

Kaplan-Meier And Cox Regression Analyses of Exclusive Breastfeeding Discontinuation In Mansoura, Egypt

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Abstract

Background: Exclusive breastfeeding (EBF) is the single most cost-effective intervention to reduce infant mortality in developing countries. However, most studies concluded that a large proportion of infants are not exclusively breastfed. **Objectives:** to estimate duration of EBF using Kaplan-Meier analysis and to find out the independent factors associated with early cessation of EBF. **Method:** A cross-sectional descriptive study was carried out on 884 mother-infant pairs during vaccination at age of six months in Mansoura District, Egypt. Data collected are: sociodemographic characteristics of mothers, infants their families, antenatal, natal and postnatal data. Kaplan Meier estimator were used to produce valid estimates of EBF duration and the Cox's proportional hazards model was fitted to identify risks of early EBF discontinuation. **Results:** At six months 14.8% of infants are still exclusively breastfed. The median period of EBF was 4.0 months. The independent risk factors of EBF discontinuation are maternal work (Adjusted Hazard Ratio (AHR)=1.6, Confidence Interval (CI)=1.3-1.9), preterm births AHR=1.4, CI=1.1-1.1), urban residence (AHR=1.3, CI=1.1-1.5) and being female infant (AHR=1.2, CI=1.1-1.4). **Conclusion:** The median duration of EBF is below the recommended; and early discontinuation was associated with many factors that should be considered in designing breast feeding promotion programs.

Keywords: *Kaplan-Meier - Cox regression - exclusive breastfeeding-early discontinuation*

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Introduction

Exclusive breastfeeding (EBF) is defined as infant feeding on human milk without any supplements of any type except for minerals, vitamins, and medications, with no other fluids or food even juices and plain water.¹ The benefits of exclusive breastfeeding are well documented and infants who are on exclusive breastfeeding for the first six months have a lower probability for respiratory diseases, gastrointestinal infections, low linear growth rates and cognitive impairment.² In Egypt, EBF is a frequent practice but not general. Among

infants below the age of 2 months, 79% were counted to be exclusively breastfed. However, this proportion decreases dramatically among older infants by the age between 4 and 5 months. Supplementary foods or drinks are reported in around 7 in 10 babies, with somewhat more than 3 in 10 given complementary foods.³

Existing information on EBF in Egypt has been largely derived from cross sectional studies to measure EBF rate at specific age e.g. 4 months, 6 months with little attention to the variability in its duration and high

chance of maternal recall bias. Owing to the benefits of EBF, knowledge about its epidemiology and factors that hinder or facilitate its practice need periodical update in the context of health and planning of public policies. The present analyses using Kaplan Meier estimator which adjusted the under-calculated duration of breastfeeding used to be calculated by traditional methodology, intend to provide information about the duration of EBF and to find out the independent factors associated with early cessation of EBF.

Method

This is a cross-sectional study conducted in Mansoura, Egypt between January 1st and March 31, 2019.

All apparently healthy infants aged six months and their mothers.

Twins and infants who had specific feeding problems (e.g. cleft lip and palate) were excluded.

Data were collected from mothers through interview during vaccination sessions at primary health care (PHC) facilities.

Sample size was calculated using MedCalc Statistical Software version 14.8.1 (MedCalc software bvba, Ostend, Belgium). A previous study in the same locality found that 13.6% of infants were exclusively breastfed at the age of six months.⁵ With 0.05 alpha error, 80% study power and 3% precision, the sample size needed was calculated to be at least 884.

According to the local Health Directorate statistics, the total live births in 2018 were 27378 distributed as 60% in rural and 40% in urban areas. All PHC facilities (11 health offices in urban areas and 39 family health centers/ rural health units in rural areas) were included in the study. Sample was disseminated using birth registry at PHC facilities proportionally. All the mothers and infant dyad visiting vaccination clinic were enrolled in the study. The studied mother

and infant dyad was recruited sequentially till the needed sample size was fulfilled. During the vaccination sessions, mothers were interviewed by nurses who completed data collection sheets.

Mothers completed an Arabic questionnaire covering the socio-demographic data about the mother and family, as well as type and place of birth. Infant's sex, weight at birth, birth order, gestational age, previous hospitalization, pre-lacteal feeding and time of first suckling were recorded. The family socioeconomic level was estimated using El-Gilany et al, 2012.⁴ Information about current feeding was collected by asking about breastfeeding and any other liquids or food ingested in the previous 24 hours.

The outcome variable or event of interest is 'end of EBF' i.e. at the point of introduction of complementary food and when breastfeeding becomes partial if continues. "Exclusive breastfeeding" is defined as the consumption of breast milk without any additional semisolid/ solid foods or liquids; intakes of oral rehydration solution (ORS), syrups or drops of minerals, vitamins or medications.¹ If mother was not EBF to her infant, the age of start of complementary food was recorded in complete months.

Data analysis

Data were analyzed using SPSS version 23. The duration of EBF was created considering the month in which EBF was stopped. Cessation of EBF was measured as the event of interest. Those who continue to breastfeed their infants exclusively after the first six months were labeled as censored observations. Presence of censored data makes the traditional statistical methodology unsuitable. The optimum statistical technique in this condition is survival analysis, which is a method of assessing time to event data in the presence of censored cases. The median durations of EBF and their 95% CIs were derived using non-parametric Kaplan-Meier Survival

analysis. Log-rank test was used to compare duration of EBF for risk factors.

The significant covariates in univariate analysis were included in a multivariable Cox proportional hazard model using Wald forward stepwise procedure. Adjusted hazard ratios and their 95% CIs were calculated. $P \leq 0.05$ was considered statistically significant.

Ethical consideration

The research was accepted by Institutional Research Board of the Medical College, Mansoura University (code number: R.19.09.615). Informed consents to contribute in the study were collected from mothers before the interview.

Results

At the age of six months only 14.8% of infants are exclusively breastfed and the overall median duration of EBF was 4.0

months. Table 1 shows that infants from rural area are exclusively breast fed for statistically significant longer duration than infants from urban area (5 and 4 months; respectively). Also, being a housewife mother increases the duration of exclusive breast feeding to 5 months compared to 4 months among working mothers. Infants belong to middle socio-economic class are breast fed for statistically significant longer duration compared to other classes.

Table 2 shows that the duration of exclusive breast feeding is statistically significant longer with male infants compared to females (5 and 4 months; respectively) and it is shorter with preterm than full term (4 and 5 months; respectively)

Table 3 reveals that the independent significant predictors of EBF are housewife mothers, full term infants, rural residence and being a male infant (AHR=1.6, 1.4, 1.3 and 1.2; respectively).

Table 1: Kaplan-Meier analysis of discontinuing EBF and its variation according to the socio-demographic factors

		Total	Age of EBF discontinuation	
			Median (95% CI)	Log rank test
Overall		884	4 (3.9-4.1)	
Residence	• Rural	543	5 (4.9-5.1)	$\chi^2=24.3$, $P \leq 0.001$
	• Urban	341	4 (3.8-4.1)	
Mother's work	• Housewife	424	5 (4.9-5.1)	$\chi^2=37.4$, $P \leq 0.001$
	• Working	160	4 (3.7-4.3)	
Mother's education	• <Secondary	118	4 (3.8-4.2)	$\chi^2=10.1$, $P=0.07$
	• Secondary	446	4 (3.9-4.1)	
	• >Secondary	320	4 (3.8-4.2)	
Father's work	• Farmer/MW	408	5 (4.9-5.1)	$\chi^2=8.6$, $P \leq 0.014$
	• Prof/Semi-prof.	290	4 (3.8-4.2)	
	• Others#	186	5 (4.9-5.1)	
Father's education	• < Secondary	138	5 (4.8-5.2)	$\chi^2=6.2$, $P=0.044$
	• Secondary	397	4 (3.9-4.2)	
	• >Secondary	349	4 (3.8-4.2)	
Socio-economic class	• Very low	172	4 (3.7-4.3)	$\chi^2=16.4$, $P \leq 0.001$
	• Low	301	4 (3.9-4.1)	
	• Middle	336	5 (4.9-5.1)	
	• High	75	4 (3.7-4.3)	

MW=Manual workers, Prof.=professional, #others as trades, business, etc. CI=Confidence Interval

Table 2: Kaplan-Meier analysis of discontinuing EBF according to the maternal characteristics and maternity care

		Total	Age of EBF discontinuation	
			Median (95% CI)	Log rank test
Mother's age (years)	• <20	387	4 (3.9-4.1)	$\chi^2=2.8, P=0.25$
	• 20-34	422	4 (3.8-4.2)	
	• 35 & more	75	4 (3.9-4.1)	
Antenatal visits	• <5	173	5 (4.8-5.2)	$\chi^2=8.7, P=0.013$
	• 5-9	489	4 (3.9-4.1)	
	• 10 & more	222	4 (3.8-4.2)	
Place of delivery	• Home	83	5 (4.9-5.1)	$\chi^2=4.1, P=0.13$
	• Governmental hospital	242	4 (3.8-4.2)	
	• Private clinic/hospital	559	4 (3.9-4.1)	
Mode of delivery	• Caesarean section	272	4 (3.9-4.1)	$\chi^2=5.4, P=0.02$
	• Vaginal delivery	612	4 (3.9-4.1)	
Birth order	• First-born	345	4 (3.8-4.2)	$\chi^2=1.4, P=0.5$
	• 2 & 3	434	4 (3.9-4.1)	
	• 4 & more	105	4 (3.7-4.3)	
Sex	• Male	463	5 (4.9-5.1)	$\chi^2=19.3, P\leq 0.001$
	• Female	421	4 (3.9-4.1)	
Low birth weight	• No	820	4 (3.8-4.1)	$\chi^2=9.8, P=0.02$
	• Yes	64	4 (3.4-4.6)	
Preterm	• No	767	5 (4.9-5.1)	$\chi^2=16.4, P\leq 0.001$
	• Yes	117	4 (3.6-4.4)	
Hospitalization	• No	822	4 (3.9-4.1)	$\chi^2=1.5, P=0.2$
	• Yes	62	4 (3.7-4.3)	
Prelacteal feed	• No	390	4 (3.9-4.1)	$\chi^2=8.6, P=0.003$
	• Yes	494	5 (4.9-5.1)	
First suckling	• One hour or more	532	4 (3.9-4.1)	$\chi^2=0.1, P=0.8$
	• Within one hour	352	4 (3.8-4.2)	

CI=Confidence Interval

Table 3: Cox regression analysis of the independent significant predictors of age of exclusive breastfeeding discontinuation

		β	P	AHR (95%CI)
Residence	• Rural	-	0.001	1.3(1.1-1.5)
	• Urban	0.2		1(r)
Mother's work	• Housewife	-	≤ 0.001	1.6(1.3-1.9)
	• Working	0.5		1(r)
Sex	• Male	-	0.004	1.2(1.1-1.4)
	• Female	0.2		1(r)
Preterm	• No	-	0.004	1.4(1.1-1.7)
	• Yes	0.3		1(r)

AHR=Adjusted Hazard Ratio, CI=Confidence Interval, r=reference group

Discussion:

In the present study, data on 884 women were analyzed, asking about breastfeeding and any other liquids or foods intake by the infant in the previous 24 hours. The overall median duration of EBF was 4 (3.9-4.1) months, this figure is much higher than the reported median duration for which children are exclusively breastfed from national Egyptian survey in 2008 which was only 2.6 months.³

However, study finding was more consistent with studies from Sri Lanka⁶ and Bangladesh⁷ which found 4 and 3.67 months respectively of EBF. The data from Indian National Family Health Survey, 2006⁸ and a Brazilian study⁹ show much lower median interval of EBF as 2 months and 1 month correspondingly. On the other hand, some studies reported longer median durations. For example, a study conducted in Ethiopia, found the median duration to be 5 month¹⁰ and in another Indian study¹¹ it was 6 months. In Egypt EBF is communal but not prolonged enough; In general, about 65% of the mothers in Egypt feed their infants exclusively¹² and while most of infants below 2 months of age are exclusively on breast milk, the proportion drops off sharply in older infants at the age between 4 to 5 months. For example, EBF were reported as 97.5%, 69.3%, and 13.6% at 2, 4, and 6 months; respectively using the 24-hour recall method.⁵

This study aimed to show the factors related to timing of cessation of EBF. Among socio-demographic factors studied, the median duration of EBF was longer in rural compared to urban. Moreover, rural residence increased the likelihood of prolonged EBF by 1.3 times than urban residence. Although a previous Egyptian cross section study conducted within the

same locality didn't acknowledge residence as a significant factor for discontinuation of EBF,⁵ this outcome is consistent with a study conducted in Ethiopia where infants to rural mothers were EBF for 6.36 months compared to 5.13 months in urban infants.¹³ This is also in agreement with the findings of earlier studies reported from different countries like Bangladesh, Lebanon and Malaysia.¹⁴⁻¹⁶

In general, housewives tend to continue EBF for longer duration than working mothers. Previous Egyptian studies reported rates of EBF among working mothers at 6 months as low as 14.1%¹⁷ to 23.2%¹⁸ and 36%.⁵ This is in consistent with two Ethiopian studies.^{13,19} This negative link between short maternal leaves and BF duration has been stated in many researches especially from developed countries like France and Belgium.^{20,21} This finding can be related to the fact that employed mothers are usually burdened with work and domestic duties so may have inadequate time to nurse their infants.²² In fact, mother work status in this study was found as the strongest independent predictor for the duration of EBF as working mothers had 1.6 times higher chance for earlier cessation of EBF. This was in agreement with many studies.²²⁻²⁴ The impact of working is less when compared to the fact denoting that working females had 3.5 times higher probability of early cessation of EBF in comparison to non-working mothers.¹⁹

The present study detected significant increase in the duration of EBF with male infants as well as full term infants with adjusted hazard ration 1.4 and 1.2 times respectively. However, in the national Egyptian survey conducted in 2008³ males were breastfed slightly longer on average than females. But this was in contrast to previous two study conducted within the

same locality where there was no statistically significant association sex of the infant or being preterm with rates of EBF.^{5,17}

Moreover, a European study examined those variables and found no statistically significant difference between groups.²¹ However, the limited effect of prematurity on the duration of EBF was confirmed in another study.²⁵

This study, as many others, suggests that mothers from lower socioeconomic classes tend to stop EBF earlier.^{21,26} It was established that socioeconomic level have good influence on decision related to EBF.²⁷ It is assumed that mothers with superior socio-economic status value the advantages of breastfeeding. This may be explained by the access to information about the benefits of breastfeeding and the planning to address occasional challenges related to breastfeeding.

Conclusion

The median duration of EBF is below the recommended one and early discontinuation was associated with maternal work, preterm births, urban residence and female infants. It is important to strengthen the ongoing educational activities in health facilities and mass media and maternity leave should be compatible with the optimum duration of EBF

Study limitations: this is a small-scale study, in one region of Egypt, and its finding cannot be generalized to all over Egypt. Moreover, the possibility of recall bias in age of introduction of complementary food cannot be excluded.

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