

ORIGINAL ARTICLE

CORRELATION OF LACTOFERRIN LEVELS IN BREAST MILK WITH MATERNAL HAEMOGLOBIN PERCENTAGE AMONG LACTATING WOMEN OF LOW AND HIGH SOCIOECONOMIC STATUS

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Background: Due to considerable lack of knowledge among working class women and housewives (with no/low literacy level) about the prime sources of dietary iron and the use for their own health during child bearing age is a dilemma that affects the entire family system resulting in decreased haemoglobin level and consequent anaemia during and after pregnancy and its effect on quality of breast milk due to which the child suffers. **Objective:** To assess the lactoferrin levels in breast milk with haemoglobin percentage among lactating women of low and high socio-economic status and to compare both the groups for the same. **Methodology:** A total of 60 lactating mothers were involved in this study. Among them 30 belonged to the population of high socioeconomic status (H group) and 30 belongs to the population of low socioeconomic status (L group). The demographic data was compiled on a questionnaire proforma. 2 ml of blood was collected in EDTA bottles in each case and sent to clinical laboratory for the estimation of haemoglobin%. 5–10 ml of breast milk was collected with breast pump into sterile bottle. The assistance of nurses on duty was employed to aseptically collect the samples. The mother's consent was also obtained before collection. The samples were transported on dry ice to the clinical laboratory for estimation of the lactoferrin levels using ELISA Method. **Results:** The mean haemoglobin saturation in whole blood was calculated, in L group was 52.9% as compared to 63.6% in H group. These findings were found statistically significant ($p < 0.05$) in each group and also when comparing both groups. The mean lactoferrin level in L group was 2.472 mg/ml as compared to 3.56 mg/ml in H group. These findings were found statistically significant ($p < 0.05$) in each group and also when comparing both groups. The results of lactoferrin level were also found significant in all age groups. **Conclusion:** The current study highlights the importance of health of lactating women in order to improve the quality of milk for their babies. The data extracted shows significant difference in the lactoferrin levels of milk between low and high socioeconomic population which significantly correlates with percentage of haemoglobin, and also in different age groups of both classes indicated by the level of the lactoferrin in their milk.

Keywords: Lactoferrin, Haemoglobin, Breast Feeding, Socioeconomic Status

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INTRODUCTION

To feed the child with the mother's milk is known as the breastfeeding. The breast milk is divided into two parts, the first part is the colostrum which is from the 37 weeks of the intrauterine life up to seven days after the postpartum, this is yellowish in colour and sticky in nature. Whereas mature milk starts from 10 days after delivery and it is white in colour.^{1,2} For the child's health the colostrum plays the vital role as it has 10% more protein than the mature milk which has only 1% protein. The other components which are important to enhance the immune defense of the baby, are immunoglobulin IgA, less amount of fat, vitamin A, lactoferrin, zinc and white blood cells.³

Lactoferrin is an iron-binding multi-functional protein.⁴ In human milk lactoferrin is the main iron binding protein.⁵ In 1993, the lactoferrin was isolated from specific granules of neutrophils exocrine glands and it was also observed that blood plasma lactoferrin

level is maintained by degranulation of neutrophils.⁶ The anti-inflammatory property protects pathogenic micro-organisms.⁷

Lactoferrin can affect metabolism and distribution of various substances by binding at a low affinity with heparin, DNA, lipopolysaccharides, glycosaminoglycans, or other metal ions like Al^{+++} , Mn^{+++} , Co^{+++} , Cu^{++} , Zn^{++} , oxalates, carboxylates, etc.⁸

The myeloid series and secretory epithelial cells are the predominant cell types in lactoferrin synthesis.⁹ Increased concentrations of lactoferrin are present in milk and colostrum¹⁰, and many other secretions like tears, saliva, urine and gastric fluid^{11,12}.

In plasma or serum and whole blood the lactoferrin concentrations are low.¹³ There was remarkable difference in the results of these authors varying from 0.02 $\mu g/ml$ to 1.52 $\mu g/ml$ in blood, these differences may be because of using different analytical methods, variations in iron saturation of lactoferrin,

spontaneous polymerization, the type of anticoagulant, and by the interval between sample collection and analysis or by storage.¹¹ The plasma lactoferrin concentrations may or may not be directly proportional with the neutrophil count¹⁴, and is mainly dependent of degranulation of neutrophils may be due to the contribution of other organs, like endometrium and bone marrow¹⁵ and placenta¹⁶. Pregnancy and menstrual cycle alters the lactoferrin concentration in plasma¹¹, and excessive iron intake, tumour growth, during infection and inflammation, the level of lactoferrin increases⁸.

The objective of this study was to assess the correlation of lactoferrin levels in breast milk with haemoglobin percentage among lactating women of low and high socioeconomic status.

METHODOLOGY

This prospective experimental study was conducted for 6 months at Isra University Hospital Hyderabad. A total of 60 cases were selected randomly including with half from population of high socioeconomic status (H) and other half from population of low socioeconomic status (L). The inclusion criteria were healthy lactating women of low and high socioeconomic status, irrespective of sex and health of their babies. The exclusion criteria were the mothers having any co-morbidity, as the study was conducted on healthy mother, so any associated acute or chronic illness were excluded. The samples contaminated with blood or pus were also excluded from the study.

The study was carried out after the permission of Ethical Committee. The demographic data was collected on a questionnaire proforma. About 5–10 ml of breast milk was aseptically collected into sterile bottles with the help of nurse on duty, after taking written informed consent of the subjects. The samples were transported on ice to the clinical laboratory for estimation of the lactoferrin levels using ELISA Method.

Data analysis was conducted using SPSS-16. Mean and standard deviation were calculated for quantitative variables and lactoferrin levels. Effect modifier like weight and age were controlled by stratification.

RESULTS

The majority of cases were in their twenties in both groups but the mean age in L group was found low in comparison to H group (Table-1).

The haemoglobin and lactoferrin levels were low in L group. The mean lactoferrin level in whole L group was 2.473 mg/ml, while 3.560 mg/ml in H group. The lowest levels of lactoferrin were found in <20 years of age in both groups, which were 1.81 mg/ml and 3.10 mg/ml in L and H groups respectively which were statistically significant (Tables 2–5).

Table-1: Distribution of age groups in both groups

Age (years)	Low Socio-economic Status Group (n=30)	High Socio-Economic Status Group (n=30)
<20	8	2
21–30	16	17
31–40	4	9
>41	2	2
Total	30	30

Table-2: Mean Lactoferrin and Haemoglobin levels in both groups

Parameter	L Group (n=30)	H Group (n=30)	P
Lactoferrin (mg/ml)	2.473±0.54	3.56±0.49	0.000
Haemoglobin (G/dl)	8.460±1.06	10.17±1.52	0.000

Table-3: Lactoferrin level in individual groups

Group	(n)	Mean±SD	SEM
<20 years (low)	8	1.81±0.27	0.09717
<20 years (high)	2	3.10±0.70	0.50000
20–30 years (low)	16	2.76±0.53	0.13444
20–30 years (high)	17	3.51±0.55	0.13537
31–40 years (low)	4	2.75±0.75	0.37749
31–40 years (high)	9	3.76±0.25	0.08333
>40 years (low)	2	41.50±0.70	0.50000
>40 years (high)	2	3.45±0.21	0.15000

Table-4: Lactoferrin level in individual groups

Parameter	t-test	df	p	95% CI	
				Lower	Upper
Low (complete group)	20.68	29	0.000*	2.18	2.66
High (complete group)	39.43	29	0.000*	3.32	3.69
<20 years (low)	18.13	7	0.000*	1.53	1.99
<20 years (high)	6.10	1	0.103	-3.30	9.40
20–30 years (low)	20.17	15	0.000*	2.42	2.99
20–30 years (high)	25.61	16	0.000*	3.18	3.75
31–40 years (low)	7.15	3	0.006*	1.49	3.90
31–40 years (high)	44.60	8	0.000*	3.52	3.90
>40 years (low)	82.90	1	0.008*	35.09	47.80
>40 years (high)	22.67	1	0.028*	1.49	5.30

*Significant

Table-5: Haemoglobin level in individual groups

Parameter	t-test	df	p	95% CI	
				Lower	Upper
Low (complete group)	43.45	29	0.000*	8.01	8.80
High (complete group)	36.61	29	0.000*	9.55	10.68
<20 years (low)	34.14	7	0.000*	7.15	8.21
<20 years (high)	17.30	1	0.037*	2.29	15.00
20–30 years (low)	32.37	15	0.000*	8.05	9.18
20–30 years (high)	24.93	16	0.000*	9.24	10.96
31–40 years (low)	20.42	3	0.000*	7.91	10.83
31–40 years (high)	24.96	8	0.000*	9.59	11.54
>40 years (low)	14.00	1	0.045*	0.71	14.68
>40 years (high)	9.75	1	0.065	-2.95	22.45

DISCUSSION

The mother’s milk is also known as the ‘living nutritional fluid’.¹⁷ It is not only valuable for the baby’s health but also has many benefits for the mother’s health. Breast milk is important for the spacing between the children as it suppresses the ovulation. It decreases the bleeding after the delivery. It helps the mother to return back to the weight before the pregnancy. Breast feeding helps in the uterine involution. It helps in the

maintenance of the physical and mental health of the mother and helps in developing the bonding between the mother and the child. Breast feeding helps in reducing the risk of the carcinomas of the breast itself and the carcinoma of the ovary. It protects the bones also by the osteoporosis.¹⁸⁻²¹

The mother's milk is very good for the baby as well as the mother's health, but there are some drawbacks of breastfeeding also. They are the discomfort on feeding in public places, pain and tenderness in the breast, the problems related with positioning of feeding, time factor as it takes long duration to feed a baby with the breast as compared to the bottle feed, and the mother becomes tired.²²⁻²³

But after all above mentioned factors, the most important thing is the quality of milk, which is determined by its constituents and mainly the 'lactoferrin', and its correlation with haemoglobin.

Comparing age, the mean age was found high in H group. The mean hemoglobin percentage in L group was 52.9% as compared to 63.6% in H group. These findings were found statistically significant ($p < 0.05$) in each group and also when comparing both groups. The results were also found significant in all age groups individually, but in comparing L and H groups however the levels of hemoglobin are low in L group but the results were statistically insignificant in <20 and 31-40 years age group.

The mean lactoferrin level in L group was 2.472 mg/ml as compared to 3.56 mg/ml in H group. These findings were found statistically significant ($p < 0.05$) in each group and also when comparing both groups. The results of lactoferrin level were also found significant in all age groups individually except <20 years in H group. In comparing all age groups, the lactoferrin level was found statistically significant, indicating that socioeconomic status of mother play an important role in maintaining quality of milk, as in L group beside early marriages there is lack of education with poverty which results in under-nourished mothers having multiple pregnancies without proper interval. In a study by, Fransson *et al*²⁴, lactoferrin levels were found to be high in severely anemic women; however, the number of subjects was very low. Donangelo *et al*²⁵ in 1991 concluded that, Brazilian women of low socioeconomic status has low levels of lactoferrin as compared to high socioeconomic group but these results were not significant. Shashiraj *et al*²⁷ in New Delhi India observed low levels of lactoferrin in anemic population of both groups, but the results were not statistically significant. Houghton *et al*²⁸ studied lactoferrin levels in Australia and found lower levels in milk from women with poor nutritional caused by anemic status than in milk from well-nourished women. Shashiraj *et al*²⁷ in 2006 observed in a study in India, significant result in

the concentration of lactoferrin in socioeconomic groups.

CONCLUSION

The current study highlights the importance of health of lactating women in order to improve the quality of milk for their babies. The data shows significant difference in the quality of milk between low and high socioeconomic population which significantly correlates with percentage of haemoglobin, and also in different age groups of both classes indicated by the level of lactoferrin in their milk.

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