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Influence of Infants Feeding Practices on Their Patterns of Growth in El Beheira Governorate

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Abstract

Background: Adequate nutrition during infancy is crucial for proper growth and development as the growth rate in the life of human beings is maximal during the first year of life. **Aim of this study** is to assess the influence of infants feeding practices on their patterns of growth in El Beheira Governorate**. Research design:** a descriptive cross sectional research design. **Settings:** Eight governmental primary health care facilities in 4 health directorates in El Beheira Governorate. **Subjects:** A convenient sample of 361 infants' mothers. **Data collection tools:** Three tools were used: **Tool (I):** Mothers and Infants' Profile Structured Interview Schedule. **Tool (II):** Infant Feeding Practices Study II (IFPS II) Structured Interview Schedule. **Tool (III):** World Health Organization (WHO) Growth Chart for Infant Growth Pattern Assessment. **Results:** More than one third (35.1%) of the infants in the present study had under nutrition, among them, 14.1%, 13% and 8% were stunted, underweight and wasted, respectively, while only 3.6% of them were obese. A statistically significant relation was existed between underweight and socioeconomic level, duration of Exclusive Breast Feeding, Current feeding pattern. A statistically significant relation was found between stunting and socioeconomic level, and duration of exclusive breastfeeding. **Conclusion:** Both maternal and child related factors are associated with malnutrition in infants and most of these factors are preventable. **Recommendations:** Scale up interventions is recommended to improve nutrition status among infants and children including the promotion and support of breastfeeding, giving safe and appropriate complementary feeding as core interventions.

Keywords: Feeding Practices, Infants, Influence & Patterns of Growth

Introduction

Infancy is the period from birth through the completion of the 12th month of life **(Hoffmann et al., 2021)**. Infancy has been declared as a "critical window" for the promotion of optimal growth, health and behavioral development across the life span; as optimal nutrition during this period lowers morbidity and mortality rates and reduces the risk of overweight and under nutrition especially stunting **(Ukpabi et al., 2021)**.

According to World Health Organization (WHO) and the American Academy of Pediatrics (AAP), exclusive breastfeeding during the first six months of life and continued breastfeeding during the first year of life, combined with the addition of complementary feeding after six months is important to ensure adequate nutrient intake in line with infants' nutritional requirements. There is a strong evidence that noncompliance to these guidelines may contribute to malnutrition **(Shinn et al., 2018)**.

Poor infant feeding practices are a major threat to children's health; they are among the most serious difficulties that face infants to maintain health. No more than 35% of infants worldwide are exclusively breastfed during the first four months of life **(Washeel et al., 2019)** and complementary feeding frequently begins too early or too late, also foods are often nutritionally inadequate and unsafe **(Olatona et al., 2017)**. Infants who experience poor growth or failure to thrive are likely to have cognitive deficits and long term health complications. Therefore, optimal nutrition is critical during the first year of life, as poor nutritional health may have implications for future negative health consequences **(Wells et al., 2020)**.

Growth during the first year of life is greater than at any other time after birth **(Hanley-Cook et al., 2020)**. Infants' growth is monitored by growth charts which are essential component of the pediatric toolkit. They are useful in assessing children's nutritional status, as well as the observation of patterns in growth performance. When these measurements are taken repeatedly on the same individual over time, it makes

the analysis of the growth process more reliable **(Alfani et al., 2019)**.

The prevalence of breast and complementary feeding differs from one country to another and from one society to another; this of course is due to cultural and religious factors. Mother's practices related to breastfeeding and complementary feeding were not optimum and efforts should be done to modify their behaviors and reinforce healthy feeding practices **(Potts et al., 2021)**.

Community health nurses in primary health care facilities play an important role, as they contribute in health promotion and disease prevention. They have an important role in teaching mothers, providing guidance, giving information and counseling about the benefits of breast-feeding, and giving a timely, safe and adequate complementary feeding with continued breast-feeding. Nurses were also tasked with encouraging mothers to receive preventative services such as screenings and counseling through public health education about the appropriate infant feeding practices **(Messito et al., 2020)**. Therefore, this study is an attempt to assess the influence of infants feeding practices on their patterns of growth in El Beheira governorate.

Significance of the study

Malnutrition is one of the principal underlying causes of death for many of the world's children, contributing to more than a third of under-five deaths globally **(Raikhola et al., 2021)**. Generally, the risk of malnutrition in the first 2 years of life has been directly linked with poor breastfeeding and complementary feeding practices of mothers together with high rates of infectious diseases **(Ulak & Tiwari, 2020)**. Globally in 2020, 149 million children under-five years were estimated to be stunted, 45 million were estimated to be wasted, and 38.9 million were overweight or obese. Around 45% of deaths among children under-five years of age are linked to under nutrition. These mostly occur in low- and middle-income countries **(Krebs et al., 2021)**. In Egypt, despite the investment in the health sector, and a notable decline in child mortality, Malnutrition rates remain high particularly among children under-five, stunting among under-five children remained at 21 percent in 2014, while child wasting and underweight stood at 8 and 6 percent, respectively **(Fanzo et al., 2019)**. With two thirds of child mortality attributable to malnutrition, Egypt stands as one of the 36 countries, where 90 percent of the global burden of malnutrition falls **(Abdel Ghafar, 2021)**.

Aim of the study:

To assess the influence of infants feeding practices on their patterns of growth in El Beheira Governorate.

Research Question:

What is the infants feeding pattern that effect on their growth ?

Materials and methods

Research design:

A descriptive cross sectional research design was used to carry out this study

Setting:

The study was carried out in 8 governmental primary health care facilities (4 Maternal and Child Health Centers (MCH) and 4 rural health units) in 4 health directorates in El Beheira Governorate namely: Damanhour, El-Mahmoudia, Itay Elbaroud and Kom hamada.

Subjects

Infant's mothers attending the previously mentioned settings who fulfilled the following inclusion criteria:

- Mothers of infants (9-12) months of age.
- Infants don't have any disease that may affect growth patterns or alter oral feeding (e.g., Cystic Fibrosis, Neurological Deficits, Short Bowel Syndrome, Multiple Food Allergies, Cerebral Palsy, and Down Syndrome).
- Birth weight not less than 2500 gm.
- Willing to participate in the study.

Sampling technique

El Beheira Governorate is composed of 16 health directorates; four health directorates (25%) were selected randomly. From each health directorate, one MCH and one rural health unit were selected by using equal allocation technique based on the highest frequency of infants' mothers to be included in the study. A total number of 4 MCH centers and 4 rural health units were selected. A convenient sample of 361 mothers of infants was selected accordingly from the previously selected settings and who fulfilled the inclusion criteria.

Sample size

It was calculated by using Epi-info 7 software program through applying the following information: Population size 5788 for the last three months, Expected frequency 50%, Acceptable error 5%, and Confidence co-efficient 95%. Minimal sample size estimated was 361 mothers of infants for conducting this study.

Tools for data collection

Three tools were used in order to collect the required data:

Tool I: Mothers and Infants' Profile Structured Interview Schedule: this tool was developed by the researcher in order to collect data about the studied infants. It included the following parts:

Part I: Mothers' Profile

This section included: age, religion, age of marriage, residence (urban, rural), socioeconomic level of

mothers was measured based on updated social scale **(Fahmy et al., 2015).**

Social class assessed by using Family Socioeconomic Status Scale (SES). This scale was generated in 1983 by Fahmy and El-Sherbini then; it updated and validated by Fahmy and El-Sherbini in 2015 in English language.The resultant total score was transferred in to percentage and classified into three social classes as follow:

Score	Interpretation
<40%	Low class
40 % to<70%	Medium class
≥70% Total	High class

Part II: Infants' Profile

This section included: age in months, birth order, birth weight, birth length, current weight and length, previous four recorded measurements of weight and length and history of medical and surgical problems (history of any disease or treatment in the preceding month e.g.: common cold, diarrhea or pneumonia).

Tool II: Infant Feeding Practices Study II (IFPS II) Structured Interview Schedule:

The Infant Feeding Practices Study II was a national US-based longitudinal mail-in survey conducted from 2005 to 2007 by the Food and Drug Administration in collaboration with the Center for Disease Control and Prevention (CDC) and other US government agencies **(Sadacharan et al., 2013)** to characterize US infant feeding practices to obtain information about the infants' health, factors that may affect the infants' feeding **(Labiner-Wolfe et al., 2008; Leila M Shinn et al., 2018)**.

The IFPS II was classified into four parts:

Part I: the birth history**, Part II:** the mother and the infant in the first few weeks, **Part III:** feeding of the infant, **Part IV:** infant's other health related information

Tool III: WHO Growth Chart for Infant Growth Pattern Assessment:

The anthropometric data were collected based on standard methods (WHO Standardized Growth Chart) to assess the nutritional status of under-five children, Weight and height against age were used as indicators to identify nutrition status of the infants **(Perumal et al., 2020)**.

Methods

The study was implemented according to the following steps:

Administrative process:

- Official letter from Faculty of Nursing, Damanhour University was directed to health and population directorate in El-Beheira Governorate to inform them about the study objectives and to seek their permission to conduct the study in the previous settings.
- Approval letter was directed from health and population directorate in El-Beheira Governorate to the directors of selected governmental primary health care facilities through the researcher.
- Meetings was held with the managers of the selected settings to explain the aim of the study, notify the data collection time, assure them that collected data were used only for the study purpose, and to gain their approval and cooperation during data collection.

Development of study tools:

- Tool **(I)** and tool **(III)** were developed by the researcher after reviewing recent literature in order to collect the required data from the studied mothers.
- Tool **II (IFPS II**) was adopted by the researcher and it was translated into Arabic version.
- Content validity of the study tools **(I, III)** and translation of tool **II** was tested by a Jury consists of a group of (3) experts in the field of community health nursing in order to ascertain that content of tools were clear.
- Tool III was tested for reliability using the cronbach's alpha coefficient test which indicated an accepted reliability of the tool ($\alpha = 0.864$).

Pilot study

The Pilot study was carried out on 10 % of the selected subjects (36 mothers) who were chosen randomly and then were excluded from the study sample to assure the clarity and applicability of the study tools and to estimate time needed for data collection.

The data collected from the pilot study was analyzed. Based on the results of the pilot study, accordingly, the necessary modifications were applied.

Collection of data:

- The data were collected individually by interviewing each mother who attended the study setting after a brief clarification of the purpose and the nature of the study and assure them that collected data were used only for the study purpose, and to gain their approval and cooperation during data collection.
- Infant's weight was measured by a standardized weighing scale from the study setting, in kilograms.
- Recumbent Length was measured on infant's back with recumbent horizontal length scale featuring a headboard and moveable footboard, holding the head against the headboard. With the head facing upward measure the length by bringing the footboard up to the heels. Ensure that the legs are flat at the knee joints.

- Previous four recorded measurements of infants' weight and length were obtained from the infant's record.
- Each interview took approximately from 30-40 minutes.
- Data were collected over a period of 4 months (from February 2021 to June 2021).

Statistical analysis:

- **After data collection**, the collected data were coded and transferred into especially designed format to be suitable for computer feeding.
- Data were entered into computer and analyzed using the statistical package of social science (**SPSS**) version 20.
- **After data entry**, data were checked and revised through frequency analysis, cross tabulation, and manual revision to discover any error during data entry.
- Variables were analyzed using the **descriptive statistics** which included: percentages, frequencies, range (minimum and maximum), arithmetic mean, and standard deviation (SD).
- The level of significance selected for this study was **$p \leq 0.05$**.
- Chi square test (**x2**) was used for testing the relationship between categorical variables.
- Graphs were done for data visualization by using Microsoft Excel program.

Ethical consideration

- Permission was obtained to collect the data from the previous setting.
- Each director of selected setting was informed about the date and the time of data collection.
- Written informed consent was obtained from the mothers included in the study after explanation of the aim of the study and assure them that collected data will be used only for the study purpose.
- Confidentiality and anonymity of individual response was guaranteed by using a code numbers as an alternative of names.

Results

Table (1): Distribution of The Studied Mothers according to their Socio-Demographic Characteristics

Mothers' Personal Data and Socio-Demographic Characteristics	Total (N= 361)	
	No.	%
Age (years)		
20-	44	12.2
25-	165	45.7
30-	85	23.5
35-40	67	18.6
Min – Max 19 – 39 Mean ± SD	29.41±4.481	
Mother's Educational Qualifications		
- Illiterate	18	5.0
- Read & Write	17	4.7
- Primary education	7	1.9
- Preparatory education	27	7.5
- Secondary / technical education	140	38.8
- University education	152	42.1
Mother's Working Status		
- Housewife	271	75.1
- Working	90	24.9
Place of Residence		
- Urban	201	55.7
- Rural	160	44.3
Socioeconomic Level		
- Low	46	12.7
- Low middle	33	9.1
- High middle	17	4.7
- High	265	73.4

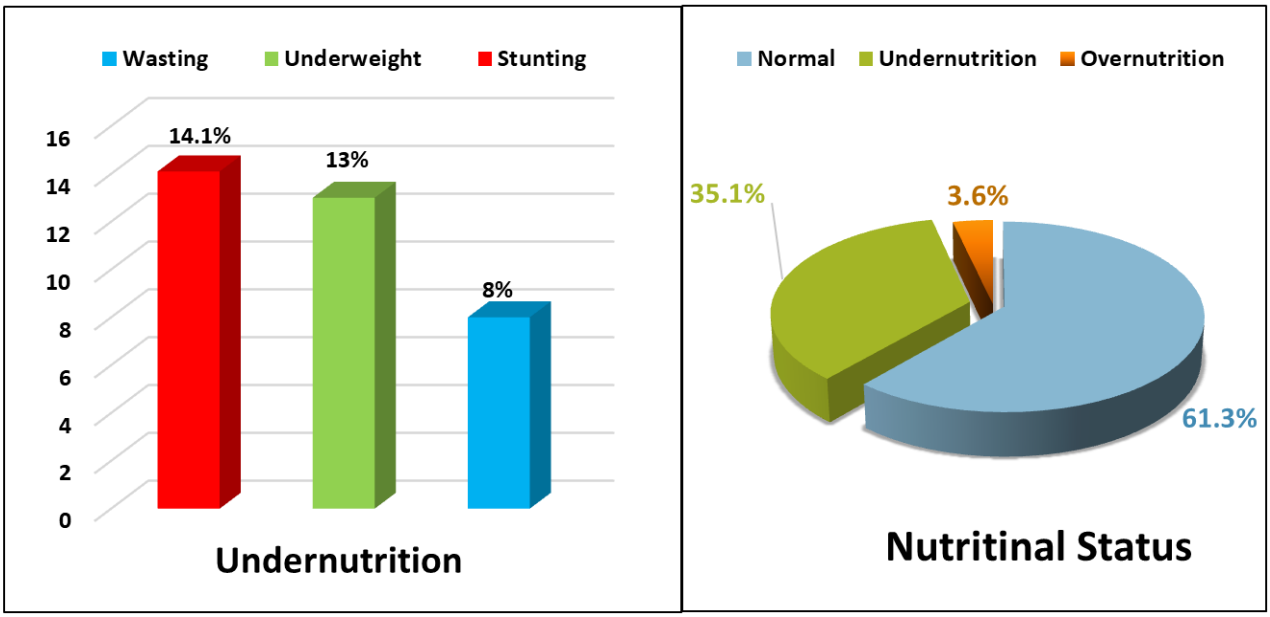

Figure (1): Distribution of the Infants according to their Weight for Age, Length for Age and Weight for Length

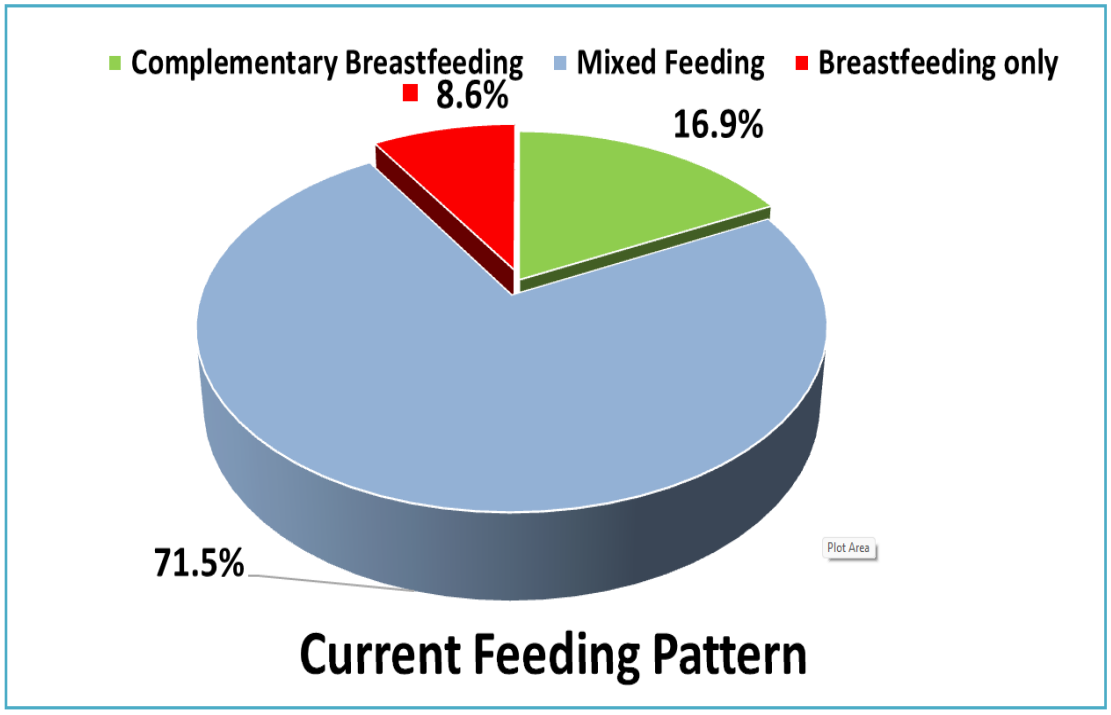

Figure (2): The Distribution of the Studied Mothers according to their infants' Current Feeding Pattern.

Table (2): Relation between Infants' Weight and Socio Demographic Characteristics of Mothers:

Mothers' Personal Data and Socio Demographic Characteristics	Weight for Age						Total (N= 361)		Test of Significance
	Under-weight (N= 47)		Normal (N= 301)		Obesity (N= 13)				
	No.	%	No.	%	No.	%	No.	%	
Age (years)									
20-	2	4.5	42	95.5	0	0.0	44	12.2	X2= 19.122
25-	20	12.1	140	84.8	5	3.0	165	45.7	P=0.004*
30-	16	18.8	61	71.8	8	9.4	85	23.5	
35-40	9	13.4	58	86.6	0	0.0	67	18.6	
Mother's Education									
- Illiterate	17	94.4	1	5.6	0	0.0	18	5.0	X2= 311.894
- Read & Write	17	100.0	0	0.0	0	0.0	17	4.7	P=0.000*
- Primary education	7	100.0	0	0.0	0	0.0	7	1.9	
- Preparatory education	5	18.5	22	81.5	0	0.0	27	7.5	
- Secondary / technical education	0	0.0	131	93.6	9	6.4	140	38.8	
- University education	1	0.7	147	96.7	4	2.6	152	42.1	
Mother's Working Status									
- Housewife	46	17.0	213	78.6	12	4.4	271	75.1	X2= 18.103
- Working	1	1.1	88	97.8	1	1.1	90	24.9	P=0.000*
Place of Residence									
- Urban	8	4.0	182	90.5	11	5.5	201	55.7	X2= 35.667
- Rural	39	24.4	119	74.4	2	1.2	160	44.3	P=0.000*
socioeconomic Level									
- Low	46	100.0	0	0.0	0	0.0	46	12.7	X2= 355.154
- Middle	0	0.0	50	100.0	0	0.0	50	13.9	P=0.000*
- High	1	0.4	251	94.7	13	4.9	265	73.4	
Age at Marriage									
<18	8	25.8	23	74.2	0	0.0	31	8.6	X2= 19.615
18-21	34	16.7	162	79.8	7	3.4	203	56.2	P=0.003*
22-29	4	4.0	89	89.9	6	6.1	99	27.4	
30-35	1	3.6	27	96.4	0	0.0	28	7.8	

*X2 Chi Square Test * statistically significant at p ≤ 0.05*

Table (3): Relation between Infants' Weight and their Feeding pattern:

Infants' feeding Pattern	Weight for Age						Total N=361		Test of Significance
	Under-eight (N= 47)		Normal (N= 301)		Obesity (N= 13)				
	No.	%	No.	%	No.	%	No.	%	
Current Feeding Pattern									
- Breastfeeding only	19	45.2	23	54.8	0	0.0	42	8.6	X2= 129.602
- Mixed feeding	1	0.4	244	94.6	13	5.0	258	71.5	P=0.000*
- Complementary BF	3	4.9	58	95.1	0	0.0	61	16.9	
Initiation of BF									
< 2 hours	0	0.0	43	100.0	0	0.0	43	11.9	X2= 108.483
2- < 6 hours	28	20.0	108	77.1	4	2.9	140	38.8	P=0.000*
6- <12 hours	18	29.5	43	70.5	0	0.0	61	16.9	
12-<24 hours	1	1.1	86	98.9	0	0.0	87	24.1	
≥24 hours	0	0.0	21	70.0	9	30.0	30	8.3	
Pre lacteal Feeding at hospital									
- Water	0	0.0	19	100.0	0	0.0	19	5.3	X2= 46.376
- Artificial milk	1	0.8	116	92.1	9	7.1	126	34.9	P=0.000*
- Water with sugar	0	0.0	18	100.0	0	0.0	18	5.0	
- Other drinks	46	23.2	148	74.7	4	2.0	198	54.8	
Duration of Exclusive Breastfeeding as Recommended by Pediatrician									
- Four months	1	0.4	212	95.1	10	4.5	223	61.8	X2= 81.628
- Six months	46	33.3	89	64.5	3	2.2	138	38.2	P=0.000*
Child Age at Start of Complementary Breastfeeding									
<6	4	4.0	89	89.9	6	6.1	99	27.4	X2= 19.615
6-8	34	16.7	162	79.8	7	3.4	203	56.2	P=0.003*
>8	8	25.8	23	74.2	0	0.0	31	8.6	
Not yet started	1	3.6	27	96.4	0	0.0	28	7.8	

*X2 Chi Square Test * statistically significant at p ≤ 0.05*

Table (4): Relation between Infants' Length and their and Socio Demographic Characteristics of Mothers:

Mothers' Personal Data and Socio Demographic Characteristics	Length for Age						Total (N= 361)		Test of Significance
	Stunting (N= 51)		Normal (N= 303)		Above Average (N= 7)				
	No.	%	No.	%	No.	%	No.	%	
Age (years)									
20-	2	4.5	42	95.5	0	0.0	44	12.2	X2= 28.349
25-	23	13.9	142	86.1	0	0.0	165	45.7	P=0.000*
30-	15	17.6	63	74.1	7	8.2	85	23.5	
35-40	11	16.4	56	83.6	0	0.0	67	18.6	
Mother's Education									
- Illiterate	13	72.2	5	27.8	0	0.0	18	5.0	X2= 249.454
- Read & Write	17	100.0	0	0.0	0	0.0	17	4.7	P=0.000*
- Primary education	7	100.0	0	0.0	0	0.0	7	1.9	
- Preparatory education	10	37.0	17	63.0	0	0.0	27	7.5	
- Secondary / technical education	0	0.0	135	96.4	5	3.6	140	38.8	
- University education	4	2.6	146	96.1	2	1.3	152	42.1	
Mother's Working Status									
- Housewife	48	17.7	216	79.7	7	2.6	271	75.1	X2= 14.528
- Working	3	3.3	87	96.7	0	0.0	90	24.9	P=0.001*
Place of Residence									
- Urban	11	5.5	185	92.0	5	2.5	201	55.7	X2= 28.300
- Rural	40	25.0	118	73.8	2	1.2	160	44.3	P=0.000*
Age at Marriage									
<18	6	19.4	25	80.6	0	0.0	31	8.6	X2= 19.519
18-21	38	18.7	163	80.3	2	1.0	203	56.2	P=0.003*
22-29	7	7.1	87	87.9	5	5.1	99	27.4	
30-35	0	0.0	28	100.0	0	0.0	28	7.8	
Socioeconomic Level									
- Low	42	91.3	4	8.7	0	0.0	46	12.7	X2= 264.801
- Low middle	5	15.2	28	84.8	0	0.0	33	9.1	P=0.000*
- High middle	0	0.0	17	100.0	0	0.0	17	4.7	
- High	4	1.5	254	85.8	7	2.6	265	73.4	

X2 Chi Square Test ***** *Statistically significant at p ≤ 0.05*

Table (5): Relation between Infants' Length and their Feeding Pattern.

Feeding Pattern	Length for Age						Total N=361		Test of Significance
	Stunting (N= 51)		Normal (N= 303)		Above Average (N= 7)				
	No.	%	No.	%	No.	%	No.	%	
Current Feeding Pattern									
- Breastfeeding only	20	47.61	22	52.4	0	0.0	42	8.6	X2= 119.050
- Mixed feeding	4	0.6	247	95.7	7	2.7	258	71.5	P=0.000*
- Complementary BF	2	3.3	59	96.7	0	0.0	61	16.9	
Initiation of BF									
< 2 hours	0	0.0	43	100.0	0	0.0	43	11.9	X2= 74.108
2- < 6 hours	28	20.0	110	78.6	2	1.4	140	38.8	P=0.000*
6- <12 hours	19	31.1	42	68.9	0	0.0	61	16.9	
12-<24 hours	3	3.4	84	96.6	0	0.0	87	24.1	
≥24 hours	1	3.3	24	80.0	5	16.7	30	8.3	
Pre lacteal Feeding at Hospital									
- Water	5	26.3	14	73.7	0	0.0	19	5.3	X2= 29.430
- Artificial milk	4	3.2	117	92.9	5	4.0	126	34.9	P=0.000*
- Water with sugar	0	0.0	18	100.0	0	0.0	18	5.0	
- Other drinks	42	21.2	154	77.8	2	1.0	198	54.8	
Duration of Exclusive Breastfeeding as Recommended by Pediatrician									
- Four months	6	2.7	212	95.1	5	2.2	223	61.8	X2= 62.903
- Six months	45	32.6	91	65.9	2	1.4	138	38.2	P=0.000*
Child Age at Start of Complementary Breastfeeding									
<6	7	7.1	87	87.9	5	5.1	99	27.4	X2= 19.519
6-8	38	18.7	163	80.3	2	1.0	203	56.2	P=0.003*
>8	6	19.4	25	80.6	0	0.0	31	8.6	
Not yet started	0	0.0	28	100.0	0	0.0	28	7.8	

X2 Chi Square Test ***** *statistically significant at p ≤ 0.05*

Table (1): Illustrates the distribution of the studied mothers according to their socio-demographic characteristics. Regarding the **age of the studied mothers**, it was observed from table that it ranged from 19 to 39 years. With respect to **the mothers' education**, less than half (42.1%) of mothers had university education, followed by more than one third (38.8%) of them had secondary or technical education .Pertaining to **mother's working status**, the table depicts that three quarters (75.1%) of the studied mothers were housewives. In relation to **residence**, it is clear from the table that more than half (55.7%) of the studied mothers were living in urban areas, while 44.3% were rural residents. With respect to **socioeconomic level,** nearly three quarters (73.4%) of the studied infants**'** families were of a high socioeconomic level, followed by more than one tenth (12.7%) of them were of a low socioeconomic level.

Figure (1): Illustrates the Distribution of Infants according to their Weight for Age, Length for Age and Weight for Length. Regarding the WHO growth reference standard by using z. score growth chart, the figure shows that nearly two thirds (61.3%) of the infants were normal. On the other hand, more than one third (35.1%) of them were having under nutrition, among them, 14.1%, 13% and 8% of them were stunted, underweight and wasted, respectively, while only 3.6% of them were obese.

Figure (2): Illustrates the Distribution of the Studied Mothers according to their infants' Feeding. The figure shows that, less than three quarters (71.5%) of them feed their infants mixed feeding, followed by less than one fifth (16.9%) of them feed their infants Complementary BF, while only 8.6% of them feed their infants only breast milk.

Table (2): Illustrates the relation between infants' weight and socio demographic characteristics of mothers: Regarding to **mothers' age**, the majority (95.5%) of the studied mothers aged from 20 to less than 25 years had infants with normal weight for age. On the other hand, nearly one fifth (18.8%) of those aged from 30 to less than 35 years had infants with underweight. Highly statistically significant relationship was found between mothers' age and their infants' weight for age. (X2= 19.122, **P** = 0.004). With respect to **mother's education,** the majority (94.4%) of the illiterate mothers had infants with underweight A statistically significant association was observed between mothers' education and their infants' weight for age (X2= 311.894, **P** = 0.000).

Regarding **the Place of residence**, the majority (90.5%) of the studied mothers who were living in urban areas had infants with normal weight for age, compared to one quarter (24.4%) of the studied mothers from rural areas had infants with underweight. The place of residence was statistically related with the infants' weight for age (X2= 35.667, P = 0.000). With respect to **socioeconomic level,** the majority (94.7%) of the studied infants**'** families of high socioeconomic level had infants with normal weight for age, While 100% of studied infants' families of low socioeconomic level had infants with under-nutrition. Highly statistically significant relationship was detected between Socioeconomic level of the family and the infants' weight for age (X2= 355.154, P = 0.000).

Table (3): Relation between Infants' Weight and their Feeding pattern:

Pertaining the **Current feeding pattern**, the majority (94.6%) of mothers who gave mixed feeding to their infants had infants with normal weight for age, compared to less than half (45.2%) of mothers who gave only breastfeeding had infants with underweight. There was a statistically significant association between current feeding pattern and the infants' weight for age (X2= 129.602, P = 0.000).

Regarding the **duration of exclusive breastfeeding as recommended by pediatrician**, the majority (95.1%) of infants whose mothers breastfeed them exclusively for 4 months had normal weight for age, compared to one third (33.3%) of infants whose mothers breastfeed them exclusively for 6 months were underweight. A highly statistically significant relationship was observed between the duration of exclusive breastfeeding and the infants' weight for age (X2= 81.628, P = 0.000).

Concerning the **child age at start of complementary feeding**, 89.9% of mothers who started complementary feeding to their infants at age less than 6 month had infants with normal weight for age, compared to more than one quarter (25.8%) of mothers who started complementary feeding after age of eight months had infants with underweight, A statistically significant association was observed between the child age at start of complementary feeding and the infants' weight for age (X2= 19.615, P = 0.003).

Table (4): Illustrates the Relation between Infants' Length for Age and their Mothers' Personal Data and Socio Demographic Characteristics:

Regarding **mother's age**, the majority (95.5%) of the studied mothers aged from 20 to less than 25 years had infants with normal length for age, compared to nearly one fifth (17.6%) of those aged from 30 to less than 35 years who had infants with stunting. There was a statistically significant association between the age of mothers and their infants' length for age. (X2= 28.349, **P** = 0.000).

Regarding **the Place of residence**, the majority (92.0%) of the studied mothers living in urban areas had infants with normal length for age, compared to one quarter (25%) of the studied mothers from rural

areas had infants with stunting. A highly statistically significant link was found between place of residence and the infants' length for age (X2= 28.300, P = 0.000).

With respect to **socioeconomic level**, 85.8% of the studied infants**'** families of high socioeconomic level had infants with normal length for age, while 91.3% of the studied infants' families of low socioeconomic level had infants with stunting. A statistically significant relationship was reported between socioeconomic level of the family and the infants' length for age (X2= 264.801, P = 0.000).

Table (5): Illustrates the Relation between Infants' Length and their feeding pattern.

Pertaining the **Current feeding pattern**, 96.7% of mothers who gave complementary breastfeeding to their infants had infants with normal length for age, compared to nearly half (47.6%) of mothers who gave only breastfeeding had infants with stunting. A highly statistically significant link was reported between current feeding pattern and the infants' length for age (X2= 119.050, P = 0.000).

Regarding the **duration of exclusive breastfeeding as recommended by pediatrician**, the majority (95.1%) of infants whose mothers breastfeed them exclusively for 4 months had normal length for age, compared to nearly one third (32.6%) of infants whose mothers breastfeed them exclusively for 6 months were stunting. A statistically significant link was detected between the duration of exclusive breastfeeding as recommended by pediatrician and the infants' length for age (X2= 62.903, P = 0.000).

Discussion

Proper feeding practices are essential for maintaining proper nutrition, health, and development of infants. Results of studies on infant and child feeding have indicated that inappropriate feeding practices can have profound negative consequences for the growth, development, and survival of infants and children, particularly in developing countries **(Palmquist & Gribble, 2018; Akther et al., 2019; Hoffman et al., 2019)**.

Malnutrition is a violation of a child's right to survival and development. Today the world faces double burden of under nutrition, especially in developing countries where under nutrition contributes to about one third of all child deaths **(Lokossou et al., 2021 & Nguyen et al., 2021)**.

In Egypt, despite the investment in the health sector, and a notable decline in child mortality, Malnutrition rates remain high particularly among children under-five **(Keats et al., 2021)**. Thus, addressing the influence of infant feeding practices on their pattern of growth in El Beheira Governorate may be an important approach to reducing the burden of child malnutrition.

Malnutrition can be assessed at different levels to determine the nutritional status of infants and therefore detection of infants with normal nutritional status, and those at risk of malnutrition or malnourished. Several factors should be assessed such as infants' anthropometric measurements (weight and length) and comparing these measurements to The WHO growth reference standard **(Sunjaya et al., 2021)**.

Regarding the WHO growth reference standard, the present study revealed that more than one third of the studied infants were malnourished; prevalence of stunting, underweight and wasting among study participants were 14.1%, 13.0% and 8.0% respectively. the prevalence of stunting and wasting among infants in this study was lower than that observed by Derso et al., (2017) in Ethiopia **(Derso et al., 2017)** who reported that the prevalence of stunting and wasting among study participant was 58.1% and 17.0% respectively. Similar magnitude of underweight was reported by Baharudin (2019) in Malaysia **(Baharudin et al., 2019)** but the prevalence of stunting and wasting was higher (17% and 11%, respectively). The discrepancy might be related to variations in residence, culture and level of socioeconomic status between the study participants.

In the current study, several maternal factors were found to be associated with infant malnutrition and affecting their growth such as age of mother, mother's age at marriage, education, working status, residence, socioeconomic status and Mother's knowledge regarding child's growth and development.

Regarding age of mothers in this study, it ranged from 19 to 39 years. It is obvious from this study that Children born to older women had higher odds of underweight and stunting than children of younger women. These findings were in agreement with the findings of Woldeamanuel and Tesfaye (2019) in Ethiopia**(Woldeamanuel & Tesfaye, 2019)** to assess the risk factors associated with stunting, wasting, and underweight of children. While contraindicated with the findings of Kinanthi et al., (2021) in Indonesia **(Kinanthi et al., 2021)** to assess the nutritional status and associated factors in children between the ages 0-2 years old. This could be explained by that mothers older than 30 years are more likely to have many young children, who might compete for the available care resources, which can affect good care practices and consequently their children growth outcomes.

Early marriage (before 18 years) increased the risk of child malnutrition **(Azinar et al., 2022)**. In this study, the prevalence of stunting and underweight were high among children whose their mothers got married at age less than 20 years. This result is consistent with

the study conducted in Pakistan by Khan et al., (2019) **(Khan et al., 2019)** who reported that stunting and underweight were high among children whose their mothers got married at age less than 18 years. This could be explained by that a pregnant woman cannot provide a good supply of food from her body to the fetus as they still need to provide for their own growth and developmental needs, Therefore, pregnancy in such women increases the drain of their already low reserve of nutrients and thus increases the probability of delivering low birth weight infants.

Maternal education plays a central role in children's health and nutrition. The vital role that maternal education plays in promoting positive child health outcomes was observed in the present study which revealed that infants of mothers with higher education levels were less likely to have malnutrition which manifests as underweight, wasting, and stunting than those of illiterate or having primary school education mothers. These findings were agree with the findings in China by **Liu et al., (2019) & (Liu et al., 2021)** to assess the prevalence of malnutrition and associated factors of stunting among 6–23-month-old infants. This could be explained by the higher the level of education of a woman, the more knowledge about the use of health facilities, family planning methods, and the health of her children, the more accurate care will be provided for the infant.

In the current study, it was obvious that mother's working status was significantly associated with child's growth. Underweight and stunting were higher among infants whose their mothers are housewives compared to those whose their mothers are working. These results were contraindicated with the study by **Dwinanda et al., (2021)** in Indonesia**(Dwinanda et al., 2021)** to determine the consequence of a mother's work status on children's health, illustrated that the status of a mother's work has a significant and negative effect on children's growth. The variance may be attributed to that mothers' employment status positively affects the growth of children by increasing family income, and consequently able to provide nutritious food for their children, good sanitation, and optimal health care.

Residence may give an idea about the circumstances in which the children live. UNICEF in (2015) reported that the children who settled in urban areas were significantly more likely to be malnourished compared to those of rural areas.**(Asim & Nawaz, 2018)** The same was observed from the results of **Khan et al., (2019)** in Pakistan.**(Khan et al., 2019)** On the contrary, Results of the present study showed that the overall prevalence of underweight and stunting among infants was significantly higher among children who live in rural area. These findings could be explained by the fact that rural residence is characterized by low social rank, low educational level for mothers, poor water supply, difficulty accessing to health services, and high incidence of infectious diseases which are reflected negatively on the nutritional status of the children.

According to UNICEF, one of the things that underlie the occurrence of malnutrition in children under five is socio-economic factors.**(Kinanthi et al., 2021)** This study approved that socioeconomic status had association with child growth. Lower socioeconomic status was associated with high rate of under nutrition. The same was postulated by Pravana et al., (2017) in Nepal,**(Pravana et al., 2017)** John (2018) in Puducherry,**(John & John, 2018)** and Bogale et al., (2020) in Southern Ethiopia.**(Bogale et al., 2020)** This could be explained by the fact that children from families of low socioeconomic status have limited access to food, health services, hygiene and sanitation.

The WHO recommends that all neonates should be breastfed within one hour of birth. The current study portrayed that early initiation of breastfeeding within an hour of birth has been connected with better nutrition outcomes and less risk for malnutrition. This was parallel with Sirajuddin et al., (2021) in Indonesia **(SIRAJUDDIN et al., 2021)** who found that early initiation of breastfeeding is protective against child stunting, while the findings by Ishwarji et al., (2019) in India **(Ishwarji et al., 2019)** portrayed that no significant association was observed between undernutrition and time of breast-feeding initiation. This may be attributed to that early breastfeeding initiation in the first hour of life is associated with the establishment of longer and more successful breastfeeding and ensures that the infant will get the highly nutritional and immunological benefits of colostrum.

Although there are many health programs applied for promoting skin to skin contact and early initiation of breastfeeding, pre-lacteal feeding (PLF) is still considered one of the barriers of optimal breastfeeding practices **(Yacout & Ouda)**. The present study found that infants receiving pre-lacteal food were more likely to be underweight and stunted. This result is consistent with the findings of Hanifah et al., (2018)**(Hanifah et al., 2018)** who found that children receiving pre-lacteal feeding were more likely to be stunted. This may be due to that pre-lacteal feeding diminishes the immunological benefits a newborn receives from colostrum and it exposes the baby to risk of infection, pneumonia, diarrhea, ear infections, and have fewer nutrients which leads to child malnutrition.

EBF is the most widely known and effective intervention for preventing early-childhood deaths and improve the child survival.**(Atimatia & Adam,**

2020) Accordingly, the findings of Laily Hanifah in 2018**(Hanifah et al., 2018)** approved that the risk of being undernutrition was higher among children who were not exclusively breast-fed in the first six months. On the contrary, the present study found that the prevalence of underweight and stunting was observed to be high among children who were exclusively breastfed compared with children who received complementary feeding or bottle feeding in addition to breast milk. These results corroborate the findings of **Meshram et al., (2018)** in India.**(Meshram et al., 2019)** It may be attributed to more than one tenth of mothers in the current study are young age less than 20 years old and These mothers still need to provide for their own growth and developmental needs and are at risk to inadequately breastfeed their infants due to low milk supply which results in undernourished children or may be attributed to the type of formula used was iron fortified.

The WHO and UNICEF have described breastfeeding as an unequalled way of providing ideal food for the healthy growth and development of infants. Around the age of 6 months, an infant's need for energy and nutrients starts to exceed what is provided by breast milk, and complementary foods are then necessary to meet those needs. If complementary foods are not introduced around the age of 6 months, or if they are given inappropriately, infant's growth may falter **(Alemu & Berhanu, 2018)**.

Matching with the above evidence, the present study revealed that underweight and stunting were more prevalent among infants whose mothers gave them only breast feeding after the age of six months. On the other hand, a couple of studies have also found that prolonged breastfeeding after six months was protective against various forms of undernutrition **(Muchina & Waithaka, 2010; Mgongo et al., 2017)**. while another study found no association between breastfeeding and any form of undernutrition**(Qadri et al., 2017)**. The justification may be related to that breast milk alone is no longer enough to fulfill their nutritional need and they need appropriate dietary intake to support their growth and development **(Hanifah et al., 2018).**

In healthy infants, introducing complementary feeding must be timely at age of 6 months as WHO recommends that initiating Complementary feeding on time has been widely connected with better nutrition outcomes. In the current study the prevalence of underweight and stunting was observed to be high among children who received complementary feeding after age 8 months compared with children who received complementary feeding less than 6 months of age. Similar picture was provided by **Meshram et al., (2018)** in India.**(Meshram et al., 2019)**

The present study has demonstrated that mixed feeding was the highly prevalent style of feeding and it was associated with overweight or obesity in infancy. These findings were in congruous with the study conducted by **Ardic et al., (2019)** in turkey.**(ARDIÇ et al., 2019)** This could be explained by that children who were introduced to bottle-feeding in their early childhood might fail to improve their control over their satiation, and thus, have a tendency to gain weight.

To sum up, feeding practices of infant and young child are often inadequate in developing countries.**(Belayneh & Tirfie, 2022)** Egypt is no exception, as the study indicated that mother's practices related to infant feeding were not optimum and a significant relationship was found between improvement in nutritional status of children and optimum infant feeding practices by their mothers. While poor feeding practices have carried a significant risk of malnutrition

Therefore, efforts should be done to change their behaviors and reinforce healthy feeding practices as early childhood development is the key to a full and productive life for a child and to the progress of the nation.

Conclusion and Recommendations

Based upon the results of the present study, it could be concluded that both maternal and child related factors are associated with malnutrition in infants and most of these factors are preventable. There is a significant relation between undernutrition and parents' education, age of the mother, early marriage, mother's working status, residence, socioeconomic status, feeding practices as exclusive BF, and age of starting complementary feeding. Also, it was associated with health status of infants.

Based on the current study findings the following recommendations are suggested:

1. Implementation of health education programs in primary health care settings to improve and support the breastfeeding and complementary feeding practices among mothers.
2. Scale up interventions to improve nutrition status among infants and children including the protection, promotion and support of breastfeeding, improve EBF, and giving safe and appropriate complementary feeding as core interventions.
3. Develop legislative, regulatory and other effective measures to promote nutrition, beginning with nutrient supplementation during pregnancy and maternity protection policies for pre- and postnatal care).
4. Implement measures for prevention of under nutrition as specified in the WHO/ UNICEF joint

statement on community-based management of under nutrition.

5. Implementation of health education programs in primary health care settings to improve and support the breastfeeding and complementary feeding practices among mothers.

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