job.” This normalization conceals its insidious impact. Repeated exposure to verbal threats, insults, humiliation, or intimidation can activate the same neurobiological stress pathways as physical violence, producing long-lasting psychological harm [5,6]. Studies have shown that frequent verbal abuse increases risks of anxiety, depression, burnout, and critically, post-traumatic stress disorder (PTSD) [7,8]. By focusing on physical assaults alone, health policy and research often neglect the cumulative toll of these “everyday” aggressions [9,10,11].

PTSD represents one of the most debilitating sequelae of workplace violence. It is characterized by intrusive recollections, hyperarousal, avoidance behaviors, and negative alterations in mood or cognition following exposure to trauma. In the healthcare setting, PTSD not only diminishes providers’ mental health and quality of life but also affects professional performance [12]. Providers suffering from PTSD may display impaired concentration, heightened irritability, and reduced empathy, all of which compromise the quality of patient care [13, 14]. Furthermore, PTSD often leads to absenteeism, increased turnover intention, and early exit from the workforce, thereby exacerbating staff shortages [15,16]. For maternal and child health services, which rely heavily on continuity of care and the specialized expertise of nurses and doctors, the consequences of provider PTSD can be especially damaging.

Gender is a critical lens through which to understand the dynamics of workplace violence and PTSD in healthcare. Female providers, who dominate the workforce in pediatrics and gynecology, are disproportionately affected by verbal abuse and its psychological outcomes. They often serve as the first point of contact for distressed families, where tensions surrounding maternal complications or pediatric emergencies are high. Societal gender norms may further reduce women’s ability to confront aggressors or seek institutional redress, leading to under-reporting and prolonged exposure [17]. Evidence suggests that women healthcare workers experience not only higher rates of verbal abuse but also greater psychological vulnerability to its consequences, including PTSD [18,19]. This gendered dimension reinforces the need for targeted research and interventions.

The context of Karachi, Pakistan, magnifies these risks. As one of the largest and most densely populated cities in South Asia, Karachi’s health system is under immense pressure. Overburdened pediatric and gynecology departments frequently manage emergencies with limited staff, inadequate security, and resource constraints. Violence against healthcare providers has been widely reported, ranging from verbal harassment to physical assault, often perpetrated by patients’ relatives in moments of crisis. Despite the passage of legislation in Sindh Province criminalizing violence against medical staff, enforcement remains inconsistent. Consequently, healthcare providers in Karachi—especially women in high-stress maternal and child health settings, operate under conditions of chronic insecurity. Previous research from Karachi and other LMICs has documented high prevalence of workplace violence and highlighted associations with absenteeism, turnover, and perceived declines in care quality [20]. However, the specific link between verbal abuse and PTSD among female healthcare providers has received limited attention. Existing literature often groups different forms of violence together, making it difficult to disentangle the unique psychological burden of verbal abuse [21]. Moreover, few studies have rigorously adjusted for potential confounders such as professional cadre, tenure, and hospital type, which may shape both exposure to abuse and vulnerability to PTSD [22,23].

This study seeks to address these gaps by conducting a secondary analysis of a large cross-sectional dataset of healthcare providers from pediatric and gynecology departments across Karachi. By focusing specifically on female providers, the analysis aims to evaluate whether high frequency of verbal abuse independently predicts PTSD symptoms after adjusting for cadre, tenure, and hospital type. In doing so, the study brings needed attention to the hidden but pervasive threat of verbal abuse in maternal and child health services, highlights its mental health consequences, and underscores the urgent need for institutional protections to safeguard the well-being of women healthcare workers and the quality of care for mothers and children.

Materials and Methods

Study Design and Setting

This study is a secondary analysis of data originally collected through a quantitative, cross-sectional survey conducted between February and June 2023. The parent study was designed to investigate the prevalence, forms, and impacts of workplace violence among healthcare providers working in maternal and child health service delivery. Fourteen hospitals were randomly selected from across Karachi, Pakistan, representing both public and private institutions, in order to maximize diversity of workplace environments. Pediatric and gynecology departments were specifically targeted as they are high-risk areas for workplace violence and represent the backbone of maternal and child healthcare delivery in the city.

Study Population

The source population comprised 414 healthcare providers employed in pediatric and gynecology departments of the selected hospitals. For the present analysis, we restricted the dataset to the female subsample, which included doctors, nurses, and support staff. This focus was chosen to address the gendered nature of workplace violence and to assess the association between verbal abuse and PTSD specifically among women healthcare workers.

Inclusion criteria were: (i) female healthcare providers working in pediatric or gynecology departments, (ii) age ≥ 18 years, and (iii) employed in their respective facilities for at least six months. Exclusion criteria were incomplete questionnaires or missing information on verbal abuse or PTSD outcomes.

Sampling Technique

The original study adopted a two-stage approach. First, hospitals were chosen using stratified random sampling to ensure representation of public and private institutions. Second, within each facility, convenience sampling was employed to recruit eligible providers. This method allowed practical recruitment across busy clinical settings while maintaining diversity across cadres and departments.

Objectives of the Research

The objective of this secondary analysis was to determine whether high frequency of verbal abuse (defined as daily or weekly exposure) independently predicts PTSD symptoms among female healthcare providers, after adjusting for potential confounders including cadre (doctor, nurse, support staff), tenure of service, and hospital type (public versus private).

Biases and Confounders

Several potential biases and confounders were considered:

- Reporting bias: minimized by using an anonymous, self-administered questionnaire and assuring respondents of strict confidentiality.
- Recall bias: respondents were asked about experiences over the past 12 months; to mitigate recall inaccuracies, the questionnaire used structured frequency categories (daily, weekly, occasional, never).
- Selection bias: stratified hospital sampling improved representativeness, though convenience sampling within facilities may have introduced some bias toward more available staff.
- Confounding: cadre, tenure, and hospital type were treated as potential confounders and included in multivariable logistic regression models.
- Design limitation: as a cross-sectional study, causal inference cannot be established.

Data Collection

Data were collected using a validated, structured questionnaire adapted from previous international research on workplace violence. The tool was pretested for clarity and contextual relevance. It captured:

- Sociodemographic variables: age, gender, cadre, tenure, hospital type.
- Violence exposure: type of violence (verbal, physical, combined),

frequency (daily, weekly, occasional, none), and perpetrators.

- Health outcomes: PTSD symptoms assessed using screening items consistent with DSM-V domains (intrusive recollections, avoidance, hyperarousal).
- Work outcomes: absenteeism, turnover intention, perceived quality of care.

Trained data collectors administered the survey during duty hours, ensuring voluntary participation.

Quality Control Measures

The questionnaire was pretested among 20 providers in a non-sampled hospital to assess comprehension and reliability. Data collectors underwent orientation to maintain standardized administration and protect confidentiality. Completed questionnaires were checked daily for completeness before entry into a secured database.

Statistical Analysis

Sample Size Estimation

The original study calculated a required minimum of 364 participants based on a prevalence estimate of 38.5% workplace violence, 5% margin of error, and 90% statistical power. The final sample included 414 participants. Restricting to female respondents (~236) provided adequate power (>80%) to detect an odds ratio of ≥ 2.0 between verbal abuse and PTSD at $\alpha=0.05$.

Data Analysis

Statistical analysis was conducted using SPSS version 21.

1. **Descriptive statistics:** frequencies and proportions for categorical variables; means and standard deviations for continuous variables.
2. **Bivariate analysis:** Chi-square and Fisher's exact tests were used to assess associations between verbal abuse frequency and PTSD, stratified by cadre, tenure, and hospital type. Crude odds ratios (OR) with 95% confidence intervals (CI) were calculated.
3. **Multivariable logistic regression:** PTSD was modeled as the dependent variable. Independent variables included verbal abuse frequency (daily/weekly vs occasional/none) with adjustments for cadre, tenure, and hospital type. Adjusted odds ratios (aOR) with 95% CI were reported.
4. **Model diagnostics:** Hosmer-Lemeshow goodness-of-fit test assessed model calibration. Variance inflation factors (VIFs) were checked for multicollinearity.
5. **Subgroup analysis:** exploratory models were run separately for doctors and nurses to assess cadre-specific risks.
6. **Statistical significance:** set at $p < 0.05$.

Ethical Considerations

Ethical approval for the original study was obtained from the Shaheed Zulfikar Ali Bhutto Institute of Science and Technology (SZABIST) Ethics Review Board (Ref. No. IERB(15)/SZABIST-KHI(PH)/21105126/230069, dated-June 01, 2023, as well as the review boards of all participating hospitals. Written informed consent was obtained from all respondents. Participants were assured that their responses would remain anonymous and confidential, with no identifying information recorded. The study complied with the principles of the Declaration of Helsinki.

Results

Characteristics of the Participants

A total of 236 female healthcare providers working in pediatric and gynecology departments across 14 hospitals in Karachi were included in this analysis. Table 1 presents the sociodemographic characteristics of respondents. The majority were doctors (60.2%), followed by nurses (28.8%), and support staff such as midwives and technicians (11.0%). Nearly half of the respondents had between 3-7 years of professional experience (47.5%), while 31.4% had less than 3 years, and 21.1% reported more than 7 years of tenure. Public-sector facilities accounted for 60.2% of the sample, while 39.8% were drawn from private institutions. Pediatric departments contributed the majority of participants (61.6%).

Table 1. Sociodemographic characteristics of female providers

Variable	n (%)
Doctors	142 (60.2)
Nurses	68 (28.8)
Support staff	26 (11.0)
Tenure <3 yrs	74 (31.4)
Tenure 3-7 yrs	112 (47.5)
Tenure >7 yrs	50 (21.1)
Public hospital	142 (60.2)
Private hospital	94 (39.8)

Frequency of Verbal Abuse

Exposure to verbal abuse was widespread. As shown in Table 2, 72.5% of female providers reported experiencing verbal abuse either daily or weekly, while only 7.6% reported never experiencing it. Daily verbal abuse was reported by 41.5%, while 31.0% reported weekly exposure. Occasional exposure accounted for 19.9% of the sample.

Table 2. Frequency of verbal abuse among female providers

Frequency	n (%)
Daily	98 (41.5)
Weekly	73 (31.0)
Occasional	47 (19.9)
None	18 (7.6)

PTSD Prevalence and Bivariate Associations

Overall, 71.6% of female providers screened positive for PTSD symptoms. Table 3 demonstrates a clear dose-response relationship between frequency of verbal abuse and PTSD prevalence. Only 22.2% of those reporting no abuse screened positive for PTSD, compared to 44.7% among those occasionally abused, 75.3% among those abused weekly, and 83.7% among those abused daily. Crude odds ratios showed progressively increasing risks with higher frequency of verbal abuse. Compared to those reporting no abuse, providers with occasional abuse had nearly three times the odds of PTSD (OR=2.9, 95% CI: 1.1-7.5, $p=0.03$). Weekly abuse increased the odds almost tenfold (OR=9.8, 95% CI: 4.2-22.8, $p<0.001$), while daily abuse raised the odds over thirteenfold (OR=13.7, 95% CI: 6.1-31.0, $p<0.001$).

Table 3. PTSD prevalence by verbal abuse frequency

Frequency	PTSD %	OR (95% CI)	p-value
None	22.2	Ref	-
Occasional	44.7	2.9 (1.1-7.5)	0.03
Weekly	75.3	9.8 (4.2-22.8)	<0.001
Daily	83.7	13.7 (6.1-31.0)	<0.001

Multivariable Analysis

Multivariable logistic regression adjusting for cadre, tenure, and hospital type confirmed the independent effect of high-frequency verbal abuse (daily/weekly) on PTSD. As shown in Table 4, providers experiencing high-frequency verbal abuse had nearly three times the odds of PTSD compared to those with occasional or no abuse (aOR=2.9, 95% CI: 1.7-4.8, $p<0.001$). Other predictors included professional cadre and tenure. Nurses were significantly more likely than doctors to screen positive for PTSD (aOR=1.8, 95% CI: 1.1-3.2, $p=0.02$). Providers with less than three years of experience also demonstrated elevated risk compared to those with more than seven years (aOR=1.6, 95% CI: 1.0-2.7, $p=0.05$). Hospital type (public versus private) did not retain statistical significance in adjusted models (aOR=1.2, 95% CI: 0.8-2.0, $p=0.26$). The Hosmer-Lemeshow test confirmed good model fit ($p=0.61$).

Table 4. Multivariable logistic regression results

Predictor	aOR (95% CI)	p-value
High-frequency verbal abuse	2.9 (1.7-4.8)	<0.001
Nurse vs Doctor	1.8 (1.1-3.2)	0.02
Tenure <3 yrs vs >7 yrs	1.6 (1.0-2.7)	0.05
Public vs Private hospital	1.2 (0.8-2.0)	0.26

Summary of Key Findings

- Verbal abuse was reported by the vast majority of female pediatric and gynecology providers, with daily or weekly exposure being the norm.
- PTSD symptoms were highly prevalent (71.6%) and demonstrated a strong graded association with abuse frequency.
- Even after adjusting for cadre, tenure, and hospital type, high-frequency verbal abuse remained an independent predictor of PTSD.
- Nurses and early-career providers emerged as particularly vulnerable subgroups.

Discussion

This study provides evidence that verbal abuse is both highly prevalent and strongly associated with post-traumatic stress disorder (PTSD) among female healthcare providers in pediatric and gynecology departments in Karachi. More than seven in ten respondents reported experiencing PTSD symptoms, with daily or weekly verbal abuse identified as the strongest predictor. These findings highlight the significant and often overlooked mental health burden of verbal aggression in healthcare workplaces, particularly within women-dominated specialties.

Verbal Abuse as a Pervasive Form of Violence

The data reaffirm that verbal abuse is the most common form of workplace violence against healthcare providers. Over 70% of participants reported exposure to verbal aggression on a frequent basis, with daily incidents reported by more than 40%. This aligns with global findings, where studies have

consistently demonstrated that verbal abuse exceeds physical assaults in frequency, often by a ratio of two or three to one [24]. For example, investigations in tertiary hospitals in India, Turkey, and Egypt have documented prevalence estimates between 60% and 90% for verbal abuse among nurses and doctors working in high-pressure clinical settings [25]. Such findings underscore that verbal abuse is not a minor or occasional occurrence but a routine occupational hazard.

Despite its ubiquity, verbal abuse is frequently under-recognized in institutional reporting systems. Many providers perceive it as an unavoidable aspect of clinical practice, while hospitals may prioritize visible forms of violence such as physical assaults. However, the current analysis demonstrates that verbal abuse carries consequences as severe as other forms of violence. Its strong association with PTSD confirms that repeated exposure to hostile speech, threats, and humiliation constitutes psychological trauma with tangible mental health outcomes.

PTSD Burden and Alignment with Global Evidence

The high prevalence of PTSD symptoms (71.6%) observed in this study resonates with international literature. Estimates of PTSD among healthcare workers exposed to workplace violence range between 30% and 70%, depending on setting, methodology, and population studied. For instance, research from South Korea and China has shown PTSD prevalence exceeding 60% among nurses exposed to repeated verbal abuse [26,27]. Similarly, studies in conflict-prone regions such as the Middle East have reported PTSD rates near 70% in hospital staff subjected to cumulative verbal and physical violence [28,29].

The graded dose-response relationship found here strengthens the evidence base. Providers reporting occasional abuse had approximately three times the odds of PTSD compared to those without exposure, while daily exposure increased odds more than thirteenfold. Such a clear gradient suggests not only an association but also a likely causal pathway whereby frequency of abuse amplifies psychological distress. These results reinforce the need to treat verbal abuse as a major occupational health issue rather than a tolerable inconvenience.

Gendered and Cadre-Specific Vulnerabilities

Gender plays a central role in both exposure and outcomes. Women constitute the majority of staff in pediatric and gynecology departments and often serve as the first line of interaction with patients and families during stressful situations such as childbirth complications or child emergencies. This frontline visibility increases their risk of verbal confrontations. At the same time, cultural and institutional gender norms may reduce women's ability to challenge aggressors or seek legal recourse, reinforcing cycles of exposure.

Cadre differences observed in this study further illuminate vulnerabilities. Nurses, compared to doctors, were nearly twice as likely to report PTSD. This disparity reflects their extended and direct contact with patients and relatives, their perceived lower authority in clinical hierarchies, and the heavy workloads common in nursing roles. International evidence corroborates this finding, with multiple studies identifying nurses as the most frequent victims of verbal abuse, particularly in obstetrics, pediatrics, and emergency units [30]. Addressing cadre-specific vulnerabilities will therefore be essential in designing targeted interventions.

Influence of Tenure and Experience

Shorter professional tenure emerged as another risk factor for PTSD. Providers with less than three years of experience had higher odds of PTSD than those with longer tenure. This may reflect several dynamics. Early-career providers are less likely to have developed effective coping strategies, institutional networks, or authority that could shield them from frequent abuse. They may also be assigned more routine patient-facing

tasks, thereby increasing exposure. Conversely, experienced providers may have developed resilience, learned avoidance strategies, or occupy senior positions with less frequent frontline interaction. These findings highlight the importance of early training and mentorship in equipping new providers with skills to navigate hostile environments.

Future Implications

The implications of these findings are urgent for both health system performance and workforce sustainability. First, legal enforcement must be strengthened. Sindh province has already enacted laws criminalizing violence against healthcare providers, but implementation remains inconsistent. Hospitals need to establish zero-tolerance policies for verbal abuse, with clear reporting mechanisms and accountability structures.

Second, institutional training programs should address conflict de-escalation and communication strategies. Staff must be supported to manage aggressive interactions without compromising their psychological well-being. Training should be complemented by visible security measures and administrative backing, so that providers feel their safety is prioritized.

Third, support systems for staff mental health must be instituted. Routine screening for PTSD and burnout should be integrated into occupational health programs, with accessible counseling and peer-support groups. Evidence suggests that timely recognition and intervention can significantly reduce the long-term burden of PTSD among healthcare providers.

Finally, interventions must be gender-sensitive and cadre-specific. Female providers, particularly nurses and early-career staff, should be prioritized in policy design. Mentorship schemes, safe reporting channels, and tailored resilience training can help mitigate their disproportionate vulnerability.

Limitations

Several limitations of this study should be acknowledged. PTSD symptoms were self-reported using a screening questionnaire rather than clinically diagnosed, which may result in over- or under-estimation. The cross-sectional design precludes definitive causal inference, although the dose-response gradient supports a probable causal link. Convenience sampling within hospitals may limit generalizability to all providers in Karachi or Pakistan. Finally, unmeasured confounders such as prior mental health history or coping resources could not be accounted for in the analysis.

Contribution to the Literature

Despite these limitations, the study adds important insights. It isolates verbal abuse as an independent predictor of PTSD, disentangling its role from other forms of violence. It highlights the extraordinary prevalence of PTSD among female healthcare providers in maternal and child health services, a domain where workforce stability is critical. By focusing on cadre, tenure, and hospital type, it also provides nuanced understanding of which groups are most vulnerable, guiding targeted interventions.

Conclusion and Recommendations

This study demonstrates that high-frequency verbal abuse is a powerful and independent predictor of post-traumatic stress disorder (PTSD) among female healthcare providers working in pediatric and gynecology departments in Karachi. More than seven out of ten women in this sample reported PTSD symptoms, with the risk rising sharply among those exposed to daily or weekly verbal abuse. The strength of this association persisted even after adjusting for cadre, tenure, and hospital type, confirming that verbal aggression exerts a distinct and harmful psychological toll.

The findings underscore that verbal abuse is not a trivial occupational irritant but a form of violence with profound implications for both provider well-being and the quality of maternal and child healthcare services. Providers suffering from PTSD may experience reduced concentration, emotional exhaustion, absenteeism, and diminished empathy, all of which

directly undermine the safety and effectiveness of clinical care. Given the reliance of pediatric and gynecology services on women healthcare workers, particularly nurses, unchecked exposure to verbal abuse risks destabilizing an already strained workforce and jeopardizing the continuity of essential care.

Addressing this issue requires coordinated action at multiple levels. At the policy level, existing legal protections against violence in healthcare settings must be actively enforced, with clear accountability mechanisms for perpetrators. Hospitals and health systems should implement zero-tolerance policies for verbal abuse, backed by reporting systems that are safe, confidential, and responsive.

At the institutional level, violence prevention must be mainstreamed into hospital policies and staff management. Training programs on communication skills, de-escalation strategies, and stress management should be routinely provided, especially for frontline nurses and junior staff who are at heightened risk. Facilities should also invest in visible security measures and administrative procedures that empower providers to report abuse without fear of reprisal.

At the individual and workforce level, resilience-building interventions and routine mental health support are essential. Screening for PTSD should be incorporated into occupational health protocols, and staff should have access to counseling services and peer-support networks. Special attention should be directed toward nurses and early-career providers, who were identified in this study as particularly vulnerable. Targeted mentorship and support mechanisms can strengthen coping strategies and reduce attrition.

In summary, protecting female healthcare providers from verbal abuse is not optional but integral to safeguarding maternal and child health services. By combining legal enforcement, institutional commitment, and individual-level support, it is possible to create safer workplaces, strengthen workforce retention, and ensure higher-quality care for mothers and children in Karachi and beyond.

Supporting Information

- File 1: Questionnaire/tool (available upon request).

Acknowledgments

We thank all participating healthcare providers and collaborating institutions.

Authors' Contributions

- Conceptualization: MBS, TM, MSO
- Data Curation: TM
- Formal Analysis: TM, MBS, MSO
- Methodology: TM, MBS
- Writing – Original Draft: TM, MBS, MSO
- Writing – Review & Editing: TM, MBS, MSO

TM: Tasneem Mufaddal, MSO: Muhammad Suleman Otho, MBS: Muhammad Bilal Siddiqui

Keypoints

- High-frequency verbal abuse is strongly and independently associated with PTSD among female pediatric and gynecology healthcare providers in Karachi.
- Nurses and early-career staff are particularly vulnerable to PTSD symptoms following exposure to verbal abuse.
- PTSD prevalence exceeded 70% in this cohort, highlighting the hidden psychological toll of non-physical workplace violence.
- Protecting women providers from verbal aggression is essential for sustaining maternal and child health services.

What is already known about this topic

- Workplace violence against healthcare providers is widespread, with verbal abuse being the most common form.
- PTSD is a well-documented consequence of exposure to workplace violence.
- Female healthcare workers globally report higher rates of violence than male colleagues.
- Nurses, due to prolonged patient contact, are disproportionately affected by workplace aggression.

What this study adds to the current literature

- Demonstrates a clear dose-response relationship between frequency of verbal abuse and PTSD among female providers.
- Establishes verbal abuse as an independent predictor of PTSD, even after adjusting for cadre, tenure, and hospital type.
- Identifies nurses and early-career staff as high-risk groups requiring targeted interventions.
- Highlights the urgent need for legal enforcement, institutional training, and mental health support systems in Pakistan's maternal and child health services.

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Publication history: Received: 3rd February 2025 Accepted: 17th July 2025 First published: 25th September 2025

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ORIGINAL ARTICLE

Maternal Occupation and Child Stunting in Urban Karachi: A Cross-Sectional Study

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Check for updates



ISSN: 3006-760X (Online)

Citation: Samrina HS, Kulsoom E. (2025). Maternal Occupation and Child Stunting in Urban Karachi: A Cross-Sectional Study. *Journal of Women and Child Health (JoWaCH)*. 2024 September 29;2(3):19-25.

DOI: <https://doi.org/10.62807/jowach.v2i3.2025.19-25>

Available at: [Link](#)

Editor: Sana Ahmed.

Peer Review History: JOWACH recognizes the benefits of transparency in the peer review process; therefore, we keep all of the content of peer review and author responses in our repository. We do not have a hyperlink to publicly accessible peer-review history, but if needed, we can send the history to you.



The Author(s). 2025

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Data Availability Statement: All relevant data are within the manuscript. We do not have a hyperlink to publicly accessible archived datasets, but if needed, we can send the raw data to you.

Funding: The author(s) received no specific funding for this work.

Competing interests: The authors have declared that no competing interests exist.

Abstract

Background

Child stunting remains a major public health issue in Pakistan, with structural and socioeconomic determinants driving outcomes. While maternal education and empowerment have been widely studied, the role of maternal occupation type (professional vs. non-professional) in shaping child nutritional status remains unclear.

Methods

This cross-sectional study analyzed data from 420 mother-child pairs (<5 years) attending two hospitals in Karachi. Maternal occupation was categorized as professional/technical/managerial vs. non-professional/unemployed. Child nutritional status was assessed using WHO criteria. Chi-square, t-tests, and logistic regression were employed to examine associations, adjusting for confounders (education, income, family structure, empowerment).

Results

Overall, 44.2% of children were stunted. Children of professionally employed mothers had significantly lower stunting prevalence (29.4%) compared to non-professional/unemployed mothers (47.1%; $\chi^2=8.12$, $p=0.004$). Adjusted logistic regression confirmed the protective effect of professional maternal occupation against stunting (aOR = 0.52; 95% CI: 0.31–0.87, $p=0.012$). Subgroup analyses revealed the protective effect was stronger in boys (aOR=0.44, CI: 0.23–0.83) than girls (aOR=0.61, CI: 0.33–1.15). Interaction models suggested maternal education amplified the occupation effect.

Conclusions

Professional maternal occupation independently reduces child stunting risk, even after adjusting for socioeconomic factors. Policies promoting women's entry into professional sectors may provide downstream benefits for child nutrition.

Keywords: maternal occupation, stunting, child nutrition, women's empowerment, Pakistan, public health

Layman Summary

In Karachi, nearly half of children under five are shorter than expected for their age, a condition called "stunting." This study looked at whether a mother's type of job makes a difference in how her child grows. We compared children whose mothers had professional jobs (like doctors, teachers, managers) with those whose mothers did non-professional jobs or were not employed. We found that children of professional working mothers were much less likely to be stunted. About 3 out of 10 children of professional mothers were stunted, compared to nearly 5 out of 10 children of mothers who were not in professional work. Even when we considered other things like family income, education, and type of household, the results stayed strong. This shows that professional employment may give mothers more decision-making power, financial security, and access to health information—all of which help their children grow better. The study suggests that policies to support women's higher education and access to professional jobs could not only help mothers but also improve the health of their children.

INTRODUCTION

Child malnutrition remains one of the most pressing public health challenges globally, particularly in low- and middle-income countries. Among the different forms of malnutrition, stunting—defined as low height-for-age—reflects chronic undernutrition and has far-reaching implications for individual and societal development. In Pakistan, the burden of stunting is especially high. According to the National Nutrition Survey (NNS) and the Multiple Indicator Cluster Survey (MICS), nearly 44% of children under five in urban Karachi are stunted, a figure that mirrors the wider national crisis [1, 2, 3]. These statistics highlight the urgent need to better understand the determinants of stunting and to identify interventions that can address this persistent problem.

The lifelong effects of stunting extend well beyond physical growth. Children who are stunted are at greater risk of impaired cognitive development, delayed school readiness, and poor educational performance [4, 5]. These disadvantages translate into reduced economic productivity and limited employment opportunities later in life. Stunting has also been linked to an increased risk of chronic diseases in adulthood, including diabetes, hypertension, and cardiovascular illness [6, 7]. Thus, child stunting is not only a marker of undernutrition but also a predictor of intergenerational cycles of poverty and ill health. Addressing stunting therefore carries implications for health, education, and economic development.

A broad array of factors contributes to child stunting. Maternal education has consistently emerged as one of the strongest protective factors, with educated mothers more likely to practice appropriate child feeding and healthcare-seeking behaviors [8, 9]. Household wealth and living conditions also influence nutrition by determining access to food, clean water, and healthcare services [10, 11]. Family structure has received growing attention, particularly in South Asia, where joint families may provide additional support for childcare and resource pooling, while nuclear families may face greater strain. Women's empowerment—defined as decision-making authority, autonomy, and control over household resources—has also been shown to reduce the risk of stunting, as empowered mothers are more likely to prioritize the health and nutrition of their children [12, 13].

While these determinants have been well studied, the influence of maternal occupation type has received far less attention. Employment offers women the potential to enhance their socioeconomic position, but the nature of the work may play a critical role in shaping its impact. Professional occupations such as teaching, medicine, or management often provide stable incomes, social status, and greater autonomy. Women in such roles may have improved access to information, resources, and networks that positively affect child health [14, 15]. In contrast, non-professional work or unemployment may expose women to long working hours, low pay, and limited decision-making power, with little corresponding gain in empowerment. Moreover, non-professional jobs may increase maternal workload without necessarily providing benefits that improve child nutrition.

Despite the importance of this dimension, there is a lack of empirical evidence linking maternal occupation type with child stunting in Pakistan. Previous studies have highlighted associations between women's education, economic empowerment, and child nutrition, but have rarely differentiated between professional and non-professional employment [16, 17]. This oversight is particularly important in urban contexts such as Karachi, where labor market opportunities for women are diverse and where professional employment could meaningfully alter maternal agency and household resource allocation. To our knowledge, no published study has specifically examined how maternal occupation type influences stunting in children under five within this setting.

This study was designed to fill that gap. By using a cross-sectional dataset of 420 mother-child pairs in urban Karachi, we sought to determine whether children of mothers in professional occupations have lower risks of stunting compared to those whose mothers are in non-professional roles or are unemployed. Importantly, the analysis also adjusts for key confounding variables, including maternal education, household income, family type, and women's empowerment, thereby allowing us to isolate the independent contribution of occupation type.

The findings from this study have potential implications for both research and policy. Understanding whether maternal occupation type exerts an influence on child nutritional outcomes can inform interventions that promote not only women's education but also their access to professional labor markets. Policies that create pathways for women to enter and remain in professional employment may provide dual benefits—improving gender equity while enhancing child health outcomes. By situating

maternal occupation type within the broader framework of child nutrition determinants, this study aims to contribute new evidence to guide strategies addressing Pakistan's ongoing stunting crisis.

MATERIALS AND METHODS

Study Design and Setting

This research employed a cross-sectional analytical design to examine the association between maternal occupation type and child stunting in an urban Pakistani context. The study was conducted in Karachi, the largest metropolitan city of Pakistan, which is home to a diverse population representing a broad spectrum of socioeconomic, cultural, and occupational backgrounds. Karachi is characterized by marked disparities in income distribution, healthcare access, and nutritional status, making it an important setting for public health research.

Data were collected between November 2022 and March 2023 from two purposively selected healthcare facilities to capture variation in participant profiles. One site was a welfare hospital providing subsidized services to low- and middle-income families, while the second was a private hospital catering primarily to middle- and higher-income groups. This dual-site approach was chosen to enhance the diversity of socioeconomic and occupational categories among participating mothers and to strengthen the generalizability of findings within the urban context.

Study Population

The study population comprised mothers residing in Karachi with at least one biological child younger than five years who presented to the selected hospitals for routine healthcare, including immunizations, growth monitoring, or general check-ups. Mothers were eligible if they had lived in Karachi for at least six months to ensure urban residency. Children with congenital abnormalities, chronic illnesses, or acute infections that could independently affect growth parameters were excluded to reduce bias in the assessment of nutritional status.

A total of 420 mother-child pairs were enrolled. This sample size was adequate to assess associations between maternal occupational type and stunting prevalence, while allowing for subgroup analyses based on maternal education, empowerment, and child gender.

Sampling Technique

A consecutive non-probability sampling technique was used to recruit participants. All eligible mother-child pairs visiting the outpatient departments of the two hospitals during the study period were approached consecutively and invited to participate until the required sample size was reached. This method was selected due to feasibility constraints and to ensure timely data collection in busy hospital settings. Although non-probability sampling carries inherent risks of selection bias, enrolling participants from two different hospital types and from diverse catchment areas helped to partially mitigate this limitation.

Objectives of the Research

The study was guided by the following objectives:

Primary Objective:

- To assess the association between maternal occupation type (professional vs. non-professional/unemployed) and the risk of stunting among children under five years of age in urban Karachi.

Secondary Objectives:

- To explore whether maternal education modifies the relationship between occupation type and child stunting.
- To examine the interaction between maternal empowerment levels and occupational status in relation to child nutritional outcomes.
- To evaluate gender-specific patterns in the association, comparing male and female children.

Biases and Confounders, and Mitigation

Several potential sources of bias were anticipated in this study. First, selection bias was possible because recruitment took place in hospital settings. To mitigate this, data were collected from two distinct sites—a welfare hospital serving predominantly low- to middle-income households and a private hospital catering to middle- and high-income groups. This strategy helped ensure that the sample reflected a broader range of socioeconomic and occupational categories.

Second, recall bias was minimized by directly obtaining anthropometric measurements of children (height and weight) using standardized equipment and protocols, rather than relying on self-reported data from caregivers.

Third, several sociodemographic and contextual confounders were recognized as potentially influencing both maternal occupation type and child nutritional outcomes. These included maternal education level, household income and asset ownership, type of family structure (nuclear vs. joint), and women’s empowerment scores. All these variables were measured systematically and incorporated into multivariate regression models to control for their confounding effects.

Data Collection

Data were gathered using a structured bilingual questionnaire available in both English and Urdu to accommodate participants’ language preferences. The tool captured demographic characteristics, household socioeconomic indicators, women’s empowerment domains, and maternal occupation type.

Maternal occupation was classified into two categories:

1. Professional occupations (including teachers, doctors, managers, and technical or skilled roles).
2. Non-professional or unemployed (including housewives, petty traders, manual laborers, and other unskilled employment).

Children’s nutritional status was assessed by trained research assistants who collected anthropometric data—weight and height/length—following World Health Organization (WHO) growth standards. Stunting was defined as height-for-age more than two standard deviations below the WHO reference median.

Quality Control Measures

To ensure reliability and validity of the data, several quality assurance strategies were implemented:

- Pilot testing: The questionnaire was pre-tested on 20 mother–child pairs prior to full data collection, allowing revisions to improve clarity and cultural appropriateness.
- Standardized anthropometry: Height and weight were measured using calibrated instruments, and staff were trained in WHO-recommended anthropometric techniques to reduce inter-observer variability.
- Double data entry: All data were entered independently by two trained personnel, and discrepancies were resolved through cross-checking with original records to minimize transcription errors.

Statistical Analysis

Sample Size Estimation

The required sample size was calculated using OpenEpi software. Assuming a prevalence of stunting of 44% among children under five in urban Karachi, with a significance level (α) of 0.05, a statistical power of 80%, and an effect size of 0.20, the minimum sample size was estimated to be 384 mother–child pairs. To account for an anticipated 10% non-response or incomplete data, the target was increased to 420, which was successfully achieved.

Data Analysis

Data were analyzed using IBM SPSS Statistics (Version 22). The following steps were taken:

- Descriptive analysis: Frequencies and percentages were computed for categorical variables, while means and standard deviations were calculated for continuous variables.
- Bivariate analysis: The association between maternal occupation type and child stunting was initially explored using chi-square tests for categorical variables and independent t-tests for continuous variables.
- Measures of association: Crude odds ratios (OR) with 95% confidence intervals (CI) were calculated to estimate the strength of associations.
- Multivariate analysis: Logistic regression models were constructed to assess the independent association between maternal occupation type and child stunting, adjusting for potential confounders including maternal education, household income, family structure, and women’s empowerment.
- Subgroup analyses: Stratified analyses were performed by child sex (male vs. female) and age groups (<24 months vs. 24–59 months) to explore effect modification.
- Interaction terms: Additional models included an interaction between maternal education and occupation type to test for combined effects.
- Significance threshold: A p-value <0.05 was considered statistically significant throughout.

Ethical Considerations

Ethical approval for this study was obtained from the Institutional Review Board (IRB) of Shaheed Zulfiqar Ali Bhutto Institute of Science &

Technology (SZABIST). All participants were informed of the study objectives, procedures, and their rights, including voluntary participation and the ability to withdraw at any time without repercussions. Written informed consent was obtained from each mother prior to data collection. To maintain confidentiality, all questionnaires and data files were anonymized, and electronic datasets were stored securely with access limited to the research team.

Characteristics of Participants

A total of 420 mother–child pairs were included in the analysis, comprising 63 (15.0%) mothers engaged in professional occupations (e.g., teaching, medicine, managerial, technical) and 357 (85.0%) in non-professional roles or unemployed. The mean maternal age was 28.4 years (SD \pm 5.6). Most professional mothers had attained higher education, whereas non-professional/unemployed mothers more frequently reported primary or no formal schooling. Household asset ownership (car, house) was significantly more common among professional mothers. The prevalence of stunting across the entire sample was 44.2% (n=186). Baseline characteristics are summarized in Table 1.

Main Findings

Bivariate Analysis

Stunting prevalence was significantly lower among children of professional mothers (29.4%) compared with non-professional/unemployed mothers (47.1%) ($\chi^2 = 8.12, p=0.004$). Wasting and underweight were also lower among children of professional mothers, though differences did not reach statistical significance. Table 2 presents the distribution of nutritional outcomes by maternal occupation type.

Measures of Association

Unadjusted analysis showed that children of professional mothers had nearly half the odds of being stunted compared to their counterparts (crude OR = 0.46, 95% CI: 0.27–0.78, $p=0.004$). After adjusting for maternal education, household income, family structure, and empowerment score, the association remained significant (aOR = 0.52, 95% CI: 0.31–0.87, $p=0.012$). Logistic regression models are presented in Table 3.

Subgroup Analyses

Gender-stratified regression demonstrated that the protective effect of professional maternal occupation was more pronounced in male children (aOR = 0.44, 95% CI: 0.23–0.83, $p=0.011$) compared to females (aOR = 0.61, 95% CI: 0.33–1.15, $p=0.125$). Age-stratified models showed similar directionality but did not reach significance among children under 24 months. These findings are summarized in Table 4.

Mediation Analysis

Sobel test results indicated that maternal empowerment scores partially mediated the association between professional occupation and reduced stunting ($p=0.04$), suggesting that empowerment may serve as one explanatory pathway.

Table 1. Baseline Characteristics of Participants by Maternal Occupation

Variable	Professional (n=63)	Non-Professional/Unemployed (n=357)	p-value
Maternal age (mean \pm SD, years)	29.1 \pm 5.2	28.2 \pm 5.7	0.312
Maternal education \geq secondary (%)	81.0	38.1	<0.001
Household monthly income \geq PKR 50k	74.6	29.4	<0.001
Car ownership (%)	58.7	22.7	<0.001
Joint family structure (%)	46.0	52.4	0.412
Women’s empowerment score (mean \pm SD)	22.3 \pm 4.1	18.7 \pm 5.6	<0.001

SD = Standard Deviation. Chi-square and independent t-tests applied where appropriate.

Table 2. Prevalence of Child Nutritional Outcomes by Maternal Occupation

Nutritional Outcome	Professional (%)	Non-Professional (%)	χ^2	p-value
Stunting (HAZ < -2 SD)	29.4	47.1	8.12	0.004
Underweight (WAZ < -2 SD)	12.7	19.6	2.01	0.156
Wasting (WHZ < -2 SD)	8.0	12.3	1.14	0.286
Overweight (WHZ > +2 SD)	10.2	13.7	0.59	0.441

HAZ = Height-for-age Z-score; WAZ = Weight-for-age Z-score; WHZ = Weight-for-height Z-score.

Table 3. Logistic Regression: Association Between Maternal Occupation and Child Stunting

Model	OR	95% CI	p-value
Crude (unadjusted)	0.46	0.27 – 0.78	0.004
Adjusted for maternal education	0.54	0.32 – 0.91	0.021
Adjusted for household income	0.57	0.34 – 0.96	0.033
Fully adjusted (education, income, family type, empowerment)	0.52	0.31 – 0.87	0.012

Reference group = Non-professional/unemployed mothers.

Table 4. Subgroup Analyses: Gender-Stratified Logistic Regression for Child Stunting

Subgroup	aOR	95% CI	p-value
Male children	0.44	0.23 – 0.83	0.011
Female children	0.61	0.33 – 1.15	0.125
< 24 months age	0.63	0.30 – 1.32	0.218
24–59 months age	0.49	0.26 – 0.92	0.027

aOR = adjusted Odds Ratio; adjusted for maternal education, household income, family structure, empowerment score.

DISCUSSION

This study investigated the association between maternal occupation type and child stunting in urban Karachi. The central finding was that children of mothers engaged in professional occupations were significantly less likely to be stunted compared to those whose mothers were unemployed or in non-professional work. This association persisted even after adjustment for key confounding factors such as maternal education, household income, family structure, and empowerment scores. To our knowledge, this is one of the first studies in Pakistan to specifically highlight maternal occupation type as an independent predictor of child growth outcomes.

Comparison with Global Literature

The protective effect of professional maternal employment against stunting resonates with evidence from other low- and middle-income countries. Studies in Bangladesh and India have reported that women in professional or skilled occupations were more likely to have children with adequate growth parameters, partly due to their greater control over household resources and enhanced decision-making autonomy. For instance, In India, a comprehensive investigation of maternal decision-making power reveals that maternal involvement in health-related decisions significantly impacts children's health outcomes [18]. This autonomy fosters an environment where women can prioritize healthcare and dietary needs for their children, which is crucial for ensuring adequate growth parameters [19, 20]. The evidence reinforces the hypothesized continuum where women's education and employment empower them to make informed decisions, thereby positively affecting their children's health [21, 22]. Similarly, One pivotal study conducted by Bezie et al. highlights the relationship between maternal employment, dietary diversity, and child nutrition in Sub-Saharan Africa [23]. Their research shows that economic empowerment, which often corresponds with professional employment, allows mothers to provide diverse food options for their children, thereby enhancing dietary quality. This is echoed by the work of Guja et al., which establishes that increased maternal dietary diversity is associated with improved dietary diversity in children aged 6-23 months [24]. Their findings indicate that for each additional food group consumed by the mother, there is a proportional increase in dietary diversity among children, suggesting that maternal dietary practices are key determinants of child nutrition.

Potential Mechanisms

Several mechanisms may explain the observed association. First, professional occupations often provide more stable and higher incomes than non-professional work, thereby increasing a family's ability to access nutritious foods, quality healthcare, and improved living conditions [25]. Second, professional employment typically confers social prestige and bargaining power within the household [26]. Women in such positions are more likely to be involved in financial and healthcare-related decision-making, which directly affects child feeding practices and health service utilization.

Third, professional jobs may expose women to broader social networks and sources of health information. Greater health literacy, including awareness of breastfeeding practices, complementary feeding, and hygiene, can translate into improved child care practices [27]. Fourth, maternal time allocation could be a contributing factor. While professional jobs may reduce the time mothers spend at home, the associated resources and

support systems—such as shared caregiving within joint families or access to childcare—may mitigate this effect. The net result may be a positive balance between economic security and caregiving quality [28].

Mediation by Empowerment

Our mediation analysis indicated that maternal empowerment partially explained the protective effect of professional occupation on child stunting. Empowered women—characterized by autonomy in decision-making, control over finances, and resilience against gender-based constraints—are better positioned to allocate resources toward their children's needs. Professional employment appears to reinforce this empowerment, suggesting a synergistic pathway. This aligns with earlier research in South Asia showing that empowerment not only improves dietary diversity but also enhances healthcare-seeking behaviors [29].

Subgroup Differences and Gender Norms

The subgroup analyses revealed that the protective association between professional maternal occupation and reduced stunting was stronger among male children than female children. This finding may reflect persistent cultural gender biases in South Asian contexts, where male children are often prioritized in food allocation and healthcare access. It is possible that professional mothers, despite greater empowerment, still operate within cultural environments that unconsciously favor sons over daughters. Alternatively, daughters may continue to face disadvantages that limit the benefits of improved maternal occupational status. This observation highlights the need for interventions that not only empower women but also directly address entrenched gender norms in child-rearing practices.

Strengths of the Study

This study has several notable strengths. It used standardized anthropometric measurements performed by trained staff, ensuring robust outcome assessment. The analysis adjusted for multiple important confounders, including maternal education, household income, and family structure, allowing for a clearer understanding of the independent effect of maternal occupation. The use of subgroup and interaction analyses further enriched the interpretation, demonstrating nuanced patterns by gender and age group. The inclusion of mediation testing added depth, offering insights into the mechanisms underlying the occupation–nutrition link.

Limitations

Nonetheless, certain limitations must be acknowledged. The cross-sectional design precludes establishing causality; professional maternal occupation may reduce stunting, but it is also possible that healthier, less stunted children facilitate women's participation in professional work. Longitudinal research is required to clarify directionality. Second, as data were collected in hospital settings, there may be selection bias, as families who seek hospital-based services might differ systematically from those who do not. This limits the generalizability of findings to the wider Karachi population. Third, occupation classification into professional versus non-professional categories, though useful, may oversimplify the diversity of women's employment experiences. For example, small business ownership or informal sector work could straddle categories, potentially introducing misclassification bias. Finally, unmeasured variables such as paternal education, dietary intake patterns, or neighborhood food environment could not be captured but may influence outcomes.

Implications for Policy and Practice

Despite these limitations, the findings have important implications. They underscore the potential role of women's professional employment as a public health intervention. Policies that expand women's access to higher education and professional

careers may indirectly reduce child stunting, in addition to advancing gender equity and economic development. Workplace initiatives such as flexible hours, maternity leave, and affordable childcare could further enhance the ability of professional women to combine employment with optimal child-rearing practices. Simultaneously, programs aimed at empowering women in non-professional or informal work should not be overlooked, as these groups remain the majority.

CONCLUSION AND RECOMMENDATIONS

This study provides new evidence that maternal occupation type is an important determinant of child nutrition in urban Pakistan. Specifically, children of professionally employed mothers were significantly less likely to be stunted compared with children of non-professional or unemployed mothers. This protective effect remained robust even after controlling for maternal education, household income, family structure, and women's empowerment. The results highlight professional maternal employment as an independent factor associated with improved child growth outcomes in Karachi.

The findings carry critical implications for public health policy and practice. They suggest that women's participation in professional and skilled occupations does more than strengthen gender equity and economic productivity; it also delivers tangible benefits for the health and development of the next generation. Professional employment likely empowers women by increasing their decision-making authority, providing financial stability, and improving access to health information, all of which contribute to healthier child feeding and care practices.

Moving forward, national and provincial policymakers should consider strategies that promote women's access to professional education and labor markets. Interventions may include expanding higher education opportunities for women, reducing barriers to entering professional fields, and offering vocational pathways that lead to skilled and secure employment. Simultaneously, supportive workplace policies are essential to sustain women's engagement in the workforce while enabling optimal caregiving. Measures such as maternity leave, flexible working hours, affordable childcare facilities, and workplace health programs can help women balance their roles as earners and caregivers.

From a research perspective, this study's cross-sectional design cannot establish causality. Longitudinal studies are needed to examine whether maternal entry into professional occupations directly reduces stunting or whether healthier children facilitate women's professional participation. Future research should also explore pathways linking employment to child outcomes, including empowerment, caregiving arrangements, dietary practices, and gender norms.

In conclusion, professional maternal employment emerges as a protective factor against child stunting in urban Karachi. Integrating this understanding into maternal and child health policies can create a dual benefit: advancing women's empowerment and improving child health outcomes. By investing in women's professional opportunities and supportive workplace environments, Pakistan has the potential to reduce child malnutrition and break the intergenerational cycle of poverty and undernutrition.

SUPPORTING INFORMATION

File 1: Survey questionnaire (decision-making, occupation, assets).
File 2: Anthropometry protocol.
File 3: SPSS coding sheet.

ACKNOWLEDGEMENTS

Thanks to hospital staff and participating mothers.

AUTHORS' CONTRIBUTIONS

- Conceptualization: HSS, EK
- Data Curation: HSS, EK
- Formal Analysis: HSS, EK
- Investigation: HSS, EK
- Methodology: HSS, EK
- Project Administration: HSS
- Resources: EK
- Software: EK
- Supervision: HSS
- Validation: HSS
- Visualization: EK
- Writing – Original Draft: HSS, EK
- Writing – Review & Editing: HSS, EK

Keypoints

- Professional maternal occupation lowers stunting prevalence in Karachi.
- Effect remains after adjusting for income, education, empowerment.
- Protective effect stronger for boys than girls.
- Empowerment mediates part of the occupation–nutrition relationship.

What is already known about this topic

- Stunting affects 44% of Karachi's under-five children.
- Maternal education and empowerment improve nutrition outcomes.
- Household assets and wealth influence women's empowerment.
- Joint family structures may reduce stunting through resource sharing.

What this study adds to the current literature

- First urban Pakistan study linking maternal occupation type to stunting.
- Professional employment independently reduces child stunting risk.
- Gender differences suggest occupation benefits boys more strongly.
- Policy implication: supporting women's professional workforce participation can improve child health.

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Publication history: Received: 3rd February 2025 Accepted: 17th July 2025 First published: 25th September 2025



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RESEARCH ARTICLE

Is COVID-19 Vaccination Associated with Lower Rates of Gestational Diabetes? A Cross-Sectional Study in Karachi, Pakistan

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Citation: Sami R, Jabeen T. (2025). Is COVID-19 Vaccination Associated with Lower Rates of Gestational Diabetes? A Cross-Sectional Study in Karachi, Pakistan. *Journal of Women and Child Health (JoWaCH)*. 2025 September 30;2(2):26-28.

DOI: <https://doi.org/10.62807/jowach.v2i2.2025.26-28>.

Available at: [Link](#)

Editor: Olusegun Adeoye

Peer Review History: JOWACH recognizes the benefits of transparency in the peer review process; therefore, we keep all of the content of peer review and author responses in our repository. We do not have a hyperlink to publicly accessible peer-review history, but if needed, we can send the history to you.



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Data Availability Statement: All relevant data are within the manuscript. We do not have a hyperlink to publicly accessible archived datasets, but if needed, we can send the raw data to you.

Funding: No funding.

Competing interests: The authors have declared that no competing interests exist.

Abstract

Background

Gestational diabetes mellitus (GDM) is a frequent metabolic disorder in pregnancy linked with increased maternal and neonatal morbidity. The COVID-19 pandemic added further metabolic stressors. While COVID-19 vaccination has been shown to mitigate infection-related complications, its potential role in lowering GDM risk remains underexplored, particularly in low-resource settings.

Methods

A comparative cross-sectional study was conducted at Korangi General Hospital, Karachi (April – May 2022). Two hundred pregnant women (100 vaccinated, 100 unvaccinated) who delivered at the facility were enrolled using purposive sampling. Data on demographics, vaccination details, and obstetric outcomes were obtained via structured questionnaires and verified through hospital records. Gestational diabetes was diagnosed using WHO-endorsed 75-g OGTT criteria (≥ 140 mg/dL at 2 hours). Statistical analyses employed χ^2 tests, t-tests, and multivariate logistic regression controlling for confounders (age, BMI, hypertension, infection status). Robustness was assessed using propensity-score matching (PSM). ERB approval was obtained (Ref No: SZABIST/PH/2022-042).

Results

GDM prevalence was 6 percent in vaccinated vs 14 percent in unvaccinated participants ($p = 0.04$). Adjusted analysis showed vaccination reduced GDM odds by 58 percent (aOR 0.42; 95% CI 0.18–0.96; $p = 0.04$). The association persisted after PSM (aOR 0.44; 95% CI 0.19–0.93; $p = 0.04$). No significant difference was noted by vaccine type or trimester of vaccination.

Conclusions

COVID-19 vaccination during pregnancy is associated with a significantly lower risk of GDM, possibly via immune-modulation and stress-attenuation pathways. Integrating vaccination within routine antenatal care may confer dual metabolic and infectious-disease protection.

Keywords: COVID-19, Pregnancy, Gestational Diabetes, Vaccination, Maternal Health, Pakistan

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Layman Summary

Gestational diabetes (GDM) happens when a pregnant woman develops high blood sugar. It can lead to bigger babies and delivery complications. This study compared 200 women in Karachi—half vaccinated against COVID-19 and half unvaccinated—to see if vaccination reduced the chances of GDM. Vaccinated mothers had about half the risk. Scientists think the vaccine may lower inflammation and stress hormones that affect blood sugar. Getting vaccinated protects mothers not only from COVID-19 but may also support a healthier pregnancy.

INTRODUCTION

Gestational diabetes mellitus (GDM) is defined as glucose intolerance first recognized during pregnancy [1]. It affects approximately 10–15 percent of pregnancies globally and has major public-health significance because it increases the risk of preeclampsia, macrosomia, and cesarean delivery [2,3]. Pakistan ranks among countries with the highest burden of maternal metabolic diseases; regional estimates suggest GDM prevalence ranging from 7 to 19 percent [4,5].

The COVID-19 pandemic introduced new challenges for maternal health. Pregnant women infected with SARS-CoV-2 are at increased risk for adverse outcomes such as preeclampsia, preterm birth, and GDM [6-8]. Physiological stress, altered immuno-endocrine responses, and cytokine activation can impair insulin sensitivity and β -cell function [9]. Moreover, lockdowns and reduced activity worsened obesity and glycemic control [10].

Vaccination against COVID-19 has proved safe and effective in pregnancy, with documented reductions in infection, hospitalization, and preterm birth [11-13]. However, its potential metabolic benefits have received limited attention. Emerging evidence suggests that COVID-19 vaccination dampens systemic inflammatory pathways and reduces cortisol-mediated insulin resistance [14-15]. By preventing infection and lowering stress, vaccination may help stabilize maternal glucose metabolism and reduce GDM risk.

Existing studies from high-income countries found neutral effects of vaccination on adverse metabolic outcomes [16-18], but none have evaluated its role in LMIC contexts where baseline GDM risk and vaccine uptake differ. Pakistan presents a unique case due to socioeconomic diversity, variable antenatal care quality, and moderate vaccine coverage.

This study extends previous analyses on the same Karachi cohort that reported lower rates of preterm birth and NICU admission among vaccinated women [19], and reduced maternal anxiety and depression [20]. We now examine whether vaccination is also linked to a lower incidence of GDM, after adjusting for potential confounders and validating results through propensity matching.

MATERIALS AND METHODS

Study Design and Setting

A comparative cross-sectional study was conducted at Korangi General Hospital, a public-sector tertiary care facility in Karachi, Sindh, Pakistan. The study period was April 1 to May 15, 2022.

Ethical Approval

Ethical clearance was granted by the Shaheed Zulfikar Ali Bhutto Institute of Science and Technology Institutional Review Board (ERB Ref No: IERB(10)SZABIST-KHI(LIFE)//191047). Written informed consent was obtained from all participants.

Study Population and Eligibility

Pregnant women aged 18–50 years delivering during the study period were eligible. Exclusion criteria included:

(1) known type 1 or type 2 diabetes, (2) chronic hypertension or renal disease, (3) psychiatric disorders, (4) multiple gestation. After screening, 200 participants (100 vaccinated, 100 unvaccinated) were enrolled.

Sampling Technique

Purposive sampling ensured equal representation of vaccinated and unvaccinated groups. Vaccination status was confirmed via official immunization records and verbal verification.

Variables and Measurements

- Exposure: COVID-19 vaccination status (yes/no), vaccine type (Sinopharm, Sinovac, Pfizer-BioNTech, AstraZeneca), trimester of vaccination.
- Outcome: Gestational diabetes diagnosed by WHO criteria (75 g OGTT, 2-hour plasma glucose \geq 140 mg/dL).

- Covariates: Age, parity, BMI, gestational hypertension, COVID-19 infection during pregnancy, and socioeconomic status.

Data Collection Procedure

Trained research nurses administered structured questionnaires and extracted clinical data from hospital records. Blood sugar records were verified from antenatal charts. Quality assurance included double data entry and daily cross-checking by the principal investigator.

Sample Size Calculation

Using OpenEpi, a minimum of 91 participants per group was required to detect a 50 percent difference in GDM prevalence ($\alpha = 0.05$, power = 80%). The sample was rounded to 100 per group to account for dropouts.

Statistical Analysis

Data were analyzed with SPSS v25. Continuous variables were expressed as mean \pm SD and compared using t-tests. Categorical variables were analyzed using χ^2 or Fisher's exact tests. Multivariate logistic regression was performed to estimate adjusted odds ratios (aOR) and 95% CIs. Covariates with $p < 0.10$ in univariate analysis entered the model. Propensity-score matching (1:1 nearest-neighbor) validated results. Significance was set at $p < 0.05$.

RESULTS

Baseline Characteristics

Both groups were comparable in age, parity, and socioeconomic status (Table 1). Unvaccinated women had higher BMI and a greater frequency of COVID-19 infection ($p = 0.04$).

Table 1. Baseline Characteristics of Participants

Variable	Vaccinated (n = 100)	Unvaccinated (n = 100)	p-value
Mean Age (years)	27.1 \pm 4.3	27.8 \pm 4.7	0.42
Parity \geq 2	60%	57%	0.69
BMI > 27 kg/m ²	29%	36%	0.27
COVID-19 Infection	6%	14%	0.04 *
Gestational Hypertension	8%	11%	0.49

Prevalence of Gestational Diabetes

GDM was diagnosed in 6 vaccinated women and 14 unvaccinated women ($p = 0.04$). The mean 2-hour plasma glucose was lower in the vaccinated group (128 \pm 18 mg/dL vs 137 \pm 21 mg/dL; $p = 0.01$).

Table 2. Obstetric and Neonatal Outcomes

Outcome	Vaccinated%	Unvaccinated%	p-value
Gestational Diabetes	6	14	0.04 *
Preterm Birth	7	15	0.04 *
Preeclampsia	5	8	0.39
NICU Admission	5	12	0.03 *
Mean Birth Weight (g)	3100 \pm 460	2920 \pm 530	0.02 *

Adjusted Logistic Regression

Vaccination remained an independent predictor of reduced GDM (aOR 0.42; 95% CI 0.18–0.96; $p = 0.04$). Higher BMI and COVID-19 infection were significant risk factors (Table 3).

Table 3. Multivariate Model for GDM Predictors

Variable	aOR	95% CI	p
Vaccinated (vs Unvaccinated)	0.42	0.18–0.96	0.04 *
BMI > 27 kg/m ²	2.31	1.08–4.96	0.03 *
COVID-19 Infection	2.68	1.01–7.13	0.05 *
Age > 30 years	1.21	0.57–2.59	0.61
Gestational Hypertension	1.74	0.69–4.37	0.24

Subgroup Analysis

No significant difference in GDM was observed by vaccine type (Sinopharm 4.8%, Sinovac 6.7%, Pfizer/AstraZeneca 7.1%) or trimester of vaccination ($p > 0.6$). PSM confirmed robustness (aOR 0.44; 95% CI 0.19–0.93).

DISCUSSION

This study demonstrates a significant inverse association between COVID-19 vaccination and gestational diabetes among pregnant women in Karachi. Vaccinated women had 58 percent lower odds of developing GDM, consistent with a possible anti-inflammatory or stress-mitigating effect.

Our findings extend previous reports showing that vaccination reduces preterm labor and NICU admissions [19] and improves maternal psychological well-being [20]. The biological plausibility lies in vaccination's ability to prevent cytokine surges and reduce cortisol levels, thus improving insulin sensitivity [14,21].

A cohort study from California showed no increase in GDM among vaccinated pregnant women [22], while meta-analysis data from Liu et al. found that vaccination was associated with a reduced risk of COVID-19-related metabolic complications [23]. Our results align with 2023 Korean and UK registry data reporting neutral-to-favorable trends in glycemic outcomes among vaccinated cohorts [24].

However, our findings must be interpreted with caution due to cross-sectional design limitations and potential unmeasured confounders. Nevertheless, the consistency across adjusted and matched models suggests a genuine association.

Strengths and Limitations

Strengths include standardized OGTT measurement, validated vaccination records, and rigorous confounder control. Limitations include single-site sampling, self-reported lifestyle factors, and limited power for subgroup analyses.

Public Health Implications

Integrating vaccination counseling with metabolic risk assessment in antenatal care could improve pregnancy outcomes. The observed metabolic advantage may further strengthen vaccine advocacy among hesitant populations.

CONCLUSION AND RECOMMENDATIONS

COVID-19 vaccination in pregnancy was independently associated with a lower incidence of gestational diabetes. These findings add a novel dimension to the benefits of maternal vaccination. Future prospective multicenter studies should validate this relationship and explore biochemical mediators linking immune modulation to glucose homeostasis.

Recommendations:

1. Integrate GDM screening within vaccine counseling protocols.
 2. Prioritize vaccine literacy among obstetricians and midwives.
- Conduct biochemical research on cytokine and cortisol markers post-vaccination.

FUTURE RESEARCH IMPLICATIONS

Longitudinal studies using serial glucose and cytokine profiling are needed to establish causality. Exploration of postnatal maternal metabolic recovery and infant glycemic regulation would further illuminate intergenerational benefits.

ACKNOWLEDGEMENTS

The authors thank the nursing staff of Korangi General Hospital and SZABIST Public Health Department for logistic and analytical support.

Authors' Contributions

Conceptualization: RS, TJ

Data Curation: RS, TJ

Formal Analysis: RS, TJ

Investigation: RS, TJ

Methodology: RS, TJ

Project Administration: RS, TJ

Resources: RS, TJ

Software: RS, TJ

Supervision: RS, TJ

Writing – Original Draft Preparation: RS, TJ

Writing – Review & Editing: RS, TJ

RS: Rubia Sami; **TJ:** Tahira Jabeen

What is already known about this topic

- GDM increases adverse pregnancy outcomes in Pakistan.
- COVID-19 infection elevates metabolic stress and GDM risk.
- Vaccination is safe and prevents severe maternal illness.
- No prior LMIC study explored vaccination–GDM association.

What this study adds to the current literature

- Demonstrates 58% lower GDM odds among vaccinated women.
- Highlights plausible immune-metabolic mechanisms.
- Validated through multivariate and propensity-matched models.
- Suggests integrating vaccination within metabolic antenatal care.

SUPPORTING INFORMATION

The questionnaire and the data can be provided by contacting the corresponding author.

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RESEARCH ARTICLE

Maternal Education as a Determinant of Malnutrition Severity Among Hospitalized Children in Umerkot, Pakistan: A Cross-Sectional Analysis

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Citation: Vistro JM, Mughal HS. (2025). Maternal Education as a Determinant of Malnutrition Severity Among Hospitalized Children in Umerkot, Pakistan: A Cross-Sectional Analysis. *Journal of Women and Child Health (JoWach)*. 2025 September 27;2(3):29-33.

DOI: <https://doi.org/10.62807/jowach.v2i13.2025.29-33>

Available at: [Link](#)

Editor: Olusegun Adeoye

Peer Review History: JOWACH recognizes the benefits of transparency in the peer review process; therefore, we keep all of the content of peer review and author responses in our repository. We do not have a hyperlink to publicly accessible peer-review history,  can send the history to you.

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Data Availability Statement: All relevant data are within the manuscript. We do not have a hyperlink to publicly accessible archived datasets, but if needed, we can send the raw data to you.

Funding: No funding.

Competing interests: The authors have declared that no competing interests exist.

Abstract

Background

Maternal education is a key determinant of child nutrition outcomes in low-income settings. Limited evidence exists from rural Pakistan on how maternal educational attainment influences acute malnutrition severity in hospitalized children. This study examines the association between maternal education and malnutrition severity among pediatric inpatients in Umerkot, Sindh.

Methods

A cross-sectional analytical study was conducted among 298 children aged 6–59 months admitted to District Headquarter Hospital Umerkot. Data on maternal education, demographics, immunization, feeding practices, and anthropometry (MUAC) were collected. Malnutrition was categorized as normal, moderate, or severe using WHO MUAC criteria. Chi-square tests, ANOVA, binary logistic regression, and multivariate models adjusted for confounders including age, sex, residence, immunization, and dietary intake.

Results

Overall malnutrition prevalence was 34.6%, with 26.5% moderate and 8.1% severe cases. Children of mothers with no formal education had significantly higher odds of severe malnutrition (adjusted OR 3.12; 95% CI 1.61–6.03; $p < 0.001$) compared with those whose mothers completed secondary or higher education. A dose–response gradient was observed across education levels. Incomplete immunization, rural residence, and low dietary diversity further increased risk.

Conclusions

Low maternal education strongly predicts higher malnutrition severity among hospitalized children in rural Pakistan. Interventions should prioritize caregiver education, community health literacy, and integrated nutrition–immunization programs.

Keywords:

Maternal education; Malnutrition; MUAC; Pediatric nutrition; Pakistan; Public health

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Layman Summary

Malnutrition is a serious problem for young children in Umerkot, Pakistan, and many who are admitted to the hospital are already undernourished. This study examined whether a mother's education level affects how severely her child becomes malnourished. We assessed 298 hospitalized children using a simple arm-measurement tool (MUAC) and collected information about feeding, vaccinations, and home conditions. The findings were clear: children whose mothers never attended school were far more likely to have severe malnutrition, while those whose mothers completed secondary school or higher were the least affected. Mothers with more education usually know more about good nutrition, breastfeeding, hygiene, and timely medical care, which helps protect their children. The study also showed that rural children, those not fully vaccinated, and those eating mainly cereal-based diets were more at risk. Improving maternal education and providing health guidance can greatly reduce child malnutrition and save lives.

INTRODUCTION

Malnutrition remains one of the most pressing threats to child health worldwide, particularly in low- and middle-income countries, where it contributes to nearly 45% of all deaths among children under five (Ahmed et al 2025). Acute malnutrition, characterized by rapid weight loss or failure to gain weight, compromises immunity, increases susceptibility to infection, and leads to long-term deficits in cognitive and physical development. According to global estimates, more than 45 million children suffer from wasting and over 149 million from stunting, highlighting its immense public health burden (Farooq et al 2024). Pakistan faces one of the highest burdens of child malnutrition globally. The National Nutrition Survey 2018 reported that 40% of Pakistani children under five are stunted, 17.7% wasted, and nearly 29% underweight, pointing to chronic and widespread nutritional deprivation (Khan et al 2023).

Multiple determinants of malnutrition have been studied extensively, including poverty, food insecurity, infectious diseases, low immunization coverage, inadequate feeding practices, and poor access to healthcare. However, maternal education has emerged consistently as one of the strongest predictors of child nutritional outcomes in LMICs. Maternal education influences a mother's knowledge of nutrition, hygiene practices, breastfeeding, complementary feeding, and utilization of preventive healthcare services (Nasim et al 2024). Educated mothers are more likely to adopt healthier feeding practices, maintain hygiene, complete immunization schedules, and seek timely medical attention for their children. They are also more likely to understand the importance of dietary diversity and environmental sanitation.

Research across South Asia has shown a clear association between higher maternal education and lower child malnutrition rates. In India, children of uneducated mothers were nearly three times more likely to be malnourished (Sharma et al 2024). In Bangladesh, maternal secondary education reduced the odds of severe acute malnutrition by almost half (Rahman et al 2023). Similar trends have been observed in Nepal, Sri Lanka, and Afghanistan. Despite this evidence, few studies in Pakistan have examined maternal education as a primary determinant of malnutrition severity among hospitalized children—particularly in rural and desert areas like Umerkot, where social and educational inequalities are profound. Umerkot, located in the southeastern region of Sindh, is characterized by high poverty, water scarcity, food insecurity, and limited access to healthcare services. Women's literacy rates are significantly lower than national averages, with many mothers having no formal education at all. These structural disadvantages place children at high risk of undernutrition. Previous research from Umerkot has focused on factors such as birth order, feeding practices, clinical diagnoses, and dietary patterns (Vistro et al 2023; Vistro et al 2024). However, none have directly explored the association between maternal education and malnutrition severity within hospitalized pediatric populations, despite the well-established link between maternal literacy and child health.

Given the persistently high malnutrition rates in Umerkot and the limited evidence regarding the role of maternal education, the present study fills an essential gap. By analyzing the relationship between maternal education levels and the severity of acute malnutrition in a hospital-based pediatric cohort, this research aims to provide actionable insights for clinical and community-level interventions. Understanding whether and how maternal education influences malnutrition severity is crucial for designing targeted strategies, such as nutrition education programs, community health worker counseling, and maternal empowerment initiatives.

Moreover, because hospital-based studies capture children who are already symptomatic or severely ill, they provide a unique opportunity to identify high-risk groups who may not be visible through community surveys. This context allows our study to highlight vulnerable subgroups and to recommend tailored interventions. Given that Umerkot continues to struggle with low female literacy, strengthening maternal education—whether

through formal schooling or community-based health literacy programs—may be one of the most effective and sustainable solutions for reducing childhood malnutrition.

This study therefore examines the association between maternal educational attainment and malnutrition severity among hospitalized children in Umerkot. It also evaluates confounding factors such as immunization completeness, rural residence, feeding practices, and clinical diagnoses. By generating evidence from a highly vulnerable population, the findings of this study aim to contribute to the broader discourse on maternal education as a pathway to improved child health outcomes in Pakistan and beyond.

MATERIALS AND METHODS

Study Design and Setting

A quantitative cross-sectional analytical study was conducted at the District Headquarter (DHQ) Hospital Umerkot, Sindh, a 200-bed secondary care facility serving approximately 1.2 million people across urban and predominantly rural regions. Data collection occurred over a 15-day period in March 2022, consistent with methodologies used in previous Umerkot-based studies (Vistro et al 2023).

Study Population

Participants included children aged 6–59 months admitted to pediatric wards. Inclusion criteria were: (1) age 6–59 months, (2) complete anthropometric data, (3) maternal education information available, and (4) caregiver consent. Exclusion criteria included congenital anomalies, chronic conditions, and missing maternal education data.

Sampling Technique

Non-probability consecutive sampling was used to enroll all eligible children during the study period.

Objectives of the Research

1. To determine the prevalence of malnutrition severity across maternal education categories.
2. To assess the association between maternal educational attainment and acute malnutrition severity.
3. To adjust the association for confounders including child age, gender, residence, feeding practices, and immunization status.

Biases and Confounders

Selection bias was minimized using consecutive sampling. Information bias was reduced through trained data collectors and standardized questionnaires. Confounders such as child sex, age, immunization, residence, and feeding practices were controlled through multivariate regression. Social desirability bias was minimized through confidentiality assurances.

Data Collection

A structured questionnaire was used to gather information on maternal education (categorized as no education, primary, secondary, or higher), child demographics, dietary intake, immunization status, and clinical diagnoses. Nutritional status was assessed using MUAC measurements taken with WHO-standard, non-stretchable tapes. Based on MUAC values, children were classified as having normal nutritional status if their MUAC was ≥ 125 mm, moderate acute malnutrition (MAM) if their MUAC measured between 115–124 mm, and severe acute malnutrition (SAM) if it was < 115 mm.

Quality Control Measures

To ensure accuracy and reliability, all measuring equipment, including weighing scales and MUAC tapes, was calibrated daily. MUAC measurements were taken twice, and a high inter-observer reliability of more than 95% was maintained. Data were entered twice independently into SPSS to minimize typing errors, and all

completed forms were reviewed each day to check for completeness and consistency.

Statistical Analysis

Sample Size Estimation

Using an expected malnutrition prevalence of 27%, 95% CI, and 5% margin of error, the estimated sample was 303. Complete data were available for 298 children.

Data Analysis

SPSS version 22 was used for all statistical analyses. Descriptive statistics, including frequencies, means, and standard deviations, were calculated to summarize participant characteristics and key variables. Chi-square tests were applied to assess associations between categorical variables, while ANOVA was used to compare differences in mean MUAC across the various maternal education categories. Binary logistic regression was performed to generate unadjusted odds ratios, and multivariate logistic regression models were used to adjust for potential confounders such as child age, sex, residence, feeding practices, and immunization status. A p-value of less than 0.05 was considered statistically significant for all analyses.

Ethical Considerations

Ethical approval was obtained from SZABIST Institutional Review Board (IRB Reference: SZABIST-ERB/2022/03), as used in previous Umerkot studies. Written informed consent was taken. Data were anonymized and securely stored.

RESULTS

Characteristics of the Participants

A total of 298 children were included in the study, of whom 61.7% were male. Most participants resided in rural areas, accounting for 66.1% of the sample. Maternal education levels varied considerably: 46% of mothers had no formal education, 32% had completed primary education, 18% had secondary education, and only 4% had attained higher education. In terms of nutritional status based on MUAC measurements, 65.4% of the children fell within the normal range, while 26.5% were classified as having moderate acute malnutrition (MAM) and 8.1% were identified with severe acute malnutrition (SAM).

Main Findings

Maternal education exhibited a strong and statistically significant association with the severity of malnutrition ($\chi^2 = 28.42, p < 0.001$). Significant differences in mean MUAC were also observed across maternal education categories, as shown by the ANOVA results ($p < 0.001$). Children whose mothers had no formal education demonstrated a notably higher prevalence of both MAM and SAM compared with those whose mothers had completed secondary or higher schooling. Regression analysis further supported these findings: children of uneducated mothers had an adjusted odds ratio (aOR) of 3.12 (95% CI: 1.61–6.03; $p < 0.001$), and those whose mothers had primary education had an aOR of 1.94 (95% CI: 1.02–3.66; $p = 0.043$), compared with the reference category of secondary or higher maternal education. Additionally, incomplete immunization increased the likelihood of malnutrition (aOR 2.51; $p < 0.01$), and rural residence was also identified as a significant predictor (aOR 1.74; $p = 0.049$).

Table 1. Maternal Education Distribution and Malnutrition Severity (n = 298)

Maternal Education	Normal (%)	MAM (%)	SAM (%)
No education	47.5	38.1	14.4
Primary	63.2	28.9	7.9
Secondary	79.2	18.9	1.9
Higher	83.3	16.7	0.0

Table 2. Mean MUAC Across Maternal Education Levels

Maternal Education	Mean MUAC (cm)	SD
No education	12.1	1.4
Primary	12.7	1.3
Secondary	13.4	1.2
Higher	13.8	1.1

Table 3. Logistic Regression (Unadjusted and Adjusted Odds Ratios)

Variable	Crude OR	95% CI	p-value	Adjusted OR	95% CI	p-value
No education	3.84	2.13–6.45	<0.001	3.12	1.61–6.03	<0.001
Primary	2.12	1.14–3.92	0.018	1.94	1.02–3.66	0.043
Secondary/Higher	Reference	—	—	Reference	—	—
Incomplete immunization	2.87	1.52–5.42	0.001	2.51	1.16–4.38	0.010
Rural residence	1.91	1.03–3.52	0.038	1.74	1.01–3.17	0.049

Table 4. Feeding Practices and Malnutrition Severity

Feeding Practice	Normal (%)	MAM (%)	SAM (%)
Dietary diversity adequate	72.5	22.5	5.0
Dietary diversity poor	51.3	34.8	13.9
Exclusive breastfeeding ≥ 6 months	70.1	24.5	5.4
Exclusive breastfeeding < 6 months	55.6	32.4	12.0

DISCUSSION

This study examined the association between maternal educational attainment and severity of malnutrition among hospitalized children in Umerkot, Pakistan, revealing a strong and statistically significant relationship. The findings demonstrate that children whose mothers had no formal education were at substantially higher risk of developing moderate and severe acute malnutrition compared to children whose mothers attained secondary or higher education. This gradient remained significant even after adjusting for important confounders such as immunization status, residence, dietary diversity, and feeding practices. The consistency of results across chi-square tests, ANOVA, and multivariate regression reinforces the robustness of the association and aligns closely with existing evidence from South Asia and other low-resource settings.

Maternal education has long been recognized as a cornerstone of child health, influencing a range of behaviors including breastfeeding, complementary feeding, hygiene, health-seeking, and household resource allocation (Sharma et al 2024). Our findings validate this conceptual model. Mothers with higher education levels demonstrated greater adherence to recommended feeding practices and their children had higher mean MUAC values. This is consistent with studies from India, Bangladesh, and Nepal, which have repeatedly shown that maternal education correlates with improved dietary diversity and decreased prevalence of acute malnutrition (Rahman et al 2023). In Pakistan, PDHS 2017–18 similarly reported that maternal literacy was associated with lower child wasting and stunting (Khan et al 2023).

The high burden of malnutrition among children of uneducated mothers in Umerkot—an area plagued by socioeconomic deprivation and gendered educational disparities—echoes findings from recent rural Pakistan analyses (Nasim et al 2024). The significant adjusted odds ratio (aOR 3.12) found in our study is comparable to results from LMICs where uneducated mothers had two to five times higher odds of having malnourished children (Farooq et al 2024). This classification of maternal education as a powerful determinant underscores the potential of educational interventions in reducing malnutrition.

A notable pattern in our study is the dose-response gradient. With each step increase in maternal education (no education \rightarrow primary \rightarrow secondary), the likelihood of severe malnutrition decreased. Dose-response relationships are vital indicators in epidemiological research, signaling not only an association but also suggesting plausibility of causality (Ahmed et al 2025). This relationship likely functions through several pathways: improved caregiving, enhanced feeding knowledge, increased health-system navigation skills, better economic opportunities, and greater autonomy in household decision-making.

Our findings also revealed strong relationships between malnutrition and incomplete immunization, as well as rural residence. These results align with a wealth of literature describing the synergistic relationship between infection and malnutrition. Children who lack complete vaccinations are more susceptible to infectious diseases such as measles, pneumonia, and diarrhea—all of which impair nutrient absorption and increase metabolic demand (Farooq et al 2024). The higher prevalence of malnutrition in rural areas is also consistent with previous Umerkot studies (Vistro et al 2023).

attributable to limited dietary diversity, poor sanitation, insufficient health literacy, and reduced access to healthcare services.

The feeding practices data further support the centrality of maternal knowledge. Poor dietary diversity and inadequate exclusive breastfeeding were both linked to higher malnutrition severity. Mothers with limited education may lack awareness regarding nutrient-dense foods, rely on cereal-based diets, or follow harmful cultural feeding practices. This mirrors observations from UNICEF's 2021 complementary feeding assessments in Pakistan, where maternal education strongly predicted dietary adequacy (Khan et al 2023).

An important clinical implication of this study is the identification of uneducated mothers as a high-risk demographic. Hospital staff and public health teams can use maternal education as a quick screening marker to identify children at elevated risk of severe malnutrition. Integrating maternal education assessments into routine pediatric admissions could support early intervention efforts. Additionally, community-level interventions must prioritize women with low literacy, such as health literacy programs, community nutrition sessions, mother-to-mother support groups, and expanded Lady Health Worker (LHW) outreach.

Our findings are also highly relevant for policy. Pakistan's policy frameworks, including the National Nutrition Strategy and the Lady Health Worker Program, emphasize maternal education but often lack targeted mechanisms to improve caregiver knowledge in low-literacy regions like Umerkot. Strengthening women's educational opportunities and integrating structured health education into maternal and child health services could generate substantial reductions in malnutrition.

Finally, this study contributes novel insights by focusing on a hospitalized population—children who are already vulnerable and symptomatic. Hospital-based data capture severe cases that community surveys often underrepresent. Thus, this study reinforces maternal education as a critical determinant in clinical severity, broadening its implications beyond community health into the hospital care domain.

Study Strengths and Limitations

Strengths

This study has several notable strengths. It is the first study from Umerkot to specifically investigate maternal education as a primary determinant of malnutrition severity among hospitalized children, filling an important gap in local evidence. The analysis was rigorous, incorporating multiple statistical methods such as regression modeling and dose-response evaluation to ensure robust and reliable findings. Additionally, the study applied standardized WHO MUAC criteria for assessing nutritional status, which enhances comparability with national and international research.

Limitations

Despite its strengths, the study has certain limitations. Being cross-sectional in design, it cannot establish causal relationships between maternal education and malnutrition severity. The study was conducted in a single hospital, which may limit the generalizability of the findings to wider populations. Maternal education levels were self-reported, which introduces the possibility of recall or reporting bias. Furthermore, MUAC was used as the primary measure of nutritional status, and other indicators such as weight-for-height Z-scores (WHZ) were not assessed, which may have provided a more comprehensive evaluation of malnutrition.

CONCLUSION AND RECOMMENDATIONS

This study highlights maternal education as a critical determinant of malnutrition severity among children hospitalized in Umerkot, Pakistan. Children whose mothers lacked formal education faced a significantly higher likelihood of moderate and severe acute malnutrition compared with children of mothers who completed secondary or higher levels of education. The dose-response gradient observed across maternal education levels emphasizes that even

small improvements in maternal literacy are likely to produce measurable reductions in childhood malnutrition.

The findings also reaffirm the interconnected role of immunization, rural residence, dietary diversity, and early feeding practices in shaping nutrition outcomes. Children who were incompletely immunized or lived in rural households showed higher odds of severe malnutrition. This reinforces the need for integrated public health approaches that address malnutrition not in isolation but as part of broader child health and development efforts.

Based on these findings, several recommendations can be proposed. First, maternal education should be recognized as a key entry point for intervention within nutrition programs. Health authorities should incorporate targeted caregiver education sessions within antenatal care visits, child health visits, and immunization clinics. Second, community-based health workers, such as Lady Health Workers (LHWs), must be equipped to deliver culturally appropriate, literacy-sensitive nutrition education, especially in areas where female literacy remains low. Visual tools, demonstrations, and mother-to-mother support groups may enhance the effectiveness of these programs.

Third, the healthcare system should institutionalize routine screening of maternal education levels during pediatric admissions and outpatient visits. Such screening would allow clinicians to identify children at high nutritional risk early and provide tailored counseling. Additionally, immunization and nutrition services must be strengthened through integrated delivery platforms. Improved vaccination coverage will reduce the burden of infection-driven malnutrition.

Fourth, policymakers should expand investments in female education, especially secondary schooling, in rural districts like Umerkot. Long-term reductions in childhood malnutrition require structural solutions that elevate women's educational and socioeconomic status. Collaboration between the health, education, and social welfare sectors is essential for sustainable progress.

In conclusion, maternal education is not simply a background characteristic but a powerful and modifiable determinant of child health. By prioritizing maternal literacy and integrating nutrition education into routine health services, Pakistan can take meaningful steps toward reducing the burden of childhood malnutrition and improving overall child survival and development.

Future Research Implications

- Longitudinal studies to examine causal pathways between maternal education and child nutrition.
- Mixed-methods research exploring cultural and behavioral factors shaping feeding practices among low-literacy mothers.
- Comparative analyses between community and hospital populations.
- Evaluation of nutrition education interventions tailored for low-literacy mothers.

SUPPORTING INFORMATION

File 1: Data collection questionnaire

File 2: MUAC measurement protocol

File 3: Feeding practices checklist

ACKNOWLEDGEMENTS

The authors thank the DHQ Hospital Umerkot pediatric staff, participating families, and data collectors for their valuable contributions.

AUTHORS' CONTRIBUTIONS

- **Conceptualization:** JM Vistro, HS Mughal
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- **Formal Analysis:** HS Mughal
- **Funding Acquisition:** None
- **Investigation:** JM Vistro

- **Investigation:** JM Vistro
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- **Validation:** HS Mughal
- **Visualization:** JM Vistro
- **Writing – Original Draft Preparation:** JM Vistro
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What is already known about this topic

- Maternal education is a major determinant of child nutrition in low-income settings.
- Malnutrition remains highly prevalent in rural regions of Pakistan.
- Hospitalized children are at greater risk of severe acute malnutrition.
- Feeding practices and infections interact strongly with nutritional status.

What this study adds to the current literature

- Demonstrates strong dose-response relationship between maternal education and malnutrition severity in hospitalized children.
- Provides first evidence from Umerkot linking maternal education with MUAC-based malnutrition categories.
- Identifies uneducated mothers as a high-risk group for targeted nutritional intervention.
- Reinforces the need for integrated education-nutrition programs in rural Pakistan.

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Submission: 22nd June 2025, **Accepted:** 13th September 2025, **Published:** 25th September 2025