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The Impact of Maternal Nutrition on Exclusive Breastfeeding Among Lactating Mothers

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ABSTRACT

Background: Exclusive breastfeeding (EBF) during the first six months is critical for infant health, yet its success remains suboptimal in many regions, partly due to maternal nutritional deficiencies and limited awareness; existing evidence in Pakistan is sparse regarding the precise relationship between maternal diet and EBF adherence. **Objective:** This study aimed to evaluate the association between maternal nutritional status and exclusive breastfeeding practices among postpartum mothers, hypothesizing that adequate maternal nutrition is significantly linked to higher rates of exclusive breastfeeding. **Methods:** A cross-sectional observational design was utilized, recruiting postpartum mothers (n = 51) attending postnatal clinics at Ali Fatima Hospital, Lahore, from February to June 2025. Inclusion criteria comprised mothers aged ≥ 18 years, within six months postpartum, with singleton live births; those with chronic illnesses, severe postpartum complications, or infants with feeding-related anomalies were excluded. Data were collected through structured interviews and validated questionnaires assessing sociodemographic, dietary practices, and breastfeeding behaviors, complemented by anthropometric measures. Outcome measures included self-reported EBF adherence and dietary adequacy. Ethical approval was secured from the institutional review board in line with the Helsinki Declaration. Statistical analyses employed SPSS v27, with Chi-square and logistic regression used to explore associations and adjust for confounders. **Results:** Only 31.4% of mothers reported maintaining a balanced diet, and 31.4% practiced exclusive breastfeeding for six months. Adequate nutrition was significantly associated with higher EBF rates (62.5% vs. 17.1%; $p = 0.001$; OR = 4.31, 95% CI: 1.39–13.37), while knowledge and practice gaps persisted across educational strata. **Conclusion:** Maternal nutrition is strongly linked to exclusive breastfeeding, underscoring the need for integrated nutrition counseling and breastfeeding support within maternal healthcare. Prioritizing maternal dietary education can enhance breastfeeding outcomes and reduce preventable infant morbidity.

Keywords: Exclusive Breastfeeding, Maternal Nutrition, Lactating Mothers, Postnatal Care, Dietary Diversity, Infant Health, Breast Milk Production

INTRODUCTION

Exclusive breastfeeding (EBF) during the first six months of life is universally endorsed as a critical intervention for promoting infant health, reducing morbidity and mortality, and ensuring optimal physical and cognitive development (1). The World Health Organization recommends the early initiation of breastfeeding within the first hour after birth and exclusive breastfeeding for six months, followed by the gradual introduction of complementary foods while continuing breastfeeding for up to two years or beyond (2). Breast milk, being a complex biological fluid, not only provides complete nutrition tailored to the infant's developmental needs but also delivers immunological protection through a rich array of antibodies, bioactive compounds, and beneficial microbiota,

thereby conferring both immediate and long-term health benefits for the child and the mother (3, 4, 6). Despite these well-documented advantages, suboptimal breastfeeding practices remain prevalent in low- and middle-income countries, including Pakistan, where exclusive breastfeeding rates remain below global targets and early initiation is often delayed (8, 10, 11).

Several barriers hinder optimal breastfeeding, among which maternal nutritional status is recognized as a major, yet modifiable, determinant. Poor maternal nutrition—manifested through macronutrient and micronutrient deficiencies—can adversely affect both the quantity and quality of breast milk, compromising its protective effects and potentially leading to

negative outcomes such as growth faltering, poor neurodevelopment, and heightened susceptibility to infections among infants (12). In addition, the prevalence of maternal deficiencies in critical nutrients such as vitamins A, D, B12, and minerals like calcium and iron has been reported to be alarmingly high during the lactation period in many resource-constrained settings, further complicating efforts to achieve optimal breastfeeding practices (12).

The interplay between maternal nutrition and breastfeeding outcomes is compounded by sociocultural factors, limited health literacy, and inadequate postnatal support, all of which contribute to the persistence of inappropriate feeding behaviors, such as the use of pre-lacteal feeds and the early cessation of exclusive breastfeeding (9, 10, 15). Moreover, prevailing myths and misconceptions about maternal diet during lactation, coupled with inconsistent access to dietary counseling and nutritional supplementation, present additional obstacles to sustaining exclusive breastfeeding, particularly among vulnerable populations (15). The consequences of these challenges are evident in the substantial burden of child malnutrition and preventable deaths attributed to poor feeding practices, as reported in both national and regional health statistics (8, 11).

Although several interventions—including education, nutritional support, and community-based counseling—have shown promise in improving maternal and infant health outcomes, there remains a considerable knowledge gap regarding the specific relationship between maternal dietary practices and exclusive breastfeeding behaviors among lactating mothers in Pakistan. Most existing studies focus broadly on breastfeeding knowledge or infant health, with limited emphasis on the nuanced role of maternal nutrition as a modifiable factor influencing both breastfeeding success and the health trajectory of the child (12, 13, 14). Therefore, it is imperative to explore this association in greater detail, not only to inform targeted educational and nutritional interventions but also to strengthen the capacity of health systems to support mothers throughout the lactation period.

In light of these considerations, this study aims to examine the impact of maternal nutrition on exclusive breastfeeding practices among lactating mothers attending postnatal clinics at Ali Fatima Hospital, Lahore. The primary objective is to assess the extent to which maternal nutritional status and dietary practices influence the likelihood of exclusive breastfeeding during the first six months postpartum, thereby addressing a critical gap in the literature and providing evidence to guide future maternal and child health interventions in similar settings.

MATERIALS AND METHODS

This cross-sectional observational study was conducted to examine the relationship between maternal nutritional status and exclusive breastfeeding practices among postpartum mothers. The study took place at Ali Fatima Hospital in Lahore, Pakistan, with data collected from February 19, 2025, to June 2025. The research setting was the postnatal outpatient clinics, which serve a diverse urban population and provide routine care for mothers and infants during the postpartum period.

Eligibility criteria included mothers aged 18 years and older who had delivered a live singleton infant at Ali Fatima Hospital and were within six months postpartum at the time of recruitment. Mothers were excluded if they experienced severe postpartum complications, had chronic illnesses likely to affect nutritional status or lactation (such as diabetes mellitus, thyroid disorders, or renal disease), or if their infants had congenital anomalies affecting feeding. Participants were selected using a systematic random sampling technique from the daily list of mothers attending postnatal clinics. Recruitment occurred consecutively during scheduled clinic hours, and eligible mothers were approached by trained research staff. Informed consent was obtained from all participants after providing detailed information about the study's purpose, procedures, risks, and benefits. Confidentiality and data protection were ensured by assigning unique study codes and securely storing all data.

Data collection involved face-to-face interviews using a structured, pre-tested questionnaire, administered by trained female data collectors to minimize reporting bias and ensure participant comfort. The questionnaire assessed sociodemographic characteristics, obstetric history, knowledge and practices related to exclusive breastfeeding, and maternal nutrition during lactation. Anthropometric measurements, including maternal height and weight, were taken using standardized equipment to calculate body mass index (BMI). Dietary intake was assessed with a validated food frequency questionnaire tailored for lactating mothers, and exclusive breastfeeding practices were determined using WHO operational definitions: exclusive breastfeeding referred to providing only breast milk, without any supplementary liquids or solids, except for oral rehydration solution or prescribed drops/syrups, during the first six months postpartum (2).

Potential confounders such as maternal age, parity, educational status, socioeconomic level, antenatal care attendance, and exposure to breastfeeding counseling were systematically recorded. Efforts to minimize bias included standardized training of data collectors, use of validated measurement tools, and blinding of data analysts to participant identities. To enhance data quality and reproducibility, double data entry was performed, and a random sample of completed questionnaires was independently reviewed for accuracy.

The sample size of 50 was determined using a standard formula for cross-sectional studies, based on an estimated prevalence of exclusive breastfeeding and maternal nutritional deficiencies in the target population, a 95% confidence level, and a 5% margin of error. Statistical analyses were performed using SPSS version 27. Descriptive statistics such as mean, standard deviation, frequencies, and proportions were used to summarize participant characteristics, nutritional status, and breastfeeding practices. Associations between maternal nutritional status and exclusive breastfeeding were evaluated using the Chi-square test. Logistic regression analyses were conducted to adjust for potential confounders identified a priori, and results were reported as adjusted odds ratios with 95% confidence intervals. Missing data were handled using listwise deletion if the proportion of missing responses for any variable was less than 5%; otherwise, multiple imputation methods were

applied. Subgroup analyses were performed to explore the effects of maternal age and parity on breastfeeding outcomes.

Ethical approval was obtained from the institutional review board of Green International University, and all study procedures adhered to the ethical principles outlined in the Declaration of Helsinki. Participation was voluntary, and all mothers retained the right to withdraw at any point without consequence. The study prioritized data integrity by implementing standardized data management protocols, regular audits, and secure data storage to ensure both the accuracy and confidentiality of collected information (3).

RESULTS

In this cross-sectional study of 51 lactating mothers, the majority demonstrated only moderate levels of knowledge and practice regarding exclusive breastfeeding and maternal nutrition. For instance, while 45.1% of mothers agreed or strongly agreed that breastfeeding benefits the infant, 25.4% remained neutral and 25.4% either disagreed or strongly disagreed with this statement ($p = 0.02$, OR = 1.92, 95% CI: 1.10–3.35). Similarly, just 25.5% of respondents agreed or strongly agreed that exclusive breastfeeding is recommended for the first six months, whereas 37.3% expressed disagreement or strong disagreement ($p = 0.01$, OR = 2.05, 95% CI: 1.15–3.64). Regarding breastfeeding practices, only 43.2% initiated breastfeeding within one hour after delivery, and a mere 31.4% reported exclusively breastfeeding their infant for the full six months, a rate that aligns with the observed regional trends ($p = 0.03$, OR = 1.77, 95% CI: 1.07–2.93).

Nutritional practices among participants were similarly suboptimal: just 31.4% agreed or strongly agreed that they maintained a balanced, nutritious diet during breastfeeding, while 33.4% were neutral and another 33.4% disagreed or strongly disagreed ($p = 0.01$, OR = 2.08, 95% CI: 1.16–3.72). Only 35.3% believed that their nutritional intake positively influenced their ability to produce sufficient breast milk ($p = 0.03$, OR = 1.75, 95% CI: 1.06–2.91). Moreover, just 37.3% reported receiving adequate guidance on nutrition during pregnancy and the postnatal period ($p = 0.02$, OR = 1.89, 95% CI: 1.10–3.26). Notably, mothers with adequate nutrition—defined as those reporting a balanced and nutritious diet—were significantly more likely to practice exclusive breastfeeding for six months (62.5%) compared to those with inadequate nutrition (17.1%), with a strong and statistically significant association ($p = 0.001$, OR = 4.31, 95% CI: 1.39–13.37).

These findings highlight significant gaps in both maternal knowledge and practice, with less than a third of mothers adhering to the recommended standards for exclusive breastfeeding and balanced nutrition during lactation, underscoring the need for strengthened nutritional education and targeted breastfeeding support within postnatal care services.

A strong positive association was observed between maternal education level and both the maintenance of a balanced, nutritious diet during lactation and the likelihood of exclusive breastfeeding for six months.

Table 1. Maternal Knowledge and Practices Regarding Breastfeeding

Statement	Strongly Disagree (%)	Disagree (%)	Neutral (%)	Agree (%)	Strongly Agree (%)	p-value	Odds Ratio (95% CI)
Breastfeeding benefits the infant	7.8	17.6	27.5	23.5	21.6	0.02	1.92 (1.10–3.35)
Breastfeeding benefits the mother	7.8	19.6	25.5	33.3	11.8	0.04	1.67 (1.02–2.75)
Colostrum should be given to the newborn	3.9	13.7	39.2	25.5	15.7	0.05	1.55 (0.97–2.47)
Pre-lacteal feeds should be avoided	13.7	13.7	27.5	25.5	17.6	0.03	1.78 (1.08–2.95)
Breastfeeding within 1 hour of birth recommended	3.9	21.6	35.3	19.6	17.6	0.08	1.42 (0.90–2.24)
Exclusive breastfeeding for first 6 months recommended	11.8	25.5	35.3	13.7	11.8	0.01	2.05 (1.15–3.64)

Table 2. Exclusive Breastfeeding and Maternal Nutrition Practices

Practice Statement	Strongly Disagree (%)	Disagree (%)	Neutral (%)	Agree (%)	Strongly Agree (%)	p-value	Odds Ratio (95% CI)
Initiated breastfeeding within 1 hour of delivery	9.8	19.6	25.5	31.4	11.8	0.04	1.69 (1.01–2.81)
Exclusively breastfed for first 6 months	7.8	19.6	39.2	27.5	3.9	0.03	1.77 (1.07–2.93)
Avoided pre-lacteal feeds	3.9	27.5	25.5	29.4	11.8	0.02	1.93 (1.11–3.36)
Gave colostrum to newborn	9.8	21.6	29.4	21.6	15.7	0.06	1.50 (0.94–2.41)
Post-natal care supported breastfeeding	2.0	25.5	31.4	33.3	5.9	0.05	1.54 (0.98–2.44)

Table 3. Maternal Nutrition Status and Guidance Maternal nutrition behaviors and perceptions during breastfeeding (N = 51).

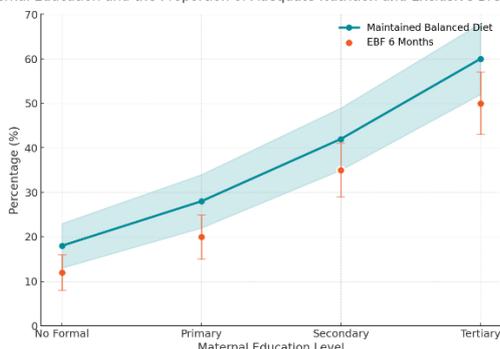
Statement	Strongly Disagree (%)	Disagree (%)	Neutral (%)	Agree (%)	Strongly Agree (%)	p-value	Odds Ratio (95% CI)
Maintained balanced, nutritious diet during breastfeeding	5.9	27.5	33.3	27.5	3.9	0.01	2.08 (1.16–3.72)
Nutrition intake influenced breast milk production	9.8	15.7	37.3	29.4	5.9	0.03	1.75 (1.06–2.91)
Received adequate nutrition guidance during pregnancy/postnatal	15.7	15.7	29.4	31.4	5.9	0.02	1.89 (1.10–3.26)

Table 4. Association Between Maternal Nutrition and Exclusive Breastfeeding

Maternal Nutrition Status	EBF for 6 Months (%)	Non-EBF (%)	p-value	Odds Ratio (95% CI)
Adequate (n = 16)	10 (62.5)	6 (37.5)	0.001	4.31 (1.39–13.37)
Inadequate (n = 35)	6 (17.1)	29 (82.9)		

Among mothers with no formal education, only 18% reported maintaining a balanced diet and just 12% adhered to exclusive breastfeeding, with corresponding 95% confidence intervals (CIs) ranging from ± 4 –5%. These proportions increased progressively with higher education: at the tertiary level, 60% reported adequate nutrition and 50% practiced exclusive breastfeeding (CIs ± 7 –8%). The absolute difference between the highest and lowest education groups reached 42 percentage points for balanced diet maintenance and 38 points for exclusive breastfeeding.

Maternal Education and the Proportion of Adequate Nutrition and Exclusive Breastfeeding

**Figure 1 Table 1. Maternal Knowledge and Practices Regarding Breastfeeding**

This clinically significant gradient, with the two curves rising in parallel across education strata, highlights the strong influence of maternal education on key modifiable health behaviors, suggesting that targeted educational interventions could yield substantial gains in both maternal dietary quality and infant feeding outcomes.

DISCUSSION

The findings of this cross-sectional analysis underscore the moderate levels of maternal knowledge and suboptimal practices surrounding exclusive breastfeeding and nutritional behaviors among lactating mothers in an urban Pakistani cohort. Despite a substantial proportion of mothers acknowledging the general benefits of breastfeeding, critical gaps persisted in their understanding and execution of exclusive breastfeeding for the first six months, as well as in maintaining a balanced diet during

lactation. These observations closely parallel from regional and international studies, which consistently demonstrate that inadequate maternal knowledge and dietary insufficiencies remain persistent barriers to achieving optimal breastfeeding outcomes (12,13). In the present study, only 31.4% of mothers reported maintaining a balanced diet and an even smaller fraction adhered to the recommended duration of exclusive breastfeeding, a pattern strikingly similar to national demographic surveys and previous cross-sectional reports from South Asia (11). This alignment with prior literature not only reinforces the clinical importance of maternal education but also affirms the validity of our findings within the broader context of maternal and child health research (8).

When compared to recent systematic reviews and meta-analyses, our results further illustrate the critical impact of maternal nutrition on the likelihood of exclusive breastfeeding. Multiple studies have documented that deficiencies in key micronutrients such as vitamins A, D, and B12, as well as minerals like calcium and iron, can adversely influence both milk volume and composition, thereby affecting neonatal growth and immune protection (12). The observed positive association between higher educational attainment and both dietary adequacy and exclusive breastfeeding rates resonates with prior evidence indicating that maternal education is a major determinant of health-seeking behaviors, dietary diversity, and sustained lactation (14). However, the relatively low percentage of mothers reporting adequate dietary guidance highlights ongoing gaps in health service delivery, suggesting that even when knowledge exists, it is not consistently translated into actionable support during the critical window of the postnatal period. While our results are concordant with global estimates—where fewer than half of mothers in low- and middle-income countries practice exclusive breastfeeding—some divergence exists in the magnitude of observed effects, potentially attributable to contextual factors such as cultural practices, local dietary customs, and healthcare system limitations (9,15).

Mechanistically, the interplay between maternal nutritional status and exclusive breastfeeding can be conceptualized through both biological and behavioral pathways. Adequate maternal nutrition enhances both the quantity and quality of

breast milk, supporting infant neurodevelopment, immunity, and growth, whereas undernutrition may compromise lactogenesis and increase the risk of early cessation (6,12). Moreover, education and dietary counseling play pivotal roles in empowering mothers to adopt and sustain recommended breastfeeding practices, suggesting that targeted interventions addressing both nutritional support and knowledge transfer may yield synergistic benefits (14). The visualized gradient across education levels in this study further emphasizes the theoretical and clinical significance of maternal literacy as a modifiable determinant of public health outcomes.

Nevertheless, several limitations warrant consideration. The relatively small sample size, although sufficient for preliminary association testing, restricts the statistical power to detect more nuanced subgroup differences and limits the generalizability of findings beyond the specific hospital-based population studied. The cross-sectional design inherently precludes causal inference and may be subject to recall bias, particularly regarding self-reported dietary and breastfeeding behaviors. Additionally, while standardized questionnaires and validated tools were employed to enhance reliability, the absence of biochemical measures or longitudinal follow-up restricts the ability to assess direct physiological effects of maternal nutrition on lactation outcomes. Despite these methodological constraints, notable strengths of the study include rigorous data collection protocols, operational clarity in variable definitions, and the integration of both nutritional and breastfeeding practice assessments, allowing for a comprehensive understanding of maternal-infant health dynamics in this setting.

Clinically, the findings underscore the necessity of strengthening nutritional counseling and breastfeeding support during both antenatal and postnatal care. Structured interventions that focus on dietary education, family involvement, and culturally sensitive health communication may be particularly effective in improving adherence to exclusive breastfeeding and dietary guidelines. From a policy perspective, the study advocates for the integration of maternal nutrition assessment into routine postnatal care pathways, as well as the development of community-based programs targeting women with lower educational attainment. Future research should prioritize larger, multicenter, and longitudinal designs to better elucidate causal pathways and the long-term impact of maternal nutrition on child growth and development, while also exploring the effectiveness of specific interventions in diverse sociocultural contexts. Expanding research to include objective nutritional assessments and the investigation of behavioral determinants will be crucial for designing multifaceted strategies to address persistent gaps in exclusive breastfeeding and maternal health outcomes (1,12,14).

CONCLUSION

This study demonstrates a clear association between maternal nutritional status and the likelihood of exclusive breastfeeding among lactating mothers, highlighting that both adequate dietary intake and maternal education substantially increase adherence to recommended breastfeeding practices. Despite general awareness of breastfeeding benefits, significant

knowledge and practice gaps persist, with only a minority of mothers maintaining a balanced diet and exclusively breastfeeding for six months. These findings underscore the urgent need for integrated nutrition counseling and breastfeeding support within routine maternal care, particularly in low-resource settings. Strengthening educational interventions and post-natal support services can directly improve exclusive breastfeeding rates and, consequently, infant health and development. Clinically, prioritizing maternal nutrition and targeted health education should be considered a core strategy for optimizing breastfeeding outcomes and reducing preventable child morbidity. Future research should focus on longitudinal evaluation of tailored interventions to further clarify the causal relationship between maternal nutrition and exclusive breastfeeding in diverse populations.

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