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Effect of Nutritional Status of Lactating Mothers on Duration of Exclusive Breast Feeding in Primary Health Care Center, at Kafer El Zayat City, Gharbia Governorate, Egypt

Aya Samir Elghareib*, Eman Ali Younis, Salwa Abd Elmageed Atlam, Nadira Mansour Hassan
Public Health and Community Medicine Department, Faculty of Medicine, Tanta University, Tanta, Egypt
***Corresponding Author**: **Aya Samir Elghareib, Email:** Aya.samir@med.tanta.edu.eg

ABSTRACT

Background: Maternal nutrition has a pivotal role in both the production of breast milk and the mother's overall health, which in turn directly influences breastfeeding practices. Adequate nutrition ensures the mother has sufficient energy, essential nutrients, and proper hydration to support consistent milk supply. **Objectives:** This research aimed to evaluate the nutritional status of lactating mothers and examine its impact on the period of exclusive breastfeeding (EBF).

Subjects and Methods: Cross-sectional research has been performed at the Primary Health Care Center in Kafr El Zayat City between March and August 2023. A total of 352 lactating mothers has been chosen through a non-probability convenience sampling method. Information has been gathered via a structured, pretested questionnaire, which included sections on sociodemographic characteristics, infant feeding patterns, and assessment of maternal nutritional status.

Results: A significant positive association (r =0.669) has been observed between the dietary diversity score and EBF. Number of meals, eating snacks, amount of water, natural drinks, dietary diversity score, body mass index, manifestation of anemia and goiter were significant predictors affecting duration of EBF.

Conclusion and Recommendations: Maternal nutritional status is a key determinant in sustaining exclusive breastfeeding. Ensuring proper maternal nutrition during the lactation period is essential for promoting optimal breastfeeding practices. Health programs should integrate nutritional counseling and support for lactating women as a central component of breastfeeding promotion strategies.

Keywords: Exclusive breastfeeding, Maternal nutrition, Dietary diversity score, Egypt.

INTRODUCTION

Exclusive breastfeeding is characterized by the practice of feeding only breast milk to babies, without of any supplementary food or drink, except for prescribed drugs and supplements. In 2001, the World Health Organization (WHO) advised that newborns be exclusively breastfed during the first six months of life, followed by continuing breastfeeding along with suitable supplemental feeding for up to two years or more [(1)]. EBF is widely recognized as a key public health intervention that significantly improves infant and maternal health outcomes. It contributes to optimal infant growth, development, and immunity, while also promoting emotional bonding and long-term cognitive and psychosocial benefits. A wealth of scientific evidence has documented the protective effects of breastfeeding against numerous health conditions in both mothers and children [(2)].

For infants, breastfeeding offers a range of benefits. It reduces the risk of infections, lowers the incidence of obesity during childhood and adolescence, enhances cognitive function, and helps prevent allergic disorders, asthma, and metabolic diseases like cardiovascular illnesses and diabetes later in life. These protective effects are particularly pronounced with prolonged and exclusive breastfeeding [(3)].

According to UNICEF's 2022 report, the global occurrence of exclusive breastfeeding at six months stood at 48%, with regional rates varying from 32% in the Middle East to 55% in parts of Africa, including Eastern, Southern, and North Africa [(4)]. In Egypt, a 2014 study reported that only 29.9% of babies were exclusively breastfed for the recommended six months [(5)]. More recent findings indicate even lower prevalence rates: 20% in Assiut Governorate in 2016 [(6)] and just 14.1% among working mothers in Mansoura District in 2017 [(7)]. Lactating women require approximately 500 additional kilocalories per day to support breast milk production, which averages around 780 mL per day (ranging from 450–1200 mL) at an energy content of 67 kcal per 100 mL [(8)]. Breast milk also contains significant levels of essential nutrients, such as calcium—around 330 mg per liter—which must be replenished through the mother's diet. Although the quality of breast milk is generally maintained under most circumstances, its quantity can be significantly affected by inadequate maternal nutrition [(9)].A well-nourished mother enters lactation with sufficient nutrient reserves, allowing her to support milk production without compromising her own health. However, continued dietary inadequacy during lactation can quickly deplete these reserves. Therefore, it is essential to provide mothers with counseling on adequate intake of energy, protein, vitamins, and minerals—especially calcium—to ensure optimal lactation outcomes [(9)].

Recent studies showed maternal nutritional status—both before and during lactation— emerged as a critical factor for the success of EBF [(10)]. A comprehensive evaluation of maternal nutrition during lactation includes assessment of dietary intake patterns, anthropometric measurements, and clinical signs of nutrient deficiencies, sometimes supplemented by laboratory testing [(11)]. Despite the recognized importance of maternal nutrition, there remains a lack of localized research on how it directly impacts EBF duration in the Egyptian context. Understanding the relationship between nutritional status and breastfeeding practices is crucial to inform policy

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makers and healthcare professionals aiming to develop targeted interventions to support lactating women and improve infant feeding practices [9].

PATIENTS AND METHODS

Study design, setting, and duration: this cross-sectional research has been performed at Kafr El Zayat Primary Health Care Center from March 2023 to August 2023. Kafr El-Zayat, is a city within Egypt's Gharbia Governorate, the primary health care center offers essential services like general medical consultations, maternal and kid health care, immunizations, family planning, and health education.

Study population: This research targeted the lactating mothers attending the primary health care center in Kafr El Zayat City for family planning, vaccination, and follow up the babies. The sample size and power analysis were computed utilizing the Epi-Info statistical program developed by the World Health Organization and the Centers for Disease Control and Prevention, Atlanta, Georgia, USA, version 2021.

The criteria used for sample size calculation were as follows:

95% confidence limit, margin of error 5%, the prevalence of undernutrition was 25.9%[12].

The least sample size needed to achieve the expected outcome was 278.

Inclusion Criteria: The lactating mothers to babies up to 6 months attending the Primary Health Care Center in Kafr El Zayat City for family planning, vaccination and follow up their babies and agreed to be interviewed were included in this study.

Exclusion criteria: Lactating mothers with chronic disease, lactating mothers of Babies with congenital anomalies or metabolic disorders.

Sample technique:

The study population was approached by non-probability (convenient) sampling method.

Data collection tool:

The data have been collected via interviewing the lactating mothers using a structured questionnaire sheet and it was designed by reviewing past literature.

The questionnaire consisted of the following sections:

- **Section 1.** Socio-demographic characteristics.
- **Section 2.** The infant data and breast-feeding patterns of the lactating mothers involved:

Type of infant feeding, duration of exclusive breast feeding, methods of infant feeding, and receiving counseling about exclusive breast feeding

- **Section 3.**

- Assessment of nutritional status of lactating mothers that involved:

- Anthropometric measurement involved height, weight, body mass index, mid upper arm circumference and waist circumference. Clinical examination searching for physical signs and symptoms of nutritional deficiency. Assessment of dietary habits and diversity of lactating mothers.

Validation of the questionnaire:

Content validity by consulting a panel of three experts in Public Health and Community Medicine Department who assessed the questionnaire clarity, relevance, and completeness. Face validity was evaluated to determine if the questions appeared appropriate and relevant to the target group. Face validity for the questionnaire was calculated and it was 100% - Reliability: Test-re-test: Alpha Kronbuch`s reliability was 0.90. - Some questions were modified and deleted according to expert opinions; content validity index equals one. Preliminary visits were carried out to orient heads and relevant personnel about the objectives and procedures of the study and to get their cooperation, help, and support.

Statistical Analysis

Information sorting and analysis have been conducted utilizing Statistical Package for the Social Sciences (SPSS) version 21. For the quantitative information, the median, interquartile range (IQR), mean, and standard deviation (SD) have been calculated, while for qualitative information, the frequency and percentage of each category have been determined. For qualitative information, comparison among two independent groups has been performed utilizing Chi-square (χ^2) test. For abnormally distributed quantitative variables, to compare between two studied groups using Mann Whitney test

Correlation between the period of EBF and age, educational level, dietary diversity score, number of meals, amount of water and body mass index of lactating mothers was calculated.

Ethical consideration: This study adhered to the research ethical rules applied in Tanta Faculty of Medicine throughout the whole interval of implementation. Approval of protocol of the research has been attained from the Ethical Committee of Tanta Faculty of Medicine prior to starting the study (approval code was 36234 /12/22). The Dean of Faculty of Medicine sent an official permission letter to the administrative head of Kafr El Zayat Primary Health Center. The researcher informed participants about the purpose of the research and get their written consent to participate. Confidentiality and privacy were guaranteed throughout the whole period of the research. This study has been performed according to the guidelines laid down in the Declaration of Helsinki.

RESULTS

Table (1) shows socio-demographic characteristics of examined mothers. It showed that the mean age of the examined mothers was 26 ± 4.7 years. More than half of them (56.5%) lived in urban areas. About one half of the studied participants (47.4%) received secondary and technical education, and 41.2% of them received university and higher education. Forty percent of them were governmental employee. More than half (53.4%) stated that their income wasn't enough.

Table (1): Socio-demographic characteristics of studied mothers

	Socio-demographic characteristics	Studied mothers, Number=352	
		(n)	(%)
Age (Years)	≤20	44	12.5
	21- 25	140	39.7
	26-30	109	31.0
	>31	59	16.8
Mean ± SD. (Range)		26 ± 4.7 (18-40)	
Residence	Rural	153	43.5
	Urban	199	56.5
Educational level	Illiterate	7	2.0
	Primary/preparatory	33	9.4
	Secondary /technical	167	47.4
	University/postgraduate	145	41.2
Occupation	Housewife	116	33.0
	Private working	92	26.1
	Governmental employee	144	40.9
Family Income	Not sufficient	188	53.4
	Just sufficient	164	46.6

Table (2) illustrates the association between dietary habits of lactating mothers and duration of exclusive breast feeding. It was found that there were statistically significant associations between number of meals, eating snacks, and number of snacks and duration of EBF. Also, a statistically significant association has been observed between drinking water/day, drinking fresh juices/day, drinking natural drinks/day, and type of natural drink and period of EBF.

Table (2): Relationship between dietary habits of lactating mothers and duration of exclusive breast feeding

Dietary habits	**Duration of exclusive breast feeding**					**χ2**	**P value**
	Non-exclusive		**Exclusive for 4-6 months**		**Total**		
	number=202		**number =150**		**number =352**		
	(n)	**(%)**	**(n)**	**(%)**			
Meals/ day Two	160	88.4	21	11.6	181	146.525	<0.001*
Three	42	24.6	129	75.4	171		
Main meal Lunch	136	54.4	114	45.6	250		
Dinner	66	64.7	36	35.3	102	3.146	0.07
Missing meal (n=181)							
Breakfast	63	92.6	5	7.4	68		
Lunch	16	80	4	20	20	2.726	0.256
Dinner	81	87.1	12	12.9	93		
Eat snacks Yes	95	43.2	125	56.8	220		
No	107	81.1	25	18.9	132	48.405	<0.001*
Number of snacks/day (n=220)							
1-2	82	46.9	93	53.1	175		
3-4	13	28.9	32	71.1	45	4.710	0.030*
Amount of water /day							
<1 litre	60	78.9	16	21.1	76		
1 litre	89	64.0	50	36	139	36.546	<0.001*
>1 litre	53	38.7	84	61.3	137		
Cups of fresh juice/day							
None	95	73.6	34	26.4	129		
1-2	83	59.3	57	40.7	140	41.660	<0.001*
3-4	24	28.9	59	71.1	83		
Drink natural drinks Yes	98	50.3	97	49.7	195		
No	104	66.2	53	33.8	157	9.089	0.003*
Type of natural drink (n=195)							
Anise	52	65.8	27	34.2	79		
Fenugreek	28	33.3	56	66.7	84	17.740	<0.001*
Mint	18	56.3	14	43.8	32		

χ^2: Chi square test *: Significant

Table (3) illustrates the association between period of exclusive breast feeding and positive clinical signs of lactating mothers. It illustrated that there were significant associations between pallor, thin hair, premature whitening of hair, spooning of nails, and glossitis and duration of EBF. Also, there were significant association between bone tenderness, joint pain, tetany, and paresthesia and duration of EBF.

Table (3): Association between positive clinical signs of lactating mothers and period of exclusive breast feeding

Clinical manifestation	Duration of exclusive breast feeding					$\chi 2$	P value
	Non-exclusive		Exclusive for 4 -6 months		Total		
	n=202		n=150		N=352		
	(n)	(%)	(n)	(%)			
Pallor	72	50.3	71	49.7	143	4.877	0.027*
Thin hair	63	40.4	93	59.6	156	33.116	<0.001*
Premature whitening of hair	86	65.6	45	34.4	131	5.825	<0.001*
Spooning of nails	72	50.3	71	49.7	143	4.877	0.027*
Glossitis	57	48.3	61	51.7	118	5.986	0.014*
Impaired night vision	69	63.3	40	36.7	109	24.583	0.081
Corneal dryness	72	61	46	39	118	0.957	0.328
Bleeding per gum	89	66.4	45	33.6	134	7.217	0.007*
Bone tenderness	85	46.7	97	53.3	182	17.587	<0.001*
Joint pain	85	48.9	89	51.1	174	10.252	0.002*
Tetany	75	55.1	61	44.9	136	0.454	0.500
Parathesis	68	51.1	65	48.9	133	3.424	0.064
Goitre	76	70.4	32	29.6	108	10.741	0.001*

χ^2: Chi square test *: Significant.

Table (4) shows relationship between duration of exclusive breast feeding and anthropometric measurements of the examined mothers. It illustrated that the values of mid upper arm circumference and waist circumference were statistically significantly higher in the group of exclusive breast feeding for 4-6 months than the other non-exclusive group.

Table (4): Relationship between anthropometric measurements of the studied mothers and duration of exclusive breast feeding

Anthropometric measurements	Exclusive breast-feeding duration		Mann-Whitney Test	P value
	Non-Exclusive	Exclusive for 4-6 months		
	n=202	n=150		
Weight (kg)				
Median	70	67	13327	
IQR	65-75	60-75.25		0.053
Height (cm)				
Median	1.63	1.63	14701.50	0.634
IQR	1.58-1.67	1.59-1.65		
Mid upper arm circumference (cm)				
Median	32	34		0.006*
IQR	30-35	32-36	12569	
Waist circumference (cm)				
Median	89	90	12600	0.007*
IQR	82-102	86-115		
Body mass index (kg/m^2)				
Median	26.40	25.48	13629.50	0.107
IQR	24.12-29.41	23.73-29.62		

*: Significant, IQR: Interquartile range

Table (5) and figures (1, 2, and 3), show that the duration of exclusive breast feeding has a significant negative correlation with educational level (r_s = 0.125) and body mass index of mothers (r_s =0.118) and significant positive correlation with dietary diversity score (r_s = 0.669), number of meals per day (r_s = 0.556), and amount of water per day (r_s = 0.265).

Table (5): Correlation between the period of EPF and age, educational level, dietary diversity score, number of meals, amount of water, and body mass index of lactating mothers

(N=352)	Correlation	Duration of exclusive breast feeding
Age of mothers	r_s	-0.029
	P	0.583
Educational level	r_s	-0.125
	P	0.019*
Dietary diversity score	r_s	0.669
	P	0.000*
Number of meals per day	r_s	0.556
	P	0.000*
Amount of water per day	r_s	0.265
	P	0.000*
Body mass index	r_s	-0.118
	P	0.026*
r_s: Spearman correlation coefficient *: Significant.		

DISCUSSION

The nutritional status of lactating mothers has a direct impact on the quality and quantity of breast milk they produce. Inadequate maternal nutrition not only affects the nutritional value of breast milk but may additionally lead to the depletion of maternal nutrient stores, thereby compromising both maternal and infant health [(13)].

Breast milk is universally acknowledged as the most suitable and complete form of nutrition for babies. It is regarded as a powerful public health tool for lowering infant morbidity and mortality rates. Supporting and promoting breastfeeding, especially exclusive breastfeeding, is vital for kid development and survival [(14)]. Breastfeeding is a critical factor in child survival, birth spacing, and the avoidance of pediatric infections. It is a complete food accessible at no cost and an efficient means to offer baby protection in a caring environment [(15)].

This cross-sectional research, performed at the Primary Health Care Center in Kafr El Zayat City, Gharbia Governorate, involved 352 lactating mothers with infants up to six months old. The research primarily aimed to evaluate the mothers' nutritional status and explore its association with the duration of exclusive breastfeeding (EBF).

The socio-demographic characteristics of the research participants, including a mean maternal age of 26 ± 4.7 years and a high level of secondary and higher education, were consistent with findings from similar studies. For example, a 2020 study in Cairo[(16)] and a 2017 study in Bangladesh[(17)] both reported comparable age ranges and educational profiles among lactating mothers.

Consistent with the findings of this research, a 2020 investigation in Cairo aimed at determining the occurrence of breastfeeding between women attending primary health care facilities, examining 400 lactating mothers. The research stated an age range of 18 to 42 years, with a mean age of 29 years and a standard deviation of ± 4.43 years. Approximately 49.5% of the participants attained a university education [(16)].

The findings of the present study correspond with a 2017 investigation carried out in Bangladesh, which aimed to evaluate the nutritional condition of mothers who practiced exclusive breastfeeding and to examine their exclusive breastfeeding practices. The investigation involved 236 mothers, revealing a mean age of 26.1 ± 4.4 years, with an age range of 18 to 36 years [(17)].

Among the socio-demographic characteristics influencing breastfeeding practices, education emerged as a significant factor in the present research. A statistically significant correlation has been observed among the educational level of mothers and the period of exclusive breastfeeding (P-value equal 0.023). Unfortunately, the present research observed a significant negative correlation between the educational level of mothers and the duration of exclusive breastfeeding (EBF) . As the greatest percentage of educated mothers practiced non-exclusive breastfeeding, despite their awareness of its substantial benefits for both child and mother.

This paradox underscores the complex interplay between education and practical challenges. Educated mothers, who are often better informed about the advantages of exclusive breastfeeding, frequently face barriers such as early return to work and insufficient workplace support. These challenges make it difficult for them to maintain exclusive breastfeeding, even with their knowledge of its importance. The demands of employment, coupled with limited maternity leave and workplaces that lack breastfeeding-friendly environments, often force mothers to supplement breastfeeding with formula or wean earlier than recommended.

The outcomes of the present research are consistent with research conducted in China 2019 to detect correlation between maternal education and breastfeeding practices. It observed that there was an association between educational level and duration of exclusive breast feeding as mothers with a greater education were less likely to exclusively breastfeeding their babies [(18)].

In contrast with the outcome of the current research performed in Indonesia in 2021, aimed to

detect the effects of mother's education on achieving exclusive breastfeeding, found that the mother's education level positively affects exclusive breastfeeding practice [19].

Maternal diet significantly influences breastfeeding duration and quality. Missing meals could have a significant impact on the duration of exclusive breastfeeding. When lactating mothers skip meals, it can lead to a decrease in their overall caloric and nutrient intake, which may affect milk production and quality. This can result in shorter periods of exclusive breastfeeding as mothers might struggle to maintain an adequate milk supply [20].

The present research illustrated that three fourths of the mothers who ate three meals per day were exclusively breastfeeding for 4-6 months. More than half of those who ate snacks were exclusively breastfeeding for 4-6 months with statistically significant associations between number of meals (P-value<0.001), eating snacks (P-value<0.001), and number of snacks (P-value=0.030), and duration of EBF. Also, the number of meals (P-value<0.001), eating snacks (P-value<0.001), and number of snacks (p-value=0.032) could be emerged as predictor for EBF duration where there was a positive correlation between number of meals and duration of EBF (r=0.556, p=0.001). The mothers who adhered to EBF demonstrated healthier dietary practices compared to their non-EBF counterparts.

Maternal dietary habits played a crucial role in the duration of EBF. Skipping meals and poor dietary intake were linked to reduced breastfeeding duration. Mothers who consumed three meals per day and incorporated snacks into their diet were significantly more probable to exclusively breastfeed for 4–6 months. This association was supported by statistical analysis and cultural practices, such as the belief that certain traditional foods (e.g., fenugreek) enhance milk supply [21]. In the same line a study conducted in Indonesia in 2018 aimed to detect the nutritional status of exclusive compared to non exclusive breastfeeding mother reported that there were statistically significant associations between main meal, snacks and duration of exclusive breast feeding. The EBF group snacked more often than compared to Non EBF group (p-value equal 0.006) [22].

The current study showed that the EBF mothers reported consuming larger quantities of water, fresh juices, and natural drinks compared to non-EBF mothers with statistically significant associations between amount of water (p-value under 0.001), fresh juices (p-value under 0.001), and natural drinks (p-value equal 0.003), and the duration of EBF. Furthermore, a significant positive correlation has been seen between daily water intake (r=0.265) and the period of exclusive breastfeeding (p-value under 0.001). This result is corroborated by evidence indicating that throughout the 1st six months of exclusive breastfeeding, milk production escalates to an average of 750 milliliters per day. During this period, elevated hydration requirements heighten the possibility of dehydration in breastfeeding, potentially resulting in fatigue, diminished milk production, headaches, muscle cramps, dry mouth, and nausea [23].

When a mother is adequately hydrated, her breast milk remains well-balanced, providing the baby with the hydration they need. Along with water, other hydrating options include milk, juice, soups, and herbal drinks, which explain the highest percentage of lactating mothers taking fresh juices and natural drinks [24].

The results of the current research explain the critical interplay between dietary habits and breastfeeding practices. A well-balanced diet, frequent meals, and proper hydration not only promote maternal health but also play a vital role in sustaining exclusive breastfeeding. Educating the mothers about the importance of these dietary behaviors and providing practical support to maintain them could further enhance breastfeeding outcomes.

The current study revealed a significant connection between the clinical health status of lactating mothers and their ability to sustain exclusive breastfeeding (EBF). Anemia was notably more prevalent among mothers who did not exclusively breastfeed with statistically significant association between manifestation of anemia and duration of EBF (p-value<0.001). Also, anemia could be emerged as a predictor for EBF duration anemia (OR: 2.337and P-value< 0.001). This finding explains the maternal anemia can pose to breastfeeding, as the condition often results in fatigue and diminished energy levels, making it difficult for mothers to produce sufficient milk and maintain the demands of exclusive breastfeeding [25].

Besides, the manifestations of hypocalcemia were statistically significantly more common in non-exclusively breastfeeding mothers (p-value=0.036). This might be due to hypocalcemia pointed to poor sources of calcium in their diet making it challenging for mothers to exclusively breastfeed for the recommended six months. Also, symptoms of hypocalcemia as muscle cramps, fatigue, and irritability can affect a mother's overall well-being and the ability to maintain exclusive breastfeeding and due to the challenges associated with hypocalcemia mothers may find it difficult to maintain exclusive breastfeeding, leading to earlier introduction of complementary foods [21]. Moreover, goiter was statistically significantly more common among non-exclusively breastfeeding mothers (p-value<0.001). This can be explained by hypothyroidism that can lead to delayed lactogenesis and reduced milk supply as thyroid hormones are crucial for normal breast development and milk production. Also, symptoms of hypothyroidism, such as fatigue, low energy, weight gain, and depression can make it challenging for mothers to maintain the energy and motivation needed for exclusive breastfeeding [26].

The current study found a clear link between the clinical signs of nutritional deficiencies in lactating mothers and the duration of exclusive breastfeeding.

Nutritional deficiencies, as indicated by clinical signs such as anemia, hypocalcemia, and iodine deficiency, were more commonly observed in mothers who did not exclusively breastfeed. This can be attributed to the variances in dietary habits between the two groups. Non-exclusively breastfeeding mothers often had a less balanced diet with limited dietary diversity, which likely contributed to poorer nutritional status. On the other hand, mothers who practiced exclusive breastfeeding tended to follow a more diverse and balanced diet, supporting their overall health and enabling them to maintain breastfeeding for longer periods.

DECLARATION

- **Data availability**: Data are accessible on reasonable request form the corresponding author.
- **Conflict of Interest:** "None."
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