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Complementary feeding pattern and its impact on growth and development of under 2-years infants in upper Egypt

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Abstract

Background: Exclusive BF till the age of 6 months is rare in developing countries and complimentary feeding (CF) are introduced at an early age which is linked to the development of chronic conditions such as childhood obesity, celiac disease, diabetes, and eczema. The aim of our work is to assess complementary feeding practices of infants under the age of 2 years and to study their impact on their growth and development. This study is a cross-sectional study that was carried out over 3 years between March 2016 and March 2019, included 1000 apparently healthy infants aged less than 2 years old who attended University Children Hospital, Egypt. Practices among mothers including timing and types of foods introduced. Semi-structured questionnaire used for data collection and anthropometric measurements analyzed following the WHO Growth Charts.

Results: The study found that about 80% of infants were introduced to solid foods before 4 months of age. Also, a large number of infants were given liquids other than breast milk before completing their fourth month of age.

Conclusion: Despite the better mental development of the infants, there is a considerable gap between WHO Guiding Principles for Complementary Feeding and the practices among mothers of infants aged less than 2 years in Egypt.

Keywords: Complementary feeding, Exclusive breastfeeding, Infant, Egypt

Background

World Health Organization (WHO) and United Nations International Children's Emergency Fund (UNICEF) recommend exclusive breastfeeding (EBF) for 6 months and addition of complementary foods (CF) at 6 months of age with continued breastfeeding (BF) till 2 years [1, 2], while exclusive breastfeeding is recommended for at least the first 4 months of life by European and United State authorities [3, 4]. Optimal breastfeeding could prevent up to 13% of deaths of children under the age of 5 years while proper CF practices might have an additional 6% reduction in under-five mortality [5]. Improper feeding practices together with high prevalence of infectious diseases are the main causes of malnutrition during the first 2 years of life [1].

Breastfeeding is common in developing countries, but exclusive breastfeeding is rare and CF is introduced at an early age. Early solid food consumption has been linked to the development of chronic conditions such as childhood obesity, celiac disease, diabetes, and eczema [6]. The second half of the first year of life is a vulnerable time when breast milk alone is no longer sufficient to meet nutritional requirements, so proper complementary feeding should be started [7]. CF bridges the gap in energy, vitamin A, and iron intake, which occurs in breast-fed infants at 6 months of age [8]. The aim of our work is to assess complementary feeding practices of mothers of infants under the age of 2 years and to study their impact on their growth and development.

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Methods

A descriptive cross-sectional study was conducted on infants residing one of Upper Egypt governorates and attending well-baby clinic at University Children Hospital. A random sample of 1000 apparently healthy infants who attended for routine check-ups or vaccinations and fulfilling the inclusion criteria, namely, age is less than 2 years, full term and appropriate for gestational age were recruited in the research. Infants with congenital anomalies or suffering from severe illness or chronic disease were excluded from the study. A questionnaire composed of 3 parts was constructed: part 1—socio-demographic characteristics of the index child (age, sex, parents' education, residence, etc.; part 2—detailed feeding history (time of start of BF, CF, duration, etc.); and part 3—clinical assessment of child using standard parameters, developed following the guidelines of WHO. Data collection was done via interviews with mothers. The aim of the study was explained and consent was requested from each mother before interview. Collection of data is from March 2016 to March 2019. Then assessment of infant growth by measuring his/her weight for length percentile, length for age percentile, and head circumference for age percentile and comparing them with standard WHO growth curves [9, 10]. Data were collected and analyzed by using SPSS (version 18). Continuous data were expressed in form of mean ± SD or median (range) while nominal data were expressed as frequency and percentage. The odds ratio (OR) and the 95% confidence interval (CI) for each independent variable were derived through regression analysis. *P* value was significant if < 0.05,

Results

The demographic characteristics of studied infants and their families are shown in Table 1; the mean age (M) of studied infants was 8.12 ± 4.5, about two-thirds of participants (64.3%) were males and the majority (80.2%) lived in rural areas. The mean order of index infant was 2.9 ± 1.7 with an average number of children per family about 3 ± 1.6. The vast majority of mothers (96%) were house wives while the majority of fathers (86.2%) were irregular workers.

Regarding factors affecting patterns of feeding significantly, Table 2 revealed that male sex, rural residence, being the second child in the family and house wife mothers were significantly correlated with higher levels of EBF while mothers who only completed their basic education (completed preparatory education) were associated with higher levels of non-exclusive BF. When mothers were asked about reasons for early introduction of CF before 4 months of age (Fig. 1), half of the mothers (50%) mentioned that they were advised to introduce CF and about one quarter (24%) reported that lack of knowledge were the main reasons behind CF introduction. When assessing infants' growth and development, Table 3 showed that EBF infants had significantly higher levels of mental development, length for age percentiles. While EBF does not show better motor development or weight for length. Significant predictors for exclusive breast feeding (Table 4) were early starting of breast feeding after birth, male sex of the baby, lower educational level of mother, rural residence, and younger maternal age.

Table 1 Sociodemographic characteristics of the study participants

Items	Frequency (N = 1000)	Percent (%)
Infant age (M.)		
Under 4 m	141	14.1
4-6 m	262	26.2
Above 6 m	597	59.7
Sex		
Male	643	64.3
Female	357	35.7
Residence		
Rural	802	80.2
Urban	198	19.8
Order in the family	Mean ± SD 2.99 ± 1.67	
1st	255	25.5
2nd	169	16.9
3rd	224	22.4
4th and more	352	35.2
Number of children of family	Mean ± SD 3.02 ± 1.65	
Age of mother (year)	Mean ± SD 27.00 ± 5.61	
Mother educational level		
Illiterate	360	36.0
Basic	340	34.0
High school and higher	300	30.0
Occupational status of mother		
House wife	960	96.0
Working for cash	40	4.0
Occupational status of father		
Not working	38	3.8
Worker	862	86.2
Employed	100	10.0

Discussion

Feeding patterns and practices during the first year of life are very important because they will influence growth, development, and morbidity. About three quarters (76%) of the studied mothers have initiated BF within the first hour after birth. This result agrees with

Table 2 Factors affecting patterns of infant feeding

Item	EBF		Non-EBF		Non-BF		Total	*P* value*
	No.	%	No.	%	No.	%		
	241	24.1	577	57.7	182	18.2		
Sex								
Male	171	26.6	359	55.8	113	17.6	643	0.003**
Female	70	19.6	218	61.1	69	19.3	357	
Residence								
Rural	194	24.2	486	60.6	122	15.2	802	< 0.001**
Urban	47	23.7	91	46.0	60	30.3	198	
Socioeconomic level								
Low	167	24.5	397	58.2	118	17.3	682	0.008**
Moderate to high	74	23.3	180	56.6	64	20.1	318	
Order in family								
1st	57	22.3	132	51.8	66	25.9	255	< 0.001**
2nd	38	22.5	111	65.7	20	11.8	169	
3rd	60	26.8	113	50.4	51	22.8	224	
4th and more	86	24.4	221	62.8	45	12.8	352	
Educational level of mother								
Illiterate	109	30.2	200	55.6	51	14.2	360	< 0.001**
Basic	58	17.1	204	60.0	78	22.9	340	
High school and higher	74	24.7	173	57.6	53	17.7	300	
Occupational status of mother								
House wife	240	25.0	558	58.1	162	16.8	960	< 0.001**
Employed	1	2.5	19	47.5	20	50.0	40	

EBF exclusive breast feeding, *Non-EBF* non-exclusive breast feeding, *Non-BF* non breast feeders, *No.* number
*χ^2 test was used for comparison
**Significant if < 0.05

Egypt Demographic and Health Survey 2014 (EDHS) and Batal in Lebanon who revealed that 79% and 70% of the children subsequently were initiated BF within the first day after delivery [11, 12]. Lower percentages 55.4% and 46.3% were observed in other two studies [13, 14]. This might be due to sociodemographic differences including the relatively high level of parental education in our settings. It might also be explained by the low coverage and utilization of maternal health services; particularly poor postnatal care utilization in the Ethiopian study together with missed opportunities during antenatal care visits.

Our study showed that 81.8% of mothers practiced BF which is consistent with results of two studies; 96% in the EDHS study 2014 [12], and 99.6% in a study done in Ethiopia [13]. EBF practice was present in only 24.1% of our studied mothers, in accordance, Saleh in Bangladesh and Roy in India found nearly similar percentages (23% and 28.3% respectively) [15, 16] indicating the cultural and traditional nature of the phenomenon. But a much lower percentage was observed by EDHS 2014 which revealed that only 12.5% of studied children were being exclusively breastfed [12] this finding may be due to higher percentage of non-working mothers in our study which allows for EBF. Higher percentages (49.7%) were observed by Caetano in Brazil [17]. On other hand, 63.5% of Indian mothers exclusively breastfed their infants till 6 months of age [18]. These differences of results could be due to differences in socio-demographic factors which affecting feeding practice and level of health education and counseling provided to mothers in various countries.

The most common reasons reported by the mothers for the interruption of EBF in our study were as follows: advice from relative, friend, or even a health care provider (50%), deficient knowledge about proper time of CF starting (24%), perceived insufficient milk production (19%), and child's refusal (3%). Nearly similar results were found by Caetano in Brazil, who stated that the most common causes were insufficient milk production in 17.7% and child's refusal to be breastfed in 8.4% [17]. Batal and Memon explained that by mothers who did not have enough knowledge about EBF benefits, insufficient breast milk, or sickness of some mothers [11, 19].

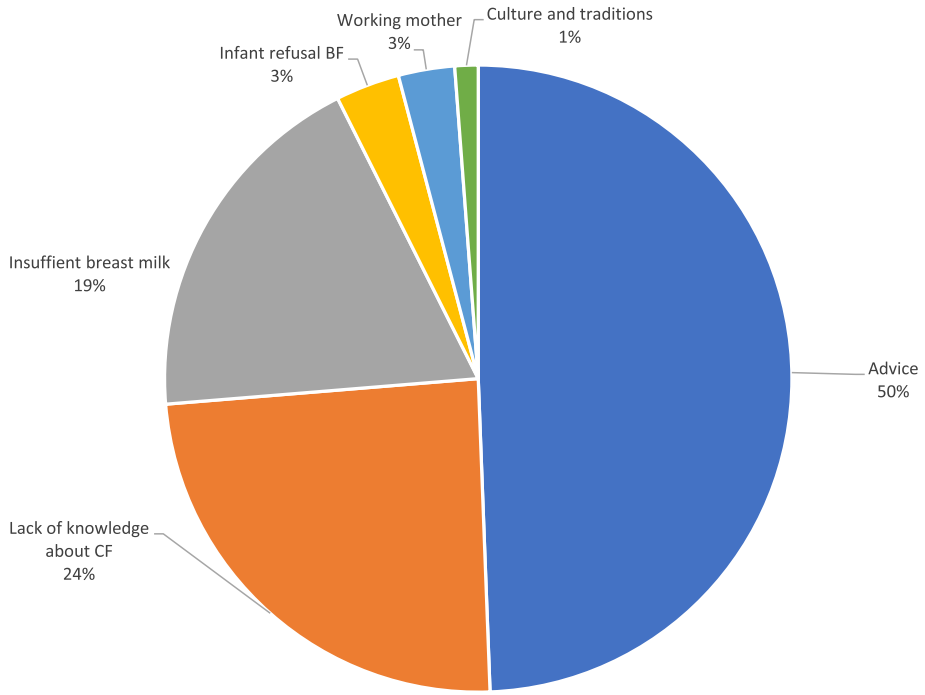

Fig. 1 Distribution of reported reasons for starting of CF introduction

Table 3 The effect of feeding patterns on infant growth and development

Item	EBF		Non-EBF		Non-BF		*P* value
	No.	%	No.	%	No.	%	
Motor development							
Normal	132	54.8	384	66.6	122	67.0	< 0.001**
Delayed	109	45.2	193	33.4	60	33.0	
Mental development							
Normal	232	96.3	566	98.1	162	89.0	< 0.001**
Delayed	9	3.7	11	1.9	20	11.0	
Weight for length percentile							
Below 3rd	62	25.7	173	30.0	80	44.0	< 0.001**
Between 3rd and 90th	178[a]	73.9	332	57.5	102	56.0	
Above 90th	1	0.4	72	12.5	0	0.0	
Length for age percentile							
Below 3rd	81	33.6	98	17.0	20	11.0	< 0.001**
Between 3rd and 90th	151	62.6	430[a]	74.4	133	73.1	
Above 90th	9	3.7	49	8.5	29	15.9	
Head circumference for age percentile							< 0.001**
Below 3rd percentile	77	32.0	201	34.8	80	44.0	
3rd-90th percentile	144[a]	59.8	345[a]	59.7	102	56	
Above 90th percentile	20	8.3	31	5.4	0	0.0	

EBF exclusive breast feeding, *Non-EBF* non-exclusive breast feeding, *Non-BF* non-breast feeders, *No.* number
*χ^2 test was used for comparison
**Significant if < 0.05
[a]The significant group

About three-quarter (74%) of the reported reasons could be controlled by better health education and counseling to mothers and other family members/friends who would influence the decision of introduction of CF.

Our study showed that the average age of CF introduction was 3.4 months, while the WHO Multicenter Growth Reference revealed the mean age was 5.4 months [20]. In our study, only about 7.1% of the mothers started CF at 6 months of age. Higher results were found in other studies in different countries as Batal et al. in Lebanon (13.4%) [11], Abba et al. in Delhi (16.6%) [21], Khan et al. in a tertiary hospital in India (17.5%) [22], Yohannes et al. in Ethiopia (20.8%) [13], and Saleh et al. in Bangladesh (23%) [15]. In our study, only 13.4% of mothers started CF to their babies at age

Table 4 Predictors for appropriate exclusive breastfeeding

Independent variable	EBF		
	OR	Sig.	95% CI
Male sex	0.10	< 0.001**	0.05-0.12
Residence	−0.06	0.002	(−0.10)-(−0.02)
Time of BF after delivery	0.28	< 0.001**	0.25-0.39
Age of mother	−0.11	< 0.001**	(−0.01)-(−0.004)
Educational level of mother	0.06	0.003	0.01-0.05
Occupational status of the father	0.14	< 0.001**	0.06-0.11

R square 0.721, *OR* odds ratio, *CI* confidence interval, *EBF* exclusive breast feeding
*χ^2 test was used for comparison
**Significant if < 0.05

of 4-6 months, 80.2% before 4 months and 6.4% after 6 months, compared to results of a study in Lebanon revealed that 66% of mothers started CF at age of 4-6 months, 21.9% before 4 months and about 12% after 6 months [11].

In the present study, male infants were 2.4 folds more likely to be exclusively breastfed more than females which is mainly due to gender preference in our community and could be due to physician recommendation as male infants are more susceptible for infectious diseases than females [23]. So, mothers become more careful and do not hasten to introduce CF early to avoid the complications commonly occurring within starting of CF.

The first baby in the family was more likely to be given CF early and about 80% of mothers who introduced CF to their babies early were from rural areas. This may be due to deficient knowledge about timing of complementary feeding starting, low milk production because of poor maternal nutrition and the thoughts and cultural habits of the rural areas. These findings show that illiterate mothers were more likely to early initiate CF compared to highly educated mothers. It agrees with result found in a study in Ethiopia, illiterate mothers were above twofolds more likely to early initiate CF compared to highly educated mothers [13]. On other hand, in Malaysia, educated mothers were 3.5 folds more likely to early initiate CF compared to illiterate mothers [24]. Our results can be explained by the fact that the better educated mothers have good knowledge about the importance of CF practice, might also better understand the message and can use nutrition information resources.

In our study, 94.9% of mothers who gave their infants CF early before the recommended age were not working. Unlikely, in a study applied in Malaysia, working mothers were 3.5 folds more likely to early start CF compared to house wives [24]. A study in Lebanon revealed that employed mothers initiated CF earlier than house wives [11]. It may be explained that most of housewife mothers received lower levels of education and belong to low socioeconomic families, so they started CF early to their babies.

About 56% of mothers started CF with cereals followed by dairy products in 51%, vegetables in 42% then desserts in 38%, and the frequency was the same whatever the time of introduction. Similarly, in a study done in Lebanon, the most common weaning food was cereals in 83.7% [11]. About 80% of studied mothers gave fluids such as water, herbals, and juices to their infants before the 4 months of age, in comparison to Lebanon study, where only 13% of mothers gave liquids before the 4 month of age which reflects the effect of counseling and health education [11].

In our study, about 45.0% of exclusively breastfed infants were physically delayed, while about 33% of non-exclusively breastfed infants were physically delayed. This could be explained by the low vitamin D content in the breast milk unlike milk formula and other specific food types [25, 26]. We found that 25.7% of EBF infants were wasted and 33.6% were stunted, while 30.0% of non-EBF infants were wasted and 17.0% were stunted. This large portion of physically delayed, wasted, and stunted infants may be due to the low socioeconomic level, poor maternal nutrition, and early and faulty introduction of complementary foods.

Regression analysis of our study revealed some of the significant determinants of EBF; early breastfed infants after delivery, male infants, infants that came from urban areas, infants of older mothers group, infants whose mothers were not educated, and infants whose fathers were not working were more likely to be exclusively breastfed than infants of other corresponding groups, respectively.

Conclusion

Complementary feeding practices among studied mothers of infants under the age of 2 years in Upper Egypt were extremely far from the WHO guidelines. About three-quarter of studied mothers introduced CF to their infants early before the recommended age. Mental development was better in exclusively breastfed infants than those given CF early. Insufficient knowledge about proper timing of CF was the main reported factor by mothers for early introduction of food. Early breast feeding, paternal occupational status, male sex, and low maternal education predicted proper timing for CF.

Abbreviations

BF: Breastfeeding; CF: Complimentary feeding; CI: Confidence interval; EBF: Exclusive breastfeeding; EDHS: Egypt Demographic and Health Survey 2014; M: Mean; OR: Odds ratio; SD: Standard deviation; SPSS: Statistical Package for the Social Science; UNICEF: United Nations International Children's Emergency Fund; WHO: World Health Organization

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None

Authors' contributions

The authors read and approved the final manuscript. OE and HO designed the study, literature search, interpreted the data, and wrote the manuscript. MM shared in study design, did all statistical analysis, shared in literature search and writing. AA shares in data collection, writing, and literature search.

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Availability of data and materials

All data generated or analyzed during this study are included in this published article and its additional file.

Declarations

Ethics approval and consent to participate

The study was approved by the ethics committee of the Faculty of Medicine, Assiut University (IRB no: 17101284). Written informed consents were taken from parents with explanation of benefits of the study; risks expected and suggested treatment for each case.

Consent for publication

Not applicable

Competing interests

The authors declare that they have no competing interests.

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