

## Research Article

# Effect of maternal nutritional status on the biochemical composition of human milk

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### ABSTRACT

**Background:** Infants normally thrive on their mother's milk. The nutrients required to sustain such a rapid growth are all supplied by breast milk alone in the first 3-4 months of life, in all infants. The composition of human milk should therefore provide a clue to the physiological needs for energy and nutrients in infants.

**Methods:** Sixty three milk samples of lactating mothers of full term babies were assessed for the levels of lactose, protein, triglyceride and cholesterol and were compared depending on their body mass index (BMI).

**Results:** The result of the present study showed that lactose content of the milk ranged between 4.2 gm/dl to 9.7 gm/dl, with a mean of 6.47 gm/dl. Protein content ranged from 0.6 gm/dl to 7.1 gm/dl, with a mean of 2.4 gm/dl. Cholesterol had a wide range with a minimum of 4.8 gm/dl to a maximum of 99.4 mg/dl, with a mean of 32.3 mg/dl. Triglyceride had a mean value of 8.4 gm/dl, values ranging from 1.9 to 34.1 gm/dl.

**Conclusions:** Breast milk composition is fairly constant and is not affected by maternal nutrition, or dietary intake.

**Keywords:** Human milk composition, BMI, Maternal nutritional status

### INTRODUCTION

The macronutrient concentrations of human milk are associated with one or more of the following factors: Maternal body weight for height, protein intake, parity, return of menstruation, and nursing frequency.<sup>1</sup> Exclusive human milk feeding for the first 6 months of life, with continued breast feeding for 1 to 2 years of life or longer, is recognized as the normative standard for infant feeding.<sup>2</sup>

It is now clearly established that breast milk composition is not constant, but rather evolves throughout lactation in response to the changing nutritional requirements of the neonate.

Nearly every macronutrient in breast milk evolves in some way during the course of lactation, with perhaps the most striking changes occurring with proteins, lipids and

energy. These variations are believed to respond to specific infant needs and have beneficial effects on growth and development both during infancy and later in life.<sup>2</sup>

There is great variability in the concentrations of energy – yielding nutrients in human milk, even within well – nourished populations. The composition of milk changes from preterm to term, at different stages of lactation, and also has diurnal variation.<sup>3</sup>

There are very scanty recent Indian and Western data, regarding the composition of human milk and the effect of maternal nutritional status on its outcome.

The existing data available is almost two decades old. This study aims to renew our data of human milk composition, in our population, and study the influence of maternal nutritional status on the milk that is secreted.

## METHODS

The study was conducted at the Lokmanya Tilak Municipal Medical Hospital, Sion, Maharashtra, India. The study was approved by the local ethics committee. A total of sixty three lactating mothers of full term babies from post – natal ward of a tertiary care hospital were selected for the study.

### Inclusion criteria

Lactating mothers of full term babies, with a mean age of 28 years, from the well – baby OPD who gave written, valid and informed consent were included in the study. Mothers with BMI in the following ranges were included:

- BMI <18.5 kg/m<sup>2</sup>
- BMI between 18.5 – 25 kg/m<sup>2</sup>
- BMI >25 kg/m<sup>2</sup>

### Exclusion criteria

- HIV positive mothers
- Mothers with acute disease.

The subjects were divided in three categories, depending on their Body Mass Index (BMI). Mother's pre – pregnancy weight were considered for calculating their BMI. 5 ml of the total breast milk expressed by mothers was taken, pre – feed at around 9am to 11am, and collected in sterile containers. Lactose was determined by Benedict's test. Protein was determined using Biuret test.

Lipids were extracted using chloroform – methanol extraction method. Triglycerides were estimated using glycerol-3-phosphate oxidase (GPO) method and cholesterol was estimated by Cholesterol oxidase (CHOD) method.

**Table 1: Body mass index chart for different groups.**

| Group | BMI                       |
|-------|---------------------------|
| I     | <18.5 Kg/m <sup>2</sup>   |
| II    | 18.5-25 Kg/m <sup>2</sup> |
| III   | >25 Kg/m <sup>2</sup>     |

### Statistics

Mean and standard deviations were determined for quantitative data. The significance of differences among the three groups was analyzed by student's t-test.

## RESULTS

The mean±SD values and p-values of biochemical parameters were performed in all the three groups (Table 2). Lactose content in the 3 groups was similar, with no statistical significant difference in the 3 groups. Protein content was significantly lower in milk of mothers from group 1. The difference is statistically significant, with a p value of 0.015. Protein content in group 1, was also found to be lower with statistical significance when compared to group 3, with a p value of 0.001. There was no statistically significant difference in triglyceride and cholesterol levels, in the 3 groups.

**Table 2: Comparison of parameters in the three groups.**

| Group, Mean (±SD) | Lactose (gm/dl) | Proteins (gm/dl) | Cholesterol (mg/dl) | Triglycerides (gm/dl) |
|-------------------|-----------------|------------------|---------------------|-----------------------|
| Group 1 (n=21)    | 6.31 (±1.41)    | 1.51 (±0.48)     | 28.4 (±23.5)        | 7.43 (±5.62)          |
| Group 2 (n=21)    | 6.66 (±1.55)    | 3.29 (±1.27)     | 36.61 (±22.59)      | 10.73 (±8.54)         |
| Group 3 (n=21)    | 6.43 (±1.44)    | 2.58 (±1.15)     | 32.03 (±17.61)      | 7.08 (±2.28)          |
| All (n=63)        | 6.47 (±1.45)    | 2.46 (±1.25)     | 32.35 (±21.33)      | 8.41 (±6.18)          |

## DISCUSSION

A study has shown that maternal nutrition, or, conversely, energy supplementation, has little effect on lactose concentration in milk; and it has been stated that of all nutrients in human milk, lactose is the nutrient least likely to be affected by maternal nutrition.<sup>4</sup>

Similarly, we see in our study, there was no difference, in the lactose levels of milk in all the 3 groups. Lactose content in a study from New Delhi were 6.4 to 7.6 gm/dl, which is similar to our results.<sup>5</sup> Present study points out that poorly nourished mothers, in group 1, had significantly lower protein content (1.5 gm/dl), when

compared to well – nourished mothers, in group 2, (3.29 gm/dl). Similarly, Garg et al found a significantly higher protein concentrations in the colostrum of well-nourished than undernourished mothers (6.0 and 4.5 g/dl respectively).

Karmarkar and Ramakrishnan found a significant relation between protein in the diet and milk protein concentration, with (as for fat) an apparent threshold effect at daily protein intakes of around 40 g to 50 g. Other authors have reported low protein concentrations in the milk of undernourished women from several countries including India and Guatemala. Low fat concentrations were found in milk from poorly nourished

women compared to published values from western societies, but methodological differences cannot be excluded. The general lack of an effect of diet on total milk fat could, of course, arise from the use of depot fat to synthesize milk fat. In our study not much difference was found in fat content of different groups.

## CONCLUSION

Breast milk composition is fairly constant and is not affected by maternal nutrition, or dietary intake. The only significantly lower levels of protein, were still in the acceptable range, and would meet the infant's requirement.

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