

Weight Loss during Prolonged Lactation in Rural Bangladeshi Mothers

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ABSTRACT

To determine the duration of lactation which is associated with weight loss in rural Bangladeshi mothers and also to determine the relationship with consumption patterns of principal food items, a cross-sectional study was carried out among 791 lactating rural Bangladeshi mothers aged 18-40 years. Results were compared with 333 non-pregnant and non-lactating mothers of a similar age group. The duration of lactation was up to 60 months. The mean difference in body-weight and body mass index (BMI) of lactating mothers who breastfed their children up to 24 months was significantly lower compared to non-lactating mothers of the same age group, but no differences were observed for those who breastfed beyond 24 months. The frequency of consumption of principal food items was comparable between the non-lactating and the lactating mothers who breastfed beyond 24 months. Results of multiple linear regression analysis showed that body-weight of mothers was negatively correlated with 1-12 month(s) and 13-24 months of lactation after controlling for height, education, and food consumption (slope -1.04, $p < 0.05$ and slope -1.23, $p < 0.05$ respectively). Height and consumption of meat and milk were significantly positively correlated with body-weight (slope 0.53, $p < 0.001$; slope 1.44, $p < 0.001$; and slope 0.75, $p < 0.05$ respectively). The study concluded that Bangladeshi women who breastfed up to 24 months were of lower weight than non-lactating mothers, most likely due to the effect of lactation. These mothers were not taking any additional foods during their lactating period. Based on the findings of the study, it is recommended that mothers consume additional energy-rich foods during the first 24 months of lactation to prevent weight loss.

Key words: Lactation; Breastfeeding; Body-weight; Anthropometry; Food consumption; Cross-sectional studies; Bangladesh

INTRODUCTION

The health and nutritional status of mothers in Bangladesh is currently a major public-health concern. Almost half of Bangladeshi mothers of childbearing age suffer from chronic energy deficiency with a body mass index (BMI) less than 18.5, and more than 70% of pregnant women are anaemic (1,2). Malnutrition, compounded by anaemia, contributes to an increased low birth-weight rates (35-50%) and a high maternal mortality rate (4/1,000) in Bangladesh (3-5).

In developing countries, most women breastfeed their babies for varying durations. Results of a study on infant-feeding practices in rural Bangladesh showed that 99% of infants aged one month were breastfed, and other foods along with breastmilk were introduced to 87% of children at 9-12 months of age (6). Breastfeeding is universal in Bangladesh, and mothers breastfeed their babies, on average, for 28.2 months (7).

Lactating mothers will lose their body-weight postpartum if they do not compensate with additional food intake. For women who exclusively breastfeed their children, the average energy costs for milk production are 595 kcal per day at 0-2 month(s) postpartum and 670 kcal per day at 3-8 months (8). Energy needs are lower for women who partially breastfeed, depending on the extent to which supplementary foods are given to the child (8). Studies in developing countries have consistently

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shown that energy intake during lactation is considerably lower than recommended (9,10). In Bangladesh, production of mother's milk is limited by poor nutritional status and concentration of nutrients in milk declined with infants' age (11). The effect of lactation on postpartum body-weight is controversial; some studies have not found any association (12,13), some reported postpartum weight gain (14,15), and many studies have shown a significant weight loss of lactating mothers after postpartum period (16-19).

Breastfeeding is a major concern in developing countries because of its positive impact on the health and nutrition of children. However, the nutrition of lactating mothers should also be taken into account where maternal under-nutrition is highly prevalent as in developing countries. Only limited studies in Bangladesh have shown the effect of lactation on changes in maternal nutritional status. This paper investigates the prolonged duration of lactation which is associated with weight loss in rural Bangladeshi mothers and its relationship with consumption patterns of principal food items.

MATERIALS AND METHODS

This cross-sectional study was carried out among rural mothers in Jhenaidah district of Bangladesh. Non-pregnant lactating mothers (n=791) aged 18-40 years were recruited for the study. The duration of lactation was up to 60 months, and it included both exclusive and partial breastfeeding. Non-pregnant, non-lactating mothers (n=333) of a similar age group who had stopped breastfeeding for at least one year were enrolled for comparison. A list of eligible non-pregnant lactating and non-pregnant, non-lactating mothers was prepared through a house-to-house survey prior to the study from five adjacent villages. Of 2,465 lactating mothers, 791 (32%) were randomly selected; and for comparison, of 1,200 non-lactating mothers, 333 (28%) were randomly selected from the same villages. As the effect of lactation on postpartum body-weight is controversial, and there is no definite longitudinal data on the exact period when mothers lose body-weight during prolonged lactation, we recruited a large number of subjects for the study. Mothers suffering from any disease during the last 14 days or at the time of interview were excluded from the survey. Verbal and written consents from the subjects were obtained prior to the interview. Data were collected during September-November 2001. A structured questionnaire was used for collecting information from mothers about their education and duration of breastfeeding, including either exclusive or partial, since childbirth.

An interviewer-administered diet history in the preceding seven days was recorded following the food frequency method of Helen Keller International (20). A special seven-day recall food frequency pre-designed form was developed, and rice, meat, fish, egg, pulses, and dark-green leafy vegetables (DGLV) were included in the food items. Mothers were asked how many times they had consumed each of these food items during the last seven days starting from the previous day, and their responses recorded. Weight or amount of food consumed was not recorded. Any food item consumed on at least one day during the previous week was recorded as one day of consumption for that particular food item. Since rice was consumed by every subject on all days of the previous week, it is not shown in the results. Weight and height of mothers were measured. Weight was measured using a digital scale accurate to the nearest 0.1 kg, and height was measured using a locally-constructed wooden scale accurate to the nearest 0.1 cm. The instruments were calibrated every morning using a standard for weight and height. BMI was calculated as weight (kg)/height (m²).

Data were entered into the computer using FoxPro software (2.6 for Windows; Microsoft Corp., 1994). Data were checked and edited using the same software. Data were analyzed using the SPSS software (Windows version 10; SPSS Inc.). Group means were compared using unpaired *t*-tests. Chi-square tests were used for categorical data. A stepwise forward multiple linear regression model was fitted to see the effect of duration of lactation on the body-weight of mothers by controlling for confounders. As the frequencies of food consumption and education data were skewed, their median value was taken as a reference value to fit in the regression model. Education and food were categorized as follows: no education=0 and rest=1, no consumption of meat=0 and 1-7 day(s)=1, 0-3 day(s) consumption of fish=0 and 4-7 days=1, no consumption of egg=0 and 1-7 day(s)=1, no consumption of milk=0 and 1-7 day(s)=1, 0-1 day consumption of pulses=0 and 2-7 days=1, 0-1 day consumption of DGLV=0 and 2-7 days=1. Age and height remained as continuous variables in the models. Univariate models were fitted by regressing body-weight on age, height, education, and consumption of all food items (Table 1, Model 1). In the multivariate model (Table 1, Model 2), duration of lactation (exposure variable) was entered as a categorical variable, and five dummy variables were created according to different durations of breastfeeding. Duration of lactation among non-lactating and non-pregnant mothers was taken as the reference

category (duration of lactation=0). Age, egg, and pulse consumption variables were excluded from the multivariate model (Model 2) as their p values were >0.25. No interaction term was significant in the model. Statistical significance was considered at the 5% probability level.

RESULTS

Distribution of age between the lactating and the non-lactating mothers was comparable (Table 2). No significant difference in distribution of age between these groups of women was observed (λ^2 value=3.43 [df=3],

24 months. Comparison of consumption of different types of foods on at least one day of the previous week for lactating mothers who breastfed for ≤ 24 months and non-lactating mothers is given in Figure 1 and for lactating mothers who breastfed for over 24 months is given in Figure 2. Only consumption of egg was significantly greater among non-lactating mothers compared to lactating mothers who breastfed for over 24 months (Fig. 2). No other significant differences of consumption of different food items were observed between the two groups.

Results of multiple linear regression analysis in Model 2 showed that body-weight of mothers was negatively

Table 1. Factors associated with weight change among study population (R²=0.29)

Predictor	Univariate (Model 1)		Multivariate (Model 2)	
	Slope β	p value (t)	Slope β	p value (t)
Age	0.03	0.437 (0.78)	NA	NA
Height	0.59	0.001 (19.7)	0.53	0.001 (19.42)
Education [1-18 year(s)]	0.79	0.031 (2.15)	0.39	0.220 (1.23)
Food consumption (days)				
Meat (1-7)	1.96	0.001 (5.38)	1.44	0.001 (4.57)
Fish (4-7)	0.52	0.153 (1.43)	0.30	0.337 (0.96)
Egg (1-7)	0.31	0.396 (0.85)	NA	NA
Milk (1-7)	1.43	0.002 (3.32)	0.75	0.044 (2.01)
Pulses (2-7)	0.35	0.342 (0.95)	NA	NA
DGLV (2-7)	0.54	0.159 (1.41)	0.38	0.239 (1.18)
Duration (months) of lactation				
1-12	NA	NA	-1.04	0.019 (2.35)*
13-24	NA	NA	-1.23	0.004 (2.83)*
25-36	NA	NA	-0.52	0.296 (1.05)
37-48	NA	NA	-0.36	0.534 (0.62)
49-60	NA	NA	0.35	0.761 (0.30)

* Significant p values (<0.05); Outcome variable=Body-weight; Exposure variable=Duration of lactation
 Age and height were entered as continuous variables
 'No education' was the reference value for the 'education' variable. Median values of consumption were entered as reference values for the food items
 DGLV=Dark-green leafy vegetables; NA=Not applicable

p=0.329). Forty-six percent of lactating and 50% of non-lactating mothers had at least one year of schooling (λ^2 =1.3 [df=1], p=0.260).

The mean body-weight and BMI of lactating mothers according to different durations of breastfeeding and the mean difference between the lactating and the non-lactating mothers are shown in Table 3. The mean differences of body-weight and BMI of lactating mothers who breastfed their children up to 24 months were significantly lower compared to non-lactating mothers in the same age group. No significant differences of mean body-weight and BMI were observed between the non-lactating and the lactating mothers who breastfed beyond

Table 2. Distribution of age between lactating (n=791) and non-lactating (n=333) mothers

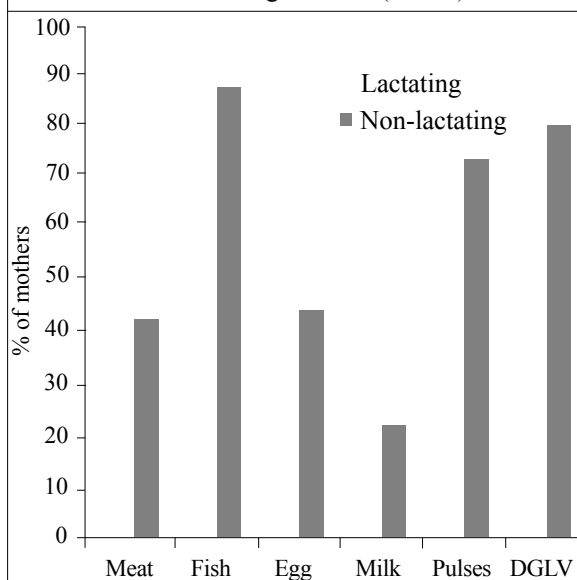
Age (years) group	Lactating		Non-lactating	
	No.	%	No.	%
18-24	268	33.9	94	28.2
25-29	271	34.3	124	37.3
30-34	146	18.4	67	20.1
35-40	106	13.4	48	14.4

No significant differences in distribution of age between the lactating and the non-lactating mothers (λ^2 value=3.43 ([df=3]), p=0.329)
 df=Degree of freedom

Table 3. Mean body-weight and body mass index of lactating mothers according to different durations of breast-feeding and mean difference with non-lactating mothers*

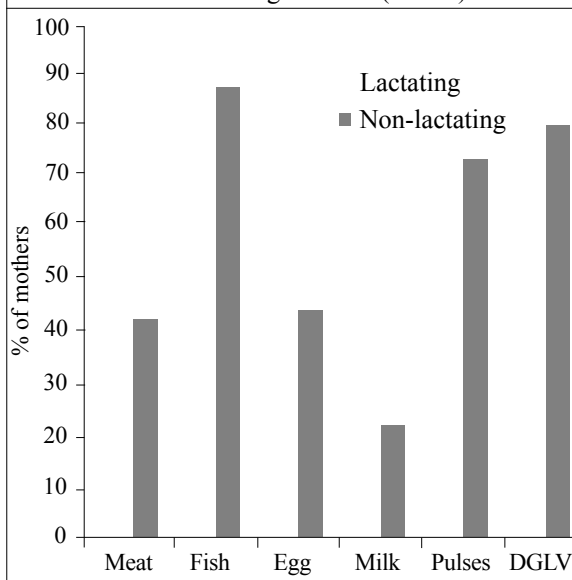
Duration (months) of breast-feeding	No. of lactating months	Body-weight (kg)		p value [†] Lactating vs non-lactating	Body mass index		p value [†] Lactating vs non-lactating
		Mean	Mean difference (Lactating–non-lactating)		Mean	Mean difference (Lactating–non-lactating)	
<12	213	42.48	-1.76	0.002	18.86	-0.51	0.017
12-24	286	42.96	-1.29	0.012	18.85	-0.51	0.007
25-36	164	43.32	-0.93	0.112	19.11	-0.26	0.246
37-48	104	43.47	-0.78	0.275	19.29	-0.08	0.782
49-60	24	44.11	-0.14	0.920	19.36	-0.00	0.996
Total	791	43.01	-1.24	0.002	19.00	-0.38	0.010

* Mean body mass index of non-lactating mothers (n=333)=19.4 and body-weight=44.3 kg

† Student's *t*-test**Fig. 1.** Comparison of consumption of foods at least one day of the previous week between lactating mothers (n=499) who breastfed ≤ 24 months and non-lactating mothers (n=333)** No significant differences between the two groups (λ^2 =NS)

DGLV=Dark-green leafy vegetables

NS=Not significant

Fig. 2. Comparison of consumption of foods at least one day of the previous week between lactating mothers (n=292) who breastfed > 24 months and non-lactating mothers (n=333)** Only consumption of eggs differed significantly between the two groups, $\lambda^2=4.97$ (df=1), $p=0.026$
DGLV=Dark-green leafy vegetables
df=Degree of freedom

correlated with 1-12 month(s) and 13-24 months of lactation after controlling for height, education, and consumption of food (slope -1.04, $p<0.05$ and slope -1.23, $p<0.05$ respectively). Height and consumption of meat and milk had significant positive correlation with body-weight (slope 0.53, $p<0.001$; slope 1.44, $p<0.001$; and slope 0.75, $p<0.05$ respectively) (Table 1).

DISCUSSION

A longitudinal study is better-designed to identify changes in body-weight and nutritional status in breastfeeding mothers. This cross-sectional study was used as a proxy for a longitudinal design. A food frequency method was used for assessing different types of foods consumed

by mothers. The study showed that women lost their body-weight and BMI during the first 24 months of lactation compared to non-lactating women, but not thereafter. The breastfeeding women did not consume additional foods compared to non-breastfeeding women of the same age group.

Results of a study in rural Bangladesh showed that almost four-fifths of women stated that a mother should eat more than usual during pregnancy and lactation, and 11% stated that the mother's diet should remain as usual, while only 8% thought that it should be less than usual (6). However, in practice, lactating women were not consuming more than usual. Many longitudinal studies reported a variable duration of weight loss during lactation. Postpartum weight loss was observed by Brewer in Louisiana, USA, and Dugdale in Queensland, Australia (21,22). In another longitudinal study in California, USA, Dewey found weight loss after six months of breastfeeding (16). In a longitudinal study on Filipino women, Adair *et al.* observed that lactation had a negative effect on body-weight which increased with the intensity and duration of breastfeeding, and the likelihood of weight loss significantly increased by lactation of more than 12-month duration (17).

Our study identified that the frequency of consumption of different types of energy-rich foods by lactating women was similar to those by non-pregnant, non-lactating women. Results of linear regression analysis showed that body-weight was positively correlated with consumption of meat and milk. Probably, the lactating mothers did not eat sufficient amounts of other energy-rich foods, such as fish, egg, and pulses, to affect body-weight. In lactating women, energy needs increase by ~30% over those of non-pregnant, non-lactating women (8).

Results of many studies showed that the amount of milk production was not strongly associated with the mother's BMI, but depended on the child's suckling behaviour and milk intake (23-25). Lactating mothers who do not take additional foods are likely to expend their own body reserves before there is a major impact on milk output and total milk energy transfer to the infant. Therefore, during lactation, rural mothers in our study lost body-weight presumably because the energy needs of lactation plus normal energy needs exceeded their energy intake.

In poor under-nourished populations, the energy cost of lactation should be met by an increased food intake.

In our study, we did not find weight loss among women who continued to breastfeed beyond 24 months. This is because, in this age group of children in Bangladesh, solid foods and drinks are given and, thus, breastmilk demand decreases which leads to less production of milk. Moreover, in the later part of breastfeeding, both quantity and quality of breastmilk decrease (26). A study conducted by Brown *et al.* on rural Bangladeshi breastfeeding mothers has shown that the nutritional status of these mothers is poor, and their dietary intake is inadequate (27). The majority of mothers in Bangladesh enters into pregnancy with poor nutritional status, and they do not take additional foods throughout their pregnancy and lactational period. Winkvist *et al.* also reported that women worldwide lose weight and body-fat during lactation which may be reduced by increased food intake and decreased activities (28).

Our study confirms that lactating mothers do not take additional foods during their lactation and lose body-weight during the first 24 months of lactation due to the effect of lactation. From our study, we cannot conclude exactly when lactating mothers return to their pre-pregnant body-weight or how much weight they lose due to the effect of different durations of breastfeeding due to the study design. A well-designed longitudinal study could be performed to answer these questions. Based on the findings of our study, we recommend that any food-supplementation programme for breastfeeding mothers be continued up to first 24 months of lactation to prevent weight loss due to the effect of lactation.

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