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BIOCHEMICAL STUDIES ON HUMAN MILK FROM ABEOKUTA, NIGERIA

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ABSTRACT

Biochemical analysis was carried out on the human milk of lactating mothers, aged 15-30 years [illegible] Abeokuta, Nigeria. Microbiological sampling showed the human milk to be microbiologically pure for infants consumption as the total viable bacteria growth per ml was found to be nil. The samples had pH values ranging from 5.8 to 6.2, protein content ranged from 14.3 to 21.4mg/ml, calcium content ranged from 0.13 to 0.27mg/ml and sugar content ranged from 1.6 to 3.0mg/ml. Women aged, 15-20 years had the most nutritive human milk profile, based on these parameters ($P < 0.05$).

KEY WORDS: Biochemical Studies, human milk, Nigeria.

INTRODUCTION

Milk is the natural food of the newborn mammal for whom it is the sole source of food and nourishment for some period after birth. Milk is the secretion of the mammary glands of animals which suckle their young (Ekoronye and Ngoddy, 1985). An increasing number of women are currently choosing to breast feed their infants for longer periods (Martinez and Nalesienski, 1979, 1981).

Milk is a good source of protein of high biological value as well as calcium. It therefore supports sound bone and teeth development as well as growth in children. Useful vitamins: riboflavin, pyridoxin, biotin, niacin, panthothenic acid and vitamin C have been reported in human milk (Casey and Hambidge, 1983).

Milk is known to protect infants against bacterial infection and allergic reactions (Ebrahim, 1983; Ogunsanya, 1994). Water-soluble vitamins, fatty acid composition and lipid contents of human milk have been known to reflect maternal food intake (Soderhjelm, 1953; Insull and Ahrens, 1959; Belavady, 1978; Jacharson et al, 1992; Ogunsanya, 1994). As an example, Borschel et al (1986) in his comparative study of the fatty acid composition of mature human milk of Egyptian and American women found that breast milk of Egyptian women contained higher percentages of capric, caric, myristic, linoleic and arachidonic acids while the converse of higher percentages of stearic and oleic acids in breast milk of American women was true. In the same vein, breast milk of American and Australian women were found to contain linoleic acid values of 14-16% and 11% respectively (Janssoh et al, 1981; Jobson and Kneebone, 1981; Bitaman et al, 1983).

The high nutritive value of milk makes it rapidly contaminated by microorganisms and thus gives it a short shelf life. The present study was undertaken with the following aims in view: to assess the nutritional value of human milk from Abeokuta, Nigeria; to ascertain the purity of the milk and to compare the nutritive values of human milk produced by lactating mothers of varying ages from this region.

MATERIALS AND METHODS

Human milk collection: Human milk samples were collected from 250 healthy lactating mothers, aged 15 to 40 years by manual expression, from 5 randomly selected hospitals in Abeokuta, the capital of Ogun State of Nigeria. The lactating mothers were within one month of having given birth. Twenty millilitres of human milk were obtained from each lactating mother and delivered into sterile sampling bottles which were immediately frozen prior to analysis. The lactating mother's nipple was thoroughly cleaned with 70% alcohol prior to milk collection.

Microbiological Analysis of Human Milk: Serial dilutions from 10^{-1} to 10^{-3} of each 1ml milk sample were prepared. For the viable bacterial count, 0.1ml of the stock dilutions, 10^{-1} to 10^{-3} were plated in triplicate on nutrient agar plates. The innoculum was spread evenly round the plate using pour plate method. The plates were incubated at 37°C for 48h after which bacterial colony presence in the plates was ascertained.

Calcium Content and pH Value of Human Milk: Calcium content was determined by pipetting 1ml of the milk sample into a beaker, diluting it to 100ml, adding 2 drops methyl red and ammonium hydroxide added drop-

wise until a brownish orange colour was obtained. Thereafter, 2 drops of dilute hydrochloric acid were added and the solution diluted with 50ml of water. The solution was boiled and 10ml of hot 4.2% ammonium oxalate solution added with stirring until a precipitate was formed. The precipitate was filtered out, washed with 40% ammonium hydroxide solution and dissoved in a mixture of 125ml water and 5ml 98% sulphuric acid. The ensuing solution was heated to 70°C using a water-bath and titrated against 0.05N potassium permanganate solution (IITA, 1979). The pH of the milk samples was determined by dipping the electrode of a warmed pH meter in 10ml human milk sample and the pH noted.

Protein and Sugar Contents of Human Milk: Protein content was determined using Folin Ciocalteau method by adding 3ml of solution A to 1ml of human milk (solution A consisted of 50ml 2% Na_2CO_3 in 0.1M NaOH mixed with 1ml of a mixture of 10% $CuSO_4 5H_2O$ and 2% sodium tartarate). At 10 min. after addition, 1ml of Folin Ciocalteau reagent was added and 30min. later, the optical density of the resulting solution was taken at 570nm against a blank that had 1ml human milk replaced with 1ml distilled water. The protein standard curve was prepared from various concentrations of casein in 0.1M NaOH (Lowry et al, 1951). Sugar content was determined using phenol-sulphuric acid method of Dubois et al (1956) by adding 1ml of 5% phenol and 5ml concentrated H_2SO_4 to 1ml of human milk and the optical density taken against a blank at 490nm. The blank contained 1ml of distilled water instead of milk extract and the standard curve was prepared using various concentrations of glucose (Dubois et al, 1956).

RESULTS AND DISCUSSION

The pH values of the human milk ranged from 5.9 to 6.3 while the protein contents ranged from 14.3 to 21.4mg/ml (Table 1). With regards to calcium and sugar contents, the least values of 0.13mg/ml amd 1.6mg/ml were observed in age group 36-40 while age group 15-20 had the highest values of 0.27mg/ml and 3.0mg/ml (Table 1)

Bacterial growth in the cultured human milk was found to be nil. This result is in agreement with the report of American Academy of Pediatrics which considered human milk to be a clean and optimal source of nutrition for the infants (American Academy of Pediatrics, 1978). Protein, calcium and sugar contents of human milk were observed to decline in quantities with increase in age of the women while the converse was true with regards to pH values (Table 1). Calcium and sugar contents of 15-20 years age group's breast milk were significantly higher than those of other age groups ($P < 0.05$) whereas in the case of protein contents, only those of age groups 31-35 and 36-40 were significantly lower to that of age group 15-20 years (Table 1). The implication of the above findings is that women, aged 15-20 years produce the most qualitative human milk.

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Table 1: Mean pH, protein, calcium and sugar contents of human milk from lactating mothers, aged 15-40 years

Age group (years)	pH Level	Protein content (mg/ml)	Calcium content (mg/ml)	Sugar content (mg/ml)
15 - 20	5.9	21.4	0.27	3.0
21 - 25	6.1	19.8	0.20	2.6
26 - 30	6.1	18.5	0.18	2.4
31 - 35	6.2	17.5	0.16	2.0
36 - 40	6.2	14.3	0.13	1.6

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