Breastfeeding Pattern and Gain in Weight Among a Group of Urban Infants

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Abstract

A retrospective cohort study was designed to compare weight increment between 'predominantly breastfed' (received breast milk with or without complement of water) and 'mixedfed' (received additional milk or milk based products) babies over 3 months postpartum period. Records of weekly feeding history and body weight measurements at 4-weeks interval were compared. The mean birth weight of predominantly breastfed infants was 2.83 ± 0.48 kg and mixedfed group was 2.93 ± 0.56 kg respectively, and the difference was not significant. The mean increments in weight between birth and at 12 week's time for the groups were 2.42 ± 0.46 kg (predominant breastfed) and 2.19 ± 0.61 kg (mixedfed) respectively and the difference in weight gain was significant ($P<0.05$). Weight increment in low birth weight babies (LBW) was compared, in addition, with that of normal birth weight babies (NBW) in each feeding group separately. In the predominant breastfed group no significant difference in weight increment between the LBW and NBW babies were found, indicating a catch-up growth by the LBWs near to the level of the NBWs. Predominantly breastfed infants grew better than the mixed fed infants did. LBW babies in the predominant breastfed group found protected from growth faltering.

Keywords: Birth weight, breastfeeding, infant feeding, child growth.

Introduction

Growth faltering is a major nutritional problem among the infants from developing countries[1-3]. Infant feeding is obviously a determining factor in growth and nutritional status, and is considered to be more important than morbidity[4,5]. Studies on child feeding practices show that, worldwide exclusive breastfeeding is rare, as breast milk is supplemented early in the child's life with water, cows or powdered milks, juices, other foods and fluids[6-9]. Practices of non-exclusive breastfeeding, colostrum rejection, universal pre-lacteal feeding and improper supplementation exacerbate the situation of growth faltering. There are very few studies on infant

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growth in Bangladesh[10-12] and even fewer relating growths with infant feeding[13-14]. The present study aims to describe the mode of breastfeeding among selected Bangladeshi urban mothers and it's influence on infant growth as expressed by their weight gain.

Material and Methods

This study was carried out among ninety-eight newborn babies who were delivered at the Dhaka Medical College Hospital, and were followed up for a period of twelve weeks after birth. We enrolled full term singleton healthy babies. Mothers suffering from chronic diseases like diabetes, hypertension, pre-eclampsia or tuberculosis was excluded anticipating adverse effects of the disease process on child growth both during intra-uterine life and after birth. Informed consent was obtained from the willing mothers after explaining the purpose of the study. At the end of the 3rd month follow-up, we sorted out the babies who were 'predominantly breastfed' (received breast milk with or without complement of water) and who were 'mixedfed' (received additional milk or milk based products). We got 49 babies who were predominantly breastfed and in the second cohort, we took first 49 babies who were mixed fed out of a total of 56 babies.

Weight was selected as the dependent variable for growth, because it is a sensitive indicator of recent nutritional history and morbidity. Weight at birth and at each longitudinal survey was measured to the nearest 50g using baby scale (MISAKI, Japan), regularly calibrated with standard weights. Weekly feeding records of the babies over the first 12 weeks of life were obtained. During the planned weekly home visits, a structured pre-tested questionnaire on infant feeding was used to record information. In every interview, the type of milk and food fed to the infant was recorded. Information on infant feeding was obtained from the mothers through careful and repeated probing. This procedure not only supplemented those of the formal questionnaire but also avoided misclassification. Trained project personnel took weights of the babies at 4th, 8th and 12th week during the follow-up visits at their homes. Close supervisions of the field workers were maintained to avoid possible misreporting.

Data analysis

SPSS (Version 10.0) software was used to analyses data. Normally distributed variables were initially analysed by bivariate analyses, independent sample t-test and Pearson's correlation. Categorical variables were analysed by using chi-square test and non-normally distributed variables by Mann-Whitney-U test. Furthermore,

multiple regression analyses were conducted to see the effect of feeding on final weight at 3 months controllin : possible confounders.

Results

The infants were classified into two groups based on their feeding throughout the study period. 'predominantly breast fed' or Group-1 (n=49) and 'mixed fed' or Group-2 (n=49).

Maternal and infant characteristics

Mothers of predominantly breastfed group were significantly younger than the mixedfed group (mean age: 22.1 ± 3.9 vs. 24.5 ± 4.7; P<0.01). A significant difference between the groups was observed in terms of parity. Fifty percent mothers in the predominant group were primiparae compared to only 29% in the mixed fed group (P<0.05). Nutritional status as measured by BMI score showed no significant difference between the groups.

Table 1: Maternal and infant characteristics by feeding groups

Parameters	Group 1 (n = 49)	Group 2 (n = 49)	*P* value
Maternal:			
Age (in years)	22.06 ± 3.92	24.45 ± 4.68	< 0.01
Parity			
Primi	23 (46.9)	14 (28.6)	< 0.05
Multi	26 (53.1)	35 (71.4)	
BMI Score	21.83 ± 3.41	22.58 ± 3.46	N.S.
Infants:			
Sex of the child (%)			
Male	26 (53.1)	28 (57.1)	N.S.
Female	23 (46.9)	21 (42.9)	
Time of onset on breast (hours)*			
Mean ± sd	6.2 ± 10.2	13.6 ± 18.1	
Median centile	2 (1, 4)	6 (2, 24)	< 0.01

Notes : Figures in parentheses are percentages * median values (25 th and 75th centile) and Mann-Whitney-U test

Feeding

All infants were breast-fed and none discarded colostrum. Pre-lacteal feeding was common. Plain water or sugar water was introduced shortly after birth. Therefore, none of the infants were exclusively breastfed. The mean time (hours) of putting the

infants on to the breast was found significantly different between the groups (6.2±10.2 vs. 13.6±18.1; P<0.05) – Table 1. There is a wide variation in putting the infants on to the breast between the subjects. So we calculated percentile distribution and found median value significantly higher (median time in hours: 6 vs. 2) for the mixed-fed group.

Infant growth

The mean weights of the studied infants at birth, 4th week, 8th week and 12th weeks are shown in Table 2. Although mean differences between the groups were not significant at any of the three points, the total weight gain between birth and at 12th week were significantly different between the groups. The predominantly breastfed group gained significantly more weight (2.42 kg) than the mixedfed group (2.19 kg) - Table 3. In order to see whether this weight increment at 3rd month is mainly from the effect of breastfeeding, we calculated regression analysis. In the model, the final weight (at 3rd month) was taken as dependent variable and birth weight and those factors that became significantly different between the groups (mother's age, parity and time of onset on breast) were treated as independent variables. As sex is universally related with anthropometry, we also controled sex in the analysis. Finally, we forced to enter the group (Predominant breastfed group=1 and Mixedfed group=2) as independent variable in the final step of analyses. Table 4 shows the regression coefficients, SE and P values of variables that entered in to the equation. Birth weight of the baby became a significant predictor of weight at 3rd month. After controlling all other factors, the group showed an independent effect on weight at 3 months in favour of predominantly breastfed group.

Table 2: Weight (mean ± s.d. in kg.) of the infants at different periods by groups

Time	Group 1 (n = 49)	Group 2 (n = 49)	*P* value
At birth	2.83 ± 0.48	2.93 ± 0.58	0.345
4th wk	3.59 ± 0.61	3.63 ± 0.68	0.774
8th wk	4.41 ± 0.60	4.35 ± 0.81	0.651
12th wk	5.25 ± 0.68	5.12 ± 0.86	0.399

Table 3: Mean weight gain (in gms) at different time intervals by groups

Time	Group 1 (n = 49)	Group 2 (n = 49)	*P* value
Between birth and 4th week	756 ± 0.33	692 ± 0.35	0.352
Between 4th to 8th week	827 ± 0.24	724 ± 0.40	0.123
Between 8th to 12th week	839 ± 0.27	771 ± 0.33	0.266
Between birth and 12th week	2421 ± 0.46	2187 ± 0.61	0.034

Table 4: Regression coefficients, SE and P values of significant variables entered, into the multiple regression analysis (final weight regressed against birthweight, other factors and feeding groups)

Variables	Regression coefficient	SE	*P* value
Birth weight	1.04	0.10	<0.001
Feeding Group	-0.24	0.11	0.032

R^2: 0.52

Effect of feeding on LBWs

As LBW babies are a serious concern for developing countries, we grouped the infants into two birth weight categories – (i) Low birth weight (less than 2.5 kg) and (ii) Normal birth weight (equal and more than 2.5 kg). Weight increments among the babies with low birth weight and normal birth weight were analysed separately to see the group difference and feeding effect (Table 5 and 6). We pooled both the groups into one and categorised the sample into LBW and NBW. We found 29% of our babies were LBWs and rests were NBWs. Table 5 shows the difference in mean birth weight and weight increment in 3 months period by groups. As we have grouped the babies into LBWs and NBWs, obviously there were significant group differences. It is interesting to note that, at 3 months time, there was no significant difference in the predominant breastfed group between LBWs and NBWs indicating a catch up growth by LBW babies near to the level of the NBWs. In contrast, in the mixed fed group, LBW babies failed to gain significant weight over 3 months period (1.86±0.71 vs. 2.28±0.55; P<0.05) compared to NBW babies.

Table 5: Birth weight and gain in weight over three months period by feeding and birth weight groups

Time	PDBF_LBW (n=16)	PDBF_NBW (n=33)	P value	MF_LBW (n=11)	MF_NBW (n=38)	*P* value
Weight at birth	2.32 ± 0.28	3.08 ± 0.34	<0.001	2.18±0.28	3.15±0.44	<0.001
Weight gain between birth and 12th week	2.36 ± 0.54	2.45 ± 0.42	0.536	1.86±0.71	2.28±0.55	0.042

\PDBF_LBW (predominantly breastfed LBW), PDBF_NBW (predominantly breastfed NBW); MF_LBW (mixedfed LBW), MF_NBW (mixedfed NBW).

Discussion

Predominantly breastfed group mothers were relatively younger, having lesser number of children and they were found to initiate breastfeeding earlier than the comparatively older mothers in the mixed fed group. Infants predominantly breast-fed gained more weight than those who had mixed feeding ($P < 0.05$). Predominantly breastfed infants were observed thinner at birth and displayed a '-100g' less in mean weight compared to their counter part, but minimized this difference over time and even became heavier at the end of the third month by 130g. We calculated growth velocity by dividing net gain in weight between birth and 3rd month's time divided by birth weight. The growth velocity between the groups (0.88 ± 0.25 vs 0.77 ± 0.26) showed a significant difference in favour of predominantly breastfed infants ($P<0.05$). Furthermore, infants born with low birth weight but predominantly breast-fed showed catch-up growth comparable to the NBW babies. This effect is absent in the mixedfed group, the LBW infants lagged significantly behind the NBWs in terms of weight gain. Importance of breastfeeding for the LBW's to achieve desired weight gain is thereby acknowledged as a protector. We have no data on morbidity and therefore we failed to relate nutritional status of the infants to percent time the infants were sick. Possibly that could be a factor in the mixed fed group for the hindrance of catch-up growth in them. Finally, at subsequent sub-grouping, the number of LBW babies was small in both groups. Despite that, we got a difference in weight gain in favour of predominant breastfed LBW babies. Further research with larger sample

size is needed to substantiate this finding. Because of funding constraints we couldn't follow-up babies beyond 3rd months of age, but it would have been better to see them for a full one year period in order to have a more clear view of catch up or falter in growth. Given the limitations, the results of this study highlighted the importance of breastfeeding on child growth. In conclusion, we confirm higher rate of growth increment for pre-dominantly breastfed subjects in the early extra-uterine life than the mixedfed subjects.

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References

1. Waterlow J, Ashworth A and Griffith M. Faltering in infant growth in less developed countries. *Lancet* 1980; ii: 1176.
2. Waterlow J. Observation on the natural history of stunting. In: J Waterlow, ed. *Linear growth retardation in less developed countries*, Nestle Nutrition Workshop Series 14. Newyork: Raven Press, 1980.
3. Martorell R and Habicht J-P. Growth in early childhood in developing countries. In: Falkner and JM Tanner, eds. *Human Growth: A comprehensive treatise*. Newyork: Plenum Press, second edition, 1986.
4. Briend A. Is diarrhoea major causes of malnutrition among the under-five in developing countroies? : A review of available evidence. *Eur. J. Clin. Nutr. 1990*; 44: 611-628.
5. Briend A, Hasan KH, Aziz KMA and Hoque BA (1989). Are diarrhoea control programmes likely to reduce childhood maturation? Observation from rural Bangladesh. *Lancet* 1989; ii: 319-322.
6. Victiria CG, Smith Pg, Vaughan JP, Nobre LC, Lombardi C, Texiera AM et al. Evidence for protection by breastfeeding against infant deaths from infectious disease in Brazil. *Lancet* 1987; ii: 319-321.
7. Popkin BM, Adair L, Akin JS, Black R, Briscoe J, Fleiger W. Breastfeeding and diarrhoeal morbidity. *Pediatrics*. 1990; 86: 874-882.
8. Ashraf RN, Jalil F, Khan SR, Zaman S, Karlberg J, Lindbald BS et al. Early child health in Lahore, Pakisatn. V. Feeding patterns. *Acta Pediatrica*. 1993; 82 (390 Suppl): 47-61.
9. Serenius F, Sweiler AR, Edressee AW, Hof-Vander Y. Patterns of breastfeeding and weaning in Saudi Arabia. *Acta Pediatrica*. 1988; 346 (Suppl): 121-129.

10. Rukshana G, Karim F and Chowdhury AMR. Consequences of low birth weight on infant growth, development and morbidity, *J Dairrhoeal Dis Res.* 1998; 16(1): 23-24.

11. Khaleda B, Chowdhury AKA and Malek MA. Growth and development of neonates discharged from the specialcare baby unit of Dhaka shishu hospital. *DSH Journal.* 1992; 8(1&2): 33-41.

12. Mahmud Z and Chowdhury SA. Growth of newborn in their earlylife (two weeks) according to feeding pattern in rural area of Bangladesh, *J Diarrhoeal Dis Res.* 1998; **16**(1): 40-41.

13. Talukder MQK. Growth pattern of exclusively breastfed infants, *Bangladesh J Childhealth.* 1986; 10(2): 59-65.

14. Arifeen SE, Antelman G, Alamgir S, Nahar Q, Mahmud H, Baqui AH and Black RE. Determinants of growth in the slums of Dhaka city: Size and maturity at birth and breastfeeding. *J Diarrhoeal Dis Res.* 1998; 16(1): 21-22.