RESEARCH PAPER

Prevalence of Non-Exclusive Breastfeeding and Associated Out-of-Pocket Expenditure on Feeding and Treatment of Morbidity Among Infants Aged 0-6 Months in an Urban Slum

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Correspondence to: Dr Amir Maroof Khan, Associate Professor, Department of Community Medicine, UCMS and GTB Hospital, Delhi, India. khanamirmaroof@yahoo.com Received: October 12, 2019; Initial review: December 09, 2019; Accepted: August 31, 2020. Objective: To estimate the prevalence of non-exclusive breastfeeding (NEBF) and quantify the out-of-pocket expenditure (OOPE) associated with NEBF and treatment of morbidity among infants up to six months of age. Methods: Community based in an urban slum, among 172 mother-infant dyads selected by systematic random sampling. Current breast-feeding practices and OOPE over last one month was recorded using a pre-validated, interviewer administered schedule. Independent sample t-test subsequent to bootstrapping was used to test the statistical significance of the difference in mean out of pocket expenditure between NEBF and exclusively breastfeeding (EBF) infants. The main outcome measures was nonexclusive breastfeeding rate and out of pocket expenditure associated with infant feeding and treatment of morbidity. Results: 67 (38.9%) infants were found to be non- exclusively breastfed. The median (IQR) total monthly OOPE incurred on non-breastmilk feeding and healthcare was found significantly higher among NEBF infants vs EBF infants [440 (80-982) vs [0 (0-290); P<0.001]. The median (IQR) monthly OOPE incurred on healthcare was also significantly higher among NEBF infants than EBF infants [INR 140 (0-540) vs 0(0-150); P=0.002].Conclusion: The prevalence of NEBF was high, and it was associated with higher financial burden on the families.

Key words: Breastmilk, Feeding practices, Healthcare costs, Health expenditures.

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on-exclusive breastfeeding increases the risk of diarrheal disease, respiratory illness, malnutrition and mortality among infants [1]. Attempts have been made to estimate economic costs associated with suboptimal breastfeeding. The estimated economic loss with suboptimal breastfeeding was reported to be 302-341 billion dollars annually, globally [2,3]. It is from 7.23 billion dollars in low-income countries and 218.27 billion dollars in lowand middle-income countries [3].

Researches have attempted to measure actual cost difference between non-exclusively breastfed infants and exclusively breastfed infants. The cost of formula feeding, and healthcare cost was reported higher in NEBF infants than in EBF infants in certain developed countries [4]. A study from India conducted a decade earlier, quantified the cost of infant feeding among NEBF infants which also included the cost of the foods consumed by the mother [5]. It seems obvious that non-exclusive breastfeeding will lead to increased economic burden due to two reasons. One, the costs associated with nonbreastmilk feeding and the other, associated with healthcare utilization which is higher in such infants as compared to those on EBF. However, studies on out-ofpocket expenditure (OOPE) associated with NEBF are lacking.

In this study, we estimated the prevalence of nonexclusive breastfeeding and assessed OOPE associated with non-breastmilk feeding and healthcare utilization due to infant morbidity, among infants up to six months of age.

METHODS

This community-based survey was conducted from November, 2017 to February, 2019 in an urban slum in East Delhi. Mother-infant dyads with the infant less than six months of age, from families residing in the area for at least six months, were included in the study. The sample size was calculated on the basis of 50% prevalence of NEBF in the literature [6]. With 50% prevalence, 15% relative error and 95% confidence interval, sample size obtained was 172. The approximate population of the slum was 80000. The estimated number of families based on the family size of 5 was 16000. Based on, crude birth

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rate (20 per thousand) [7], the estimated population of infants under 6 months age came out to be 800. So, about one-fourth of the 800 eligible families (the families having an infant under 6 months) were to be selected to obtain the sample size of 172. At the community level, every 80th family was selected to be included in the study. In case of refusal, the immediate next family was surveyed without disturbing the original allotment. If more than one infant of less than six months age was found in a family, then one of them was selected randomly.

Ethics approval from institutional ethics committee was obtained prior to start of the study. Written informed consent was obtained from the mothers and face-to-face interviews were held. In situations, where mothers did not know about the infant feeding and healthcare associated expenditures, the father of the child was interviewed regarding that aspect. A semi-structured, pre-validated, pre-tested, interviewer administered schedule was used to collect the data. The breastfeeding status assessment questions were adapted from the World Health Organization (WHO) recommendation [8]. Socioeconomic status is presented as monthly family income and categorization was done using BG Prasad Scale with Consumer Price Index of 2017 [9]. Breast-feeding status was assessed by 24-hour recall method.

The data on OOPE within last one month was collected regarding the following components *viz.*, (*i*) Non-breastmilk feeds: included the cost incurred on powdered milk, formula milk and animal milk, and bottles, nipples and vessels used for non-breastmilk feeding of the infants; (*ii*) Outpatient care: It included the consultation fees, investigations, medicines and transport; and (*iii*) Hospitalization: It included the bed charges, consultation fees, investigations, medicines and transport. OOPE was recorded from available payment receipts. If receipts were not available, it was recorded as per report of parents.

Statistical analyses: The data was entered in MS Excel and analyzed using SPSS 20.0. Categorical variables such as NEBF status and sociodemographic characteristics are presented as proportions. Non-parametric data such as OOPE is presented as median and interquartile range (IQR). Since, the IQR for the frequency of morbidity episodes and frequency of healthcare facility visits were zero in most of the cases, we have presented it as median and range. Non-normally distributed data such as morbidity episodes and number of healthcare facility visits in last one month were compared between NEBF and EBF infants using Mann Whitney U test. Chi-square test was used for comparing proportions such as type of hospital facility accessed by NEBF and EBF infants who were sick. Fisher exact test was used for comparing hospitalization rates between NEBF and EBF infants. For OOPE data comparisons, the recommended statistical method is independent sample *t*-test subsequent to bootstrapping [10,11]. Therefore, instead of the Mann Whitney U test, this method was used to compare OOPE among NEBF and EBF infants.

RESULTS

Out of 195 participants approached, fifteen refused to give consent for the study and eight did not give complete information; thus, 172 mother-infant dyads were included in the study giving a response rate of 88.2. The mean (SD) age of the infants was 98.3 (54.5) days. About half of the mothers were educated up to or below the primary school level. The median (range) monthly family income was INR 15000 (INR 4000 to INR 150000). Most (72.1%) of the families belonged to the upper lower and lower middle socio-economic class as per BG Prasad scale using October 2017 Consumer Price Index (CPI).

Around two-fifths (n=67, 38.9%) of the infants were practicing NEBF. Among NEBF infants (n=67), 58.2% (39/67) were givenjust water in addition to breastmilk, whereas, 41.8% (28/67) were given animal milk,(10.5%, (7/67) infant formula, 0.3% (2/67) powdered milk and 0.3% (2/67) juices.

There was no statistically significant difference between the median monthly family income of the EBF and NEBF infants (P=0.64). The prevalence of morbidity and outpatient care visits was significantly higher among NEBF than EBF infants (*Table* I).

The median (range) episodes of morbidity and healthcare facility visits among NEBF and EBF infants is given in *Web Table I*. Private healthcare facility was accessed by 51.2% of NEBF and 58.7% of EBF infants who had any morbidity and there was statistically no

 Table I Prevalence of Morbidity and Healthcare Utilization

 Among Infants in Last One Month (N=172)

Morbidity status	NEBF ($n=67$)	EBF (n=105)	P value
Any, <i>n</i> =92	46 (68.7)	46 (48.8)	0.001
Fever, <i>n</i> =37	22 (32.8)	15 (14.3)	0.004
Diarrhea, <i>n</i> =30	15 (22.4)	15 (14.3)	0.172
ARI, <i>n</i> =54	26 (38.8)	28 (26.7)	0.094
Healthcare utilization			
Outpatient care, <i>n</i> =86	43 (64.2)	43 (41.0)	0.003
Hospitalization, <i>n</i> =8	6 (9.0)	2 (1.9)	0.057

All values in no. (%); NEBF: Non-exclusive breastfeeding; EBF: Exclusive breastfeeding, ARI: Acute respiratory infection.

WHAT THIS STUDY ADDS?

 This study provides quantification of the out-of-pocket expenditure estimates of non-breastmilk feeding and healthcare utilization among non-exclusive breastfeeding infants as compared to exclusive breastfeeding from a community-based setting.

significant difference in the types of health facilities accessed by sick NEBF and EBF infants (*P*=0.21).

Average monthly OOPE (mOOPE) on non-breastmilk feeding, and on morbidity treatment is shown in *Table* II. The median (IQR) total mOOPE on nonbreastmilk feeding, and on morbidity treatment was significantly higher in NEBF *i.e.* INR 440(80-982) than EBF *i.e.* 0 (0-290) infants (P<0.001). The median (IQR) mOOPE on outpatient care was significantly higher *i.e.* INR 100 (0-520) among NEBF than EBF infants *i.e.* INR 0 (0-150) (P=0.04).

DISCUSSION

This study aimed to find out the burden of NEBF, and the associated OOPE on non-breastmilk feeding and on healthcare utilization.

In our study, around two-fifths of the infants were found to be non-exclusively breastfed. Similar prevalence of NEBF was also found in a study in an urbanized village of Delhi [6,12] and in Gujarat [13]. At national level the prevalence in urban areas was found to be higher 47.9% as per NFHS-4 [11], as also reported in another study from Delhi [9]. Higher prevalence of NEBF has also been reported from Southern India [15]. As our study area had a nongovernment organization working actively in providing primary healthcare and health education related to promotion of breastfeeding, it might have been the reason for lower prevalence of NEBF in our study, as compared to these studies.

The mean total OOPE on non-breastmilk feeding and

health care was found significantly higher among nonexclusive breastfed infants than exclusive breastfed infants. Similar findings were reported from a follow up study in Delhi in 1996, and a cohort study in Italy in 2006 [4,5]. The mean OOPE on non-breastmilk feeding was found significantly higher among non-exclusive breastfed infants than exclusive breastfed infants.

The difference in mean OOPE on both outpatient and hospitalization was found significantly higher among nonexclusively breastfed infants than exclusively breastfed infants. These findings are consistent with findings of other studies [4,5]. The difference in mean OOPE on outpatient care was found significantly higher among nonexclusively breastfed infants then exclusively breastfed infants. Similar finding was reported from another study in Italy [4]. Our findings support the hypothesis that NEBF causes more events of morbidity, thus more out of pocket expenditure on treatment of illnesses.

No significant difference was found in OOPE on hospitalization between non-exclusively breastfed infants than exclusively breastfed infants. While, a study in Italy had reported higher expenditure on hospitalization among non-exclusively breastfed infants [4]. In our study this might be because all the hospitalized patient availed their services from government health facilities and the OOPE on healthcare utilization in the government health facilities are very low.

So, there is a significant difference in cost incurred on non-breastmilk feeding and healthcare between exclusive breastfeeding and non- exclusive breastfeeding.

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Variables	NEBF (n=67)	EBF (n=105)	Mean difference (95% CI)
Non-breastmilk feeding*	207.9 (284.8)	0.0 (0.0)	207.9 (145.33-280.69)
Outpatient care*	327.1 (489.2)	180.0 (402.5)	147.0 (18.99-295.83)
Hospitalization	60.3 (267.4)	3.6 (34.2)	56.7 (8.34-112.78)
Total healthcare*	387.4 (587.39)	183.6 (402.8)	203.8 (61.10-355.97)
Wages lost	125.4 (505.6)	61.0 (259.4)	64.3 (-33.01-189.08)
Man-hour loss	17.9 (63.2)	3.0 (6.1)	14.8 (3.83-26.84)
Total (on feeding and healthcare)*	720.6 (838.1)	244.6 (491.8)	475.9 (282.61-683.95)

Table II Average Monthly Out-of-Pocket Expenditure on Non-Breastmilk Feeding and Healthcare (in INR)

All value in mean (SD); NEBF: Non-exclusive breastfeeding, EBF: Exclusive breastfeeding; *P<0.05.

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This study is a direct assessment of OOPE incurred on non-breastmilk feeding and healthcare utilization, thus provides a tangible evidence of cost saving with exclusive breastfeeding. However, the study involves only OOPE *i.e.* expenditure borne by families, it didn't assess the costs of healthcare which was not paid by the users at the point of delivery.

The study has certain limitations. Being a crosssectional study, it is possible that the observed relationship between high expenditure and NEBF may be due to certain confounders such as prematurity or low birth weight. Another limitation was that the sample size was not calculated to detect a difference in OOPE or prevalence of morbidities between NEBF and EBF infants. For the variables, where the difference in the OOPE were not found to be statistically significant, it is possible that for those variables, the sample sizes were not enough to detect the observed difference.

NEBF is associated with higher morbidity events than exclusively breastfed infants. The OOPE associated with NEBF is two-fold; the OOPE associated with nonbreastmilk feeding, and the OOPE associated with higher morbidity events. Thus, NEBF is associated with higher financial burden borne by the families. EBF should be supported and promoted. Investments in supporting and promoting EBF will cut the out of pocket expenditure at the community level.

Ethics clearance: Institutional Ethics Committee (Human Research), UCMS and GTB Hospital; No. IEC-HR/2017/32/25 dated October 17, 2017.

Contributors: AK: concept and design, analysis, interpretation of data, drafting the article; AMK: concept and design, interpretation of data, drafting the article, revising it critically; NKS: concept and design, interpretation of data, revising it critically for important intellectual content; DS: concept and design, interpretation of data, revising it critically for important intellectual content; All authors approved the final version of manuscript, and are accountable for all aspects related to the study.

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	Total	NEBF	EBF
		(n=67)	(n=105)
Morbidity status			
Fever	0 (0-2)	0 (0-2)	0 (0-2)
Diarrhea	0 (0-3)	0(0-3)	0 (0-3)
ARI	0 (0-4)	0 (0-3)	0 (0-4)
Total	0.5 (0-4)	1 (0-4)	0 (0-4)
Healthcare utilization			
Outpatient visits-public	1 (1-3)	1 (1-3)	1 (1-3)
Outpatient visits - private	1 (1-3)	1 (1-3)	1 (1-3)
Outpatient visits-total	0.5 (1-4)	1 (0-4)	0 (0-3)
Hospitalization (duration in h)	0 (0-217)	0 (0-195)	0 (0-217)

Web Table I Episodes of Morbidity and Healthcare Utilization Among Infants in Last One Month (*N*=172)

All values in median (range); NEBF: Non-exclusive breastfeeding; EBF: Exclusive breastfeeding; ARI: Acute respiratory infection.