

EXCLUSIVE BREASTFEEDING AND POSTNATAL CHANGES IN MATERNAL ANTHROPOMETRY

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ABSTRACT

Objective: To evaluate the impact of exclusive breastfeeding (EBFing) practice on maternal anthropometry during the first 6 months of birth.

Method: Measurement of weight, height, triceps skin-fold thickness (TST), and mid-arm circumference (MAC) was carried out in a matched cohort of women practicing EBFing and those using other methods of infant feeding (non-EBFing group) in the first six months after delivery.

Result: There were 322 women practicing EBFing and 205 in the non-EBFing group. Weight loss was significantly higher among the EBFing group than in the non-EBFing ones during the first six months of EBFing practice (4.13 Vs 1.06kg), $p < 0.05$. This was primarily due to average weight loss of 3.43kg in EBFing mothers in the last 3-6 months of EBFing practice. There was also a significant loss in MAC in the EBFing mothers than in the non-EBFing one (2.78 Vs 0.75cm), ($p < 0.05$). Whereas the non-EBFing group experienced an increase in their TST (2.12mm), the EBFing mothers had a mean net loss of -1.03mm, ($p < 0.05$). A positive correlation was seen between the frequency of breastfeeding and maternal weight changes in the EBFing group ($r = 0.56$, $p < 0.05$), same was also seen between frequency of breastfeeding and maternal changes in TST and MAC losses in the same group of mothers, ($r = 0.08$ for TST, and 0.28 for the MAC, $p < 0.05$). The weight/height Z scores (WHZ), an index of thinness and body mass index (BMI) that determines the nutritional status of an individual however remained within normal limit for both groups of mothers despite their weight loss (WHZ of 0.67, and BMI of $22.09 \pm 3.7 \text{ kg/m}^2$) for EBFing mothers, and (WHZ of 0.71 and BMI of $22.82 \pm 3.2 \text{ kg/m}^2$) for the non- EBFing mothers.

Conclusion: It was concluded that though EBFing enhances more maternal weight loss, the nutritional status of the women practicing it however remained normal limit despite their weight loss.

Key Words: Exclusive breastfeeding, non exclusive breastfeeding, maternal anthropometry, weight, tricep skinfold thickness, mid-arm circumference.

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INTRODUCTION

There is a conflicting evidence as to whether breastfeeding promotes more weight loss post partum.^{1,2} Studies in some other countries have shown that women lose weight during lactation.³⁻⁶ The energy needs of lactating women is about 2.09MJ/day, (500kcal/day) greater than for non-lactating mothers.^{7,8} This increased need is compensated for by increase in appetite while breastfeeding.⁸ Studies in rats as well as man have shown markedly raise prolactin level during lactation.^{8,9} This hormone apart from promoting milk production is also know to stimulate appetite,⁹ and may thus explain the increased food intake in lactating human females. However, between 3-9 months of breastfeeding, when the prolactin level starts dropping despite stable levels of milk

production, the high energy demands of lactation and decreased appetite may tend to enhance maternal weight loss.^{10,11} In most development countries like Nigeria, food is relatively expensive in the face of low per capita income. There is thus wide spread malnutrition and anaemia among women of child bearing age.¹² Despite these challenges, mothers are expected to practice EBFing which implies feeding infants only on breast milk to the exclusive of all other feeds and drinks including water for 6 months.¹³ It is of interest therefore to determine whether mothers from this part of the world can meet up with the high energy demands and increased appetite associated with demand feeding of EBFing practice without much impact in their nutritional status. Again, most of the evidences used to evaluate the optimal duration of EBFing has focused on infant intake, growth and morbidity,¹⁴⁻¹⁶ and little attention is devoted to the effect on the mother or other functional outcomes of the infants. It has been argued that there may be a tradeoff between maternal and infants needs and that

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a comprehensive assessment of the risks and benefits of EBFing for both mothers and infants is needed to formulate appropriate feeding recommendations.¹⁷ It is on this note that current study was designed to determine the effect of EBFing practice on maternal anthropometry during the first six months of birth.

SUBJECTS AND METHODS

Subjects in the EBFing group consisted of three hundred and twenty-two (322) mothers whose children were attending growth monitoring unit of the Jos University Teaching Hospital (JUTH). The matched cohorts were two hundred and five (205) mothers among whom were those who dropped out from the practice of EBFing within the first seven days of delivery, and those recruited from the hospital under-five welfare clinic. Since JUTH is a Baby Friendly Hospital, where the ten steps to successful breastfeeding are fully implemented, recruitment of non-EBFing mothers within the hospital delivery and postnatal ward was practically impossible. Recruitment of EBFing mothers was at the hospital antenatal clinic (ANC) in their last trimester of pregnancy.

Inclusion criteria for EBFing mothers were; healthy mother in their last trimester of pregnancy, with uncomplicated pregnancy, not having any chronic illness to warrant chronic drug medication, neither smokes nor not drinks, and have no antibody to retrovirus in her serum. They will be living within Jos metropolis for easy follow-up and must have shown willingness to practice EBFing for 6 months. Their babies were full-term (37-42 weeks), adequate for gestational age,¹⁸ not asphyxiated at birth (apgar scores of ≥ 8 at 5 minutes), no congenital abnormality to interfere with growth and breastfeeding example, congenital heart disease or cleft lip or palate. Mothers recruited into the non-EBFing group were those who dropped out in EBFing practice on their own within 7 days of delivery, and those who delivered outside the hospital but were attending the hospital under five welfare clinic for immunization of their babies. These mothers were healthy mothers with uncomplicated pregnancy and delivery and leaving within Jos metropolis for easy follow up. Their babies were also healthy full-term babies, adequate for gestational age, not greater than 7 days old at recruitment, and with a history of good cry immediately after delivery. Approval was obtained from the Ethic Committee of JUTH. Written informed consent was obtained from the mother. The study was carried out in the JUTH, the recruitment period was between June to December 2003. Anthropometric measurements, the weight, height, MAC and TST of the EBFing mothers were taken at delivery, at 7th day postpartum and subsequently on a

monthly basis for six months of EBFing practice. For The non EBFing mothers, the same measurements were taken on 7th day after delivery, and subsequently every month for a period of six months. Weight was measured using a beam weighing scale accurate to 0.1kg, and height was taken with Ross stadiometer accurate to 0.1cm. Measurement of TST was with Lange calipers accurate to 0.55mm. A flexible, non-stretchable steel tape of 0.7cm diameter was used in the measurement of MAC. All measurements were carried out as described by Gordon and Roche.¹⁹ The Body Mass Index (BMI) of the mothers was calculated by dividing weight in kilogram by the height in meter squared.²⁰ The other preferred anthropometric indices for determining nutritional status of an individual is the weight for height (WH). Low WH is considered an indicator of wasting (ie "thinness") and is generally associated with failure to gain weight or loss of weight.²¹ The non-EBFing group offered their infants water, artificial milk formulae and cereals in addition to breast milk, while the EBFing group offered only breast milk to their infants. EBFing mother were given and taught how to fill in their breast feeding chart. This is a chart that indicates the number of times mothers breastfed their infants per day.

Data analysis was conducted using SPSS programme version 7.5 of 1996, that provided frequency distributions, means, standard deviations, correlation coefficient, student "t" test, and statistical significance of results. EPI info of July 1996: a public domain software for Epidemiology and Disease Surveillance was used to convert the weight and height information of the mothers to weight-for-height Z-scores [WHZ]. These were values based on the standard for (National Center for Health Statistics [NCHS]/ Centre for Disease Control {CDC})/World Health Organisation [WHO] by using anthro software (version 1.01).^{21,22} The Z score for the reference population has a normal distribution with a mean of zero and a standard deviation of 1. For example, if a study population has a mean WHZ of 0, this means that it has the same median WH as the reference population. The Z-score cut off point recommended by WHO, CDC, and others to classify low anthropometry levels is less than -2 SD units from the reference median.^{21,22} The proportion of the population that falls below a Z-score of -2 is generally compared with the reference population in which 2.3% fall below this cut off.^{21,22}

RESULTS

Table 1 depicts the characteristics of EBFing and the non EBFing women and their infants. The two groups showed similar anthropometric profile on recruitment except for the frequency of breastfeeding which is significantly higher in the EBFing mothers, $p < 0.05$. Table 2 shows the changes in body weight,

MAC, TST, and BMI of EBFing and non-EBFing mothers from 7th day after delivery to 6 months postpartum. The average weight of the two groups were essentially the same soon after birth, that of the EBFing group significantly decreased from the 7th day to the sixth month after delivery ($t=8.094$, $p<0.05$). The weight change in the non-EBFing group during the same interval was not statistically significant ($t=2.869$, $p>0.05$). The weight disparity among EBFing group was more marked in the last 3-6 months, than in the first three months, (3.13 Vs 1.00 kg). Table 2 also illustrates the pattern of TST, MAC and BMI in the two groups. Significant changes was seen in TST, MAC and BMI of EBFing group ($t=7.225$ for the TST, 6.929 for the MAC, and 9.010, for the BMI, $p<0.05$ for the three values.

There was no significant change in the mean MAC, TST and BMI of the non-EBFing mothers $p>0.05$. Body Mass Index is an index of assessing the

nutritional status in adult population, this was found to be normal for the two groups of mothers despite their weight reduction (22.09±3.7 kg/m² for the EBFing mothers and 22.82±3.2 kg/m² for the non-EBFing mothers). The relationship between frequency of breastfeeding and maternal anthropometric changes was shown in Table 3. There was a positive correlation between frequency of breastfeeding and maternal weight, MAC, TST and BMI changes in EBFing group ($r=0.56$ for weight, 0.28 for MAC, 0.08 for the TST, and 0.11 for the BMI, $p<0.05$). Multiple regression analysis indicated that aside from breastfeeding frequency, and the weight of infants, other variable like sex of the baby did not show any correlation with maternal anthropometrics changes (data not shown). Table 4 shows the Z-score of the two groups of mother. Whereas EBFing grouped showed a slight drop in their Z score value, the non-EBFing group had a non-significant increase from birth to six months of breastfeeding.

Table 1: Characteristics of EBFing and Non-EBFing Mothers.

Characteristics of Mothers	EBFing Group N=322	Non-EBFing Group N=205	T-test	P-values
Age (Years)	27.0±5.0	26.5±3.7	1.963	>0.05
Length of gestation (weeks)	39.4±2.0	38.6±3.4	5.541	>0.05
Parity	3.0±1.0	3.0±2.1	2.572	>0.05
No. of times b/fed on the 7 th days PP	13.1±1.2	7.7±1.6	18.435	<0.05
No of times b/fed on the 6 th month PP	10.2±0.4	5.3±1.4	22.177	<0.05
Maternal BMI (kg/m ²) 7 th day PP	23.81±3.4	23.51±2.7	2.188	>0.05
Maternal Weight (kg) “ “ “	57.15±11.5	56.43±8.9	1.046	>0.05
Maternal Height (cm) “ “ “	155.93±20.3	154.72±16.4	1.301	<0.05
Maternal MAC (cm) “ “ “	23.77±4.6	22.62±3.8	3.095	<0.05
Maternal TST (mm) “ “ “	17.06±4.3	16.39±6.4	1.661	<0.05
Infant Weight (kg) 7 th day after delivery	3.1±0.2	3.0±0.3	1.983	<0.05

MAC- Mid-arm Circumference
TST- Tricep Skinfold Thickness
PP- Postpartum
BMI- Body Mass Index
All values are means +SD
B/fed-breastfed

Table 2:Anthropometry of EBFing and Non-EBFing Mothers.

Age Postpartum	Maternal Anthropometry	EBFing (n=3220)	Non-EBFing (n=205)	T values	P-values
7days	Wt	57.15±11.5	56.43±8.9	1.04	>0.05
	TST	17.06±4.3	16.39±6.4	1.66	>0.05
	MAC	23.77±4.6	22.62±3.8	3.09	>0.05
	BMI	23.81±3.3	23.51±2.7	2.18	>0.05
1month	Wt	57.00±7.2	56.28±7.6	3.65	>0.05
	TST	16.82±4.3	16.54±5.3	2.78	>0.05
	MAC	23.15±3.7	22.73±4.5	3.59	>0.05
	BMI	23.65±3.1	23.45±3.7	2.81	>0.05
2months	Wt	56.73±6.4	55.89±9.1	2.92	>0.05
	TST	16.54±2.9	16.73±2.3	3.25	>0.05
	MAC	23.27±5.1	23.26±2.6	0.63	>0.05
	BMI	23.63±2.5	23.28±1.8	3.89	>0.05
3months	Wt	56.15±7.5	55.63±8.9	2.91	>0.05
	TST	16.22±7.2	16.96±2.9	3.76	>0.05
	MAC	22.95±6.3	23.68±3.8	8.73	>0.05
	BMI	23.39±2.2	23.17±1.7	4.03	>0.05
4months	Wt	55.32±8.7	55.30±5.4	0.65	>0.05
	TST	15.82±3.4	17.45±3.4	8.08	<0.05
	MAC	22.36±4.1	22.93±1.5	9.39	<0.05
	BMI	23.05±2.6	23.04±2.1	3.79	>0.05
5months	Wt	54.07±9.2	55.01±8.7	1.44	>0.05
	TST	15.52±3.3	18.01±2.2	11.51	<0.05
	MAC	21.71±2.8	24.39±4.4	9.76	<0.05
	BMI	22.52±2.9	22.92±1.8	2.38	>0.05
6months	Wt	53.02±8.3	54.77±6.1	4.13	>0.05
	TST	15.03±7.4	18.51±1.7	13.11	<0.05
	MAC	20.99±3.3	24.87±7.0	12.27	<0.05
	BMI	22.09±3.7	22.82±3.2	1.89	>0.05

All values are mean ±SD

Table 3:Correlation between Breastfeeding Frequency and Maternal Weight, MAC, TST, and BMI Changes in EBFing Mothers.

Post Partum age in months	Mother's anthropometry	Mean Breastfeeding frequency per day	Correlation coefficient
0 - 2mth (n= 428)	Wt (kg)	12.9±0.8	0.16
	MAC (cm)	“	0.11
	TST (cm)	“	0.19
	BMI (kg/m ²)	“	0.05
2 - 4mth (n= 425)	Wt (kg)	11.8±1.1	0.41++
	MAC (cm)	“	0.23++
	TST (cm)	“	0.08++
	BMI (kg/m ²)	“	0.09+
4 - 6mth (n = 422)	Wt (kg)	10.2±0.4	0.56++
	MAC (cm)	“	0.28++
	TST (cm)	“	0.08++
	BMI (kg/m ²)	“	0.11+

n= Total Number of mothers

++= P<0.05

Table 4: Z scores of EBFing and Non-EBFing Mothers.

Post Partum age in month	Z scores	EBFing	Non-EBFing
0	WHZ	0.74	0.68
1	WHZ	0.71	0.69
3	WHZ	0.68	0.73
6	WHZ	0.67	0.71

Normal Z scores value = 0 ± 2

DISCUSSION

The result showed that EBFing promotes more weight loss in women than non-EBFing especially during the later 3 months of the practice. The nutritional status of these women (EBFing group) however remain within normal limit despite their weight loss, evidenced by their normal Z-score of 0.67, that measures thinness and acute malnutrition, and BMI of $22.09 \pm 3.7 \text{ kg/m}^2$ that also measures the nutritional status of an individual. The weight reducing effect of breastfeeding especially when practiced exclusively in the last three months of the practice ie 3-6 months agrees with the findings of Dewey et al⁴, Ohlin and Rossner,²² who equally observed greatest weight loss among their study population from 3-6 months and 2.5 to 6 months respectively. One therefore speculates that the delayed weight reducing effect of breastfeeding might be related to the influence of falling level of prolactin in maternal serum during latter period of lactation. As states in the literature, prolactin apart from being milk-producing hormone also stimulates appetite. During latter lactation when prolactin concentration starts declining despite sustained high milk output, its appetite stimulating property will also be diminishing. The high-energy output of lactation that would have been offset by high food intake will be reduced resulting in appreciable weight loss seen in EBFing mothers during the latter 3 month of EBFing practice. Again, in most Nigeria cultures, mothers are usually placed on special diet soon after delivery, their relatives also come to assist in their domestic works during same period. These positive cultural values by way of improving maternal nutrition after delivery, as well as decreasing energy expenditure from domestic activities does not last greater than 6weeks in most cultures, this may be an additional explanation to the slower weight reduction seen during the early weeks of lactation in EBFing mothers. Other possible explanation to the differences between the weight changes in EBFing and the non-EBFing mothers might be related to the net differences between the assumed milk volume and thus energy demand that is expected to be greater in EBFing mothers than in the non-EBFing group. The amount of weight loss in EBFing mothers is however not very large considering the normal WHZ and BMI values inspite of their weight loss, but for thin women, it may be a source of concern, while in obese ones, it will be an added advantage. The average weight of a non lactating mother in most developing countries is 55.0 kg^{28,29} and does not differ much with the average weight of 53.02 ± 8.3 kg seen in EBFing mothers after six months of EBFing practice. It may however be argued that the effect of EBFing in maternal weight is protective against obesity in affluent environment, but could contribute to maternal

depletion in undernourished population. It is probably safer to advocate for nutritional supplementation for EBFing mothers in impoverished environment than for advocating reduction in duration of EBFing since the impact is not much in their weight. The pattern of changes in TST among the non-EBFing mothers in this study appears to be in consistent with those observed in other studies,^{2,17-19} an increase in TST despite overall weight loss. For the EBFing group there was a decrease in TST as the weight decreases, during both the early and latter period of EBFing. Other workers^{17,18} have reported a synchronous decrease in skinfold thickness at biceps, subscapular and suprailiac site and wt loss in EBFing mothers during lactation. They however, made no mention of reduction of skinfold thickness at the TST area, probably because the area was not included in their study. The differences in response at various adipose tissue sites during breastfeeding might be as a result of redistribution of fats due to site specific changes in lipoprotein lipase activities during lactation.²⁰ Whereas fat is gradually mobilized from triceps site during EBFing, it is deposited at same site during non-EBFing. Mid-arm-circumference is a measure of tricep and bicep skinfold thickness as well as muscle bulk, bone and skin. The significant changes in MAC of EBFed but not in non-EBFed group, (2.78 Vs 0.95cm) during the first 6 months of delivery in this study might have resulted from the observed changes in their TST. Whereas the EBFing group lost fats at their triceps skinfold, the non-EBFing group gained fat at the same site. The WHZ score, an indicator of body thinness and acute malnutrition, and BMI which also measures the nutritional status of an individual remained within the normal limit for EBFing mothers who had a significant loss in their anthropometric indices during the 6 months of EBFing. The weight reducing effect of EBFing was also observed by other workers who also indicated non adverse affect on maternal nutrition.

CONCLUSION

It was concluded that EBFing enhances more maternal weight loss especially at the latter 3 months of the practice. It was also noted that even though these mothers lost some weight during EBFing, their nutritional profile still fall within normal limit.

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