

## ORIGINAL RESEARCH ARTICLE

# Alpha-Tocopherol Levels in Milk of Exclusively Breast-Feeding Mothers in Benin City, Nigeria

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### ABSTRACT

The influence of prolonged breastfeeding on breast-milk alpha tocopherol was assessed in 112 lactating mothers practicing exclusive breast-feeding on term infants. The cross sectional study was carried out between May 1<sup>st</sup> and 30<sup>th</sup>, 2005 at the University of Benin/University of Benin Teaching Hospital, Benin City among lactating mothers. Employing the Quaife's method, mean alpha-tocopherol values were determined in spot samples of breast milk. Though not significant mean Breast-milk (BM) alpha-tocopherol tended to decline with maternal age ( $p > 0.05$ ) parity ( $p > 0.05$ ) and duration of breast-feeding. Similarly, family socio-economic status did not significantly influence mean BM alpha-tocopherol levels. Exclusive and or prolonged breast feeding do not predispose the infant to low vitamin E supplies through the breast milk. Further studies are advocated to evaluate the effects of other biosocial variables on the levels of BM anti-oxidant vitamins including alpha-tocopherol (*Afr J Reprod Health 2009; 13[2]:55-60*).

### RÉSUMÉ

**Niveaux de tocophérol-alpha dans le lait des mères qui nourrissent leurs bébés exclusivement au sein à Benin City.** Nous avons évalué l'influence de l'allaitement prolongé sur le tocophérol-alpha du lait maternel chez 112 mères allaitant qui pratiquent l'allaitement exclusive de leurs enfants nés à terme. L'étude transversale a été effectuée entre le 1<sup>e</sup> et le 30 mai 2005 à l'University of Benin Teaching Hospital auprès des mères allaitant. A l'aide de la méthode Quaife, les valeurs moyennes du tocophérol-alpha ont été déterminés à travers des échantillons de taches du lait maternel. Quoique peu significatif, le lait maternel moyen (mm) du tocophérol-alpha avait la tendance à baisser avec l'âge maternel ( $p < 0,05$ ), la parité (0,05) et la durée de l'allaitement. De la même façon, la situation socio-économique familiale n'a pas influencé de manière significative les niveaux du tocophérol-alpha BM moyen. L'allaitement exclusif ou prolongé ne prédispose pas l'enfant à une provision baissée de la vitamine E à travers le lait maternel. Nous préconisons davantage d'études pour évaluer les effets d'autres variables biosociaux sur les niveaux des vitamines anti-oxidantes BM y compris le tocophérol-alpha (*Afr J Reprod Health 2009; 13[2]:55-60*).

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KEYWORDS: Alpha tocopherol , Breast milk, Lactating mothers, Benin City

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## Introduction

Alpha-Tocopherol or Vitamin E is a fat soluble vitamin whose role in human health has been the subject of intense concern.<sup>1,2</sup> One of its acknowledged roles is that of curtailing lipid peroxidation from oxidation stress and consequently preventing for instance, red cell haemolysis.<sup>2</sup> In deficiency state, therefore, red cell haemolysis could occur and this is marked particularly in preterm babies, especially if they are exposed to increased levels of iron.<sup>3</sup>

The recommended daily requirement for vitamin E in the first year of life is 0.14mg/kg<sup>4</sup> and this is considered to be adequately met by the vitamin endowment in breast milk.<sup>5,6</sup> However, vitamin E content of breast milk is influenced by maternal dietary intake<sup>7</sup>, parity<sup>8</sup>, type of breast milk and phase of lactation.<sup>9</sup>

The last decade has witnessed the increased or heightened emphasis on exclusive breast feeding of babies.<sup>10,11</sup> The programme demands that the infant be fed only on breast milk for a period of six months before introduction of complimentary feeds. It is uncertain how the prolonged period of exclusive breast-feeding (EBF) affects the breast milk content of vitamin E. This is particularly so in under-developed economies where maternal nutrition is at the vagary of rapid changes in the nation's socio-economic conditions. Thus, in this study the vitamin E status of breast milk obtained from exclusively breast feeding mothers is examined.

## Patients and Methods

The study was conducted at the University of Benin, Department of Biochemistry and the University of Benin Teaching Hospital (UBTH) between May 1<sup>st</sup> and 30<sup>th</sup>, 2005. Study subjects were lactating mothers (practicing or had practiced exclusive breast feeding) that were attending the Immunisation Clinics of the General Practice Clinics (GPC) of UBTH, and who consented to participating in the study following due explanations. Informed verbal consent was obtained from each participant before being consecutively enrolled in the study. None of the study subjects was receiving vitamin E supplement during the period.

Biodata was obtained from each subject and her spouse. The information included educational status and job description to facilitate socio-economic stratification in accordance with the method of Olusanya and co-workers.<sup>12</sup> Also obtained were age of the child, parity and type of breast-feeding.

Three milliliter of expressed breast milk was obtained from each subject into a sterile universal container. The method of alpha-tocopherol assay used was the Emmerie-Engel's reaction as described by Quaife<sup>13</sup> and based on reduction of ferric ion to ferrous ion in the presence of a chromogenic agent such as alpha-dipyridyl. The ferrous ion subsequently reacted with O-phenathroline to give a red colour, which is measured at 520nm (point of maximal absorption). The procedure involved deproteinisation of milk with equal volume of absolute

alcohol followed by extraction by equal volume of xylene. Alpha dipyrityl was added to an aliquot of the upper layer of the mixture to estimate the principal interfering substance, beta-carotene at 460nm. Thereafter ferric chloride was added to produce the colour obtained by the Emmerie-Engel's procedure. From the absorbencies of test and standard samples at both 460 and 520nm, the concentration of alpha-tocopherol in mg/ml was derived for each sample. For each test sample, three readings were obtained from which the mean was deduced.

**Results**

One hundred and sixteen lactating mothers were involved in the study. One hundred and twelve of these were practicing exclusive breast-feeding as recommended at the time of the study while four practiced predominant breast-feeding. They were mothers who had term normal deliveries in health facilities with ascertainable birth weight. The four cases that were not exclusively breastfed were subsequently excluded from

analysis. Mean age was  $27.8 \pm 13.9$  years, (range, 18 – 41 years). The modal age bracket was 26 – 30 years, (42.8%). Others were 20 years or below, 8(7.1%); 21 – 25, 39(34.8%) and 31 years and above 17(15.2%). The distribution of mean alpha – tocopherol by maternal age is as shown in Table 1. Values obtained in mothers that were 20 years and below were markedly lower than those from older lactating mothers. Peak values were gotten from breast milk of mothers aged 21 – 25 years. Thereafter, the tendency was towards declining values for increasing maternal age.

Mean (SEM) alpha tocopherol in breast milk during the neonatal period or first month of life was  $0.2367 \pm 0.0208$ mg/dl. It was  $0.2617 \pm 0.0079$  at second and third months of lactation but dropped to  $0.2424 \pm 0.0341$  mg/dl obtained beyond 6 months of lactation – a value comparable to that ( $0.2367 \pm 0.0208$ mg/dl) obtained in the first month of breast feeding. The variation in mean alpha tocopherol levels with duration of breast-feeding was not statistically significant.

The distribution of mean alpha toco-

**Table 1:** Distribution of mean breast-milk alpha-tocopherol by age

Age range (yr)	No of Subjects	Mean (SEM) BM alpha-tocopherol (mg/dl)	CV (%)
< 20	8	$0.2658 \pm 0.0265$	28.0
21 – 25	39	$0.2747 \pm 0.0060$	13.6
26 – 30	48	$0.2477 \pm 0.0096$	26.8
> 30	17	$0.2507 \pm 0.0094$	15.4

CV: Coefficient of variation; SEM: Standard error of mean

levels by parity is as shown in Table 2. Highest mean (SEM) alpha tocopherol of  $0.2614 \pm 0.0091$  mg/dl was obtained in nulliparas while the least value of  $0.2421 \pm 0.0106$  mg/dl was obtained in multips. Despite this trend however, parity did not significantly influence the mean breast milk values of alpha tocopherol ( $p > 0.05$ ).

**Table 2:** Mean breast milk alpha-tocopherol distribution by parity

Parity	No of Subjects	Mean (SEM) BM alpha-tocopherol (mg/dl)	CV (%)
Nullipara	9	$0.2614 \pm 0.0091$	10.4
1	21	$0.2573 \pm 0.0208$	9.5
2	27	$0.2569 \pm 0.0171$	34.5
3	33	$0.2583 \pm 0.0175$	38.9
4	22	$0.2421 \pm 0.0106$	20.5

CV: Coefficient of variation; SEM: Standard error of mean

Mean breast milk alpha – tocopherol was also not significantly influenced by mother’s socio-economic status. Values obtained in high socio-economic classes of  $0.2588 \pm 0.0094$  mg/dl did not significantly vary from that gotten from those drawn from low socio-economic classes ( $0.2553 \pm 0.0087$  mg/dl). Nonetheless, the trend was that values from lactating mother from high socio-

economic strata were higher than those from poor economic background.

## Discussion

Breast milk levels of alpha tocopherol were un-influenced by period of lactation. Even beyond 6 months values were still in excess of recommended daily allowances for age<sup>4</sup>, suggesting that prolonged breast feeding not withstanding, the exclusively breast-fed baby still had enough endowment of alpha tocopherol. A factor that could possibly explain the trend is the emphasis on the nutrition of the parturient mother during the first few months post partum. Preferential nutrition for the parturient mother during early post natal period is common in the study locale.

Values of breast milk alpha tocopherol obtained in multips and grand multiparous women were comparable to those observed in nullipara. This is however in contradistinction to that documented in the work of Lachili et al<sup>8</sup> where better plasma tocopherol status in multiparous women was noted. They had ascribed the difference to an improved adaptive response to oxidative stress in multiparous women. However, such adaptive responses would be modulated by the status of other antioxidant substances particularly; ascorbic acid that has been demonstrated to have some synergistic functions with Vitamin E.<sup>14</sup> The implication of our finding is that adequate supply of breast milk alpha-tocopherol during breast feeding could be guaranteed irrespective of the parity.

The roles of maternal nutrition on the nutritional status of their babies, regarding fat-soluble vitamins, have been duly acknowledged.<sup>15</sup> It can be argued that a malnourished lactating mother would be more liable to producing small volume milk of low quality. However there was no significant variation in breast milk status of vitamin E between mothers from low and high socio-economic settings, even though lower values were obtained in the former group.

Maternal age had some relationship, albeit not significantly, with breast milk alpha-tocopherol. The decline in values with increasing age beyond 20 years may be readily explained on the basis of the confounding factor of increasing parity with age. Of note, however, is the observation that very low levels were obtained in teenage mothers. It is uncertain why the trend should be so. Perhaps low maternal endowment arising from physiologic immaturity may be responsible. It is also plausible that due to her peculiar social characteristics, than anyone else, she is predisposed to malnutrition and poor lactation practices.

In conclusion, the exclusively breast fed term infant has access to adequate serum alpha tocopherol. Despite prolonged breast-feeding, parental low-socio-economic status and high parity the breast milk is endowed to provide enough alpha-tocopherol to the growing infant.

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