

## DR. SYED QAISER HUSAIN NAQVI

Assistant Professor, Pathology Department  
Peoples University of Medical & Health Sciences, Nawabshah.

## DR. MOHAMMAD SHIRAZ KHAN

Associate Professor, Pathology Department,  
Peoples University of Medical & Health Sciences, Nawabshah.

## DR. ALI AKBAR SIYAL

Associate Professor & Chairman Pediatrics Department,  
Peoples University of Medical & Health Sciences, Nawabshah.

## Dr. Mir Muhammad Sehto

Assistant Professor, Pathology Department,  
Peoples University of Medical & Health Sciences, Nawabshah.

## Dr. Riaz Ahmed Qazi

Assistant Professor, Pathology Department,  
Peoples University of Medical & Health Sciences, Nawabshah.

## Dr. Rasool Bux Shaikh

Professor & Chairman Pathology Department,  
Peoples University of Medical & Health Sciences, Nawabshah.

## Dr. Anwar Ali Akhund

Professor of Pathology & Dean Basic Medical Sciences,  
Peoples University of Medical & Health Sciences, Nawabshah.

**ABSTRACT... Objective:** This study was aimed to see the significance of Lactoferrin in human breast milk among lactating mothers of healthy and sick babies. **Place and duration:** This study was conducted at pathology and paediatrics departments of Peoples University of Medical and Health Sciences Nawabshah, Shaheed Benazirabad between Jan 2011 to Dec 2011. **Design:** Cross sectional study. **Method:** Lactoferrin levels in breast milk of 356 mothers of healthy babies were estimated and similarly lactoferrin levels in breast milk of 318 lactating mothers of sick babies were estimated & these results were analyzed. **Results:** the mean lactoferrin level in breast milk of 356 lactating mothers of healthy babies was 9.37 mg/ml and the mean lactoferrin level in breast milk of 318 mothers nursing sick babies was 3.73mg/ml. **Conclusions:** There is decrease in lactoferrin levels of lactating mothers of sick babies in their mature milk, which could account for the susceptibility of their babies to infection.

**Key words:** Lactoferrin levels, breast milk, lactating mothers, sick babies.

## INTRODUCTION

Breastfeeding is the process of feeding the infant with mother's milk, either by direct nipple-baby mouth contact or by expressed breast milk<sup>1</sup>. It is widely accepted that human milk is good for child health. Breast fed babies have protection against various infectious diseases primarily because of various factors including secretory immunoglobulin A, lactoferrin, lysozyme, affording antimicrobial activity<sup>2</sup>. Substances in breast milk can actively stimulate development of the new born's host defenses to provide continued mucosal protection after breast feeding is terminated. Several components of breast milk can reduce the inflammatory response to stimuli in the new born intestine. These include growth factors, interleukin 10 and lactoferrin<sup>3,4</sup>.

A relationship between breast-feeding and infant health had been recorded periodically for thousands of years across many disparate civilizations<sup>5</sup>. In 1934, a report on 20,000 mother infant dyads in the United States found

that morbidity or mortality due to enteric diseases were several times higher for non breast-fed infants than for breast-fed infants<sup>6</sup>.

Lactoferrin is one of the transferrin proteins that transfer iron to the cells and control the level of free iron in the blood and external secretions. It is present in the milk of humans & other mammals<sup>7</sup>, in the blood plasma and neutrophils and in one of the major proteins of virtually all exocrine secretions of mammals such as saliva, tears and Pancreas<sup>8</sup>. Concentration of lactoferrin in milk varies from 7 g/l in the colostrums to 1 g/l in mature milk. Antibacterial activity of lactoferrin originates from its iron – binding capacity, thus depriving the bacterial flora from an element necessary for its growth<sup>9</sup>. Antibacterial action of lactoferrin is also explained by the presence of specific receptors on the cell surface of micro – organisms. Lactoferrin binds to lipopolysaccharides of bacterial walls, and the Exidized iron part of lactoferrin oxidizes bacteria ia formation of peroxides. This effects the

membrane permeability and result in the cell breakdown<sup>9,10</sup>. Lactoferrin also stimulates phagocytosis<sup>11</sup>. Lactoferrin is capable of binding certain DNA and RNS Viruses<sup>12,13</sup>. Its main contribution to antiviral defense consists in its binding to cell membrane glycosaminoglycans. In the manner lactoferrin prevents viruses from entering cells and infection is stopped at an early stage. Lactoferrin acts against parasites in various ways. Lactoferrin breaches parasitic membrane integrity causing subsequent changes in interactions between the host & parasites<sup>13,14</sup>. Lactoferrin may support the proliferation, differentiation and activation of immune cells and strengthen the immune response<sup>15</sup>. Lactoferrin has a potent anabolic effect on osteocytes. Lactoferrin stimulates osteoblast proliferation, enhance thymidine incorporation into osteocytes and reduces apoptosis of osteocytes<sup>16</sup>.

## MATERIAL AND METHOD

The current study was conducted at pathology and paediatric departments of Peoples University of Medical and Health Sciences Nawabshah, Shaheed Benazirabad between Jan 2011 to Dec 2011. Total 674 mothers were included in the study. The inclusion criteria was Lactating mothers, of healthy and sick neonates irrespective of sex and age upto 2 months, the exclusion criteria was, age of baby more than 2 months, neonates born with congenital anomalies and mother have any comorbidity.

5ml of breast milk from 356 selected mothers having healthy babies was taken and similarly five ml of breast milk from 318 selected mothers of sick babies taken into sterile bottle. The lactoferrin levels were evaluated using ELISA Method.

## RESULTS

The mean lactoferrin levels in milk of mothers of healthy babies were 9.37 mg/ml. The mean lactoferrin levels in milk obtained from mothers of sick babies were 3.73 mg/ml (Table-I).

The mean values of lactoferrin in the mothers with sick babies were lower than those obtained from mothers with healthy babies. Considering the various age groups. The lactoferrin levels in mothers with healthy babies upto 20

years the mean value were 8.64 mg/ml. The values for mothers between 21-30 years were 11.43 mg/ml. Similarly in age group over 40 years, the level was 7.82 mg/ml. The mothers with sick babies were revealing low levels. The mothers upto 20 years and below had 3.76 mg/ml. The mothers within 21-30 years group had 4.62 mg/ml, mothers within age group 31-40 years of age had 2.81 mg/ml. The figure for above 40 years age group showed 3.72 mg/ml (Table-II).

**Table-I. Lactoferrin levels in milk of healthy & sick babies.**

Mother's status	No. of cases	Mean lactoferrin level (mg/ml)	Standard Deviation
Healthy babies	356	9.37	1.34 ± 0.26
Sick babies	318	3.73	1.077 ± 0.19

**Table-II. Comparison of lactoferrin level with age of healthy and sick babies mothers.**

Age of mothers in year	Mature Milk				
	No.	Value g/ml	No.	Value mg/ml	St. Deviation P-value
< 20	26	8.64	30	3.76	2.43 ± 0.36 <0.05
21-30	186	11.43	172	4.62	2.81 ± 0.74 <0.001
31-40	130	9.61	106	2.81	1.99 ± 0.90 <0.05
> 40	14	7.82	10	3.72	1.46 ± 0.71 <0.05
Total/Me an level	356	9.37	318	3.73	2.57 ± 0.65 <0.05

*MHB = Mothers of Healthy Babies.  
MSB = Mothers of Sick Babies.*

## DISCUSSION

Breast feed infants have demonstrated better iron accessibility than babies on formula<sup>17</sup>. The protective role of lactoferrin has been studied by administration of lactoferrin through drinking water to milk with weakened immune system, that reduced the symptoms of aphthous ulcer and the number of Candida albicans strain in the

mouth were also reduced<sup>18</sup>. Oral administration of lactoferrin to animals also reduces the number of pathogenic organisms in the tissues close to the gastrointestinal tract. *Candida albicans* could also be completely eradicated with a mixture containing lactoferrin, lysozyme and itraconazole in HIV – Positive patients who were resistant to other antifungal drugs<sup>19</sup>, the role of lactoferrin in regulation of host immunity is widely accepted<sup>20,21</sup>, some studies explain the antioxidant and scavenging activity of human milk<sup>22</sup>. Thus explaining its importance and relative values in babies of healthy mothers and in mothers of sick babies.

In current study the mean lactoferrin levels obtained in breast milk of mothers of healthy babies and sick babies vary, which is consistent with other international studies<sup>23</sup>. The lactoferrin level in mature milk of mothers of healthy babies varied from 7mg to 11 mg/ml, and in mother of sick babies from 4 to 8 mg/ml. The low levels of lactoferrin obtained from mothers of sick babies could account for susceptibility of these babies to infection. The increased level of lactoferrin in mothers of healthy babies could be because of its antibacterial properties and its direct bactericidal function.

The increased levels of lactoferrin in mature milk obtained from mothers of healthy babies in contrast to mothers of sick babies clearly indicate the protective role of lactoferrin, which is also indicated in reviewing of the literature. Further research should be carried out which could show on the bare minimum levels of lactoferrin required in protecting the child from infective diarrhea, neonatal sepsis and other sickness.

## CONCLUSIONS

The mean lactoferrin level obtained from the mature milk of healthy mothers vary significantly from corresponding levels of mothers of sick babies. The low levels of lactoferrin obtained in mothers with sick babies could account for the susceptibility of their babies to infection.

Copyright© 08 May, 2012.

## REFERENCES

1. Chan GM, Martin, Lee, Rechtman DJ. **Effects of a Human Milk-Derived Human Milk Fortifier on the Antibacterial Actions of Human Milk.** *Breastfeeding Medicine* 2007;2(4):205-8.
2. Lonnerdal B. **Biochemistry and Physiological function of human milk protein.** *AmJ clin Nutr* 1985;42: 299-317.
3. Walkar A. **Breast milk as the gold standard for protective nutrients.** *J Pediatrics* 2010;156(2):3S7.
4. Petit AI. **Perception and knowledge on exclusive breastfeeding among women attending antenatal and postnatal clinics.** A study from Mbarara Hospital–Uganda, August 2008. Tanzania Medical Students' Association 2008;27-30.
5. Donnet-Hughes A, Schiffrin EJ, Walker WA. **Protective Properties of Human Milk.** *Nutrition in Pediatrics.* 4th ed. Hamilton, Ontario, Canada: BC Decker Inc 2008;355-62.
6. Yamauchi K, Tomita M, Giehl TJ, Ellison RT. **Antibacterial activity of lactoferrin and a pepsin-derived lactoferrin peptide fragment.** *Infect Immun* 1993;61:719-28.
7. Johanson B. **Isolation of an iron containing red protein from human milk.** *Acta chem Scand* 1960;14(2):510-2.
8. Birgens HS. **Lactoferrin in Plasma measured by ELISA technique evidence that plasma lactoferrin is an indicator of neutrophil turnover and bone marrow activity in acute leukemia.** *Scand J Haematol* 1985;34(4):326-31.
9. Faranard S, Evans RW. **Lactoferrin – a multifunctional Protein with antimicrobial Properties.** *Mol Immunol* 2003;40(7):395-405.
10. Adlerova L, Bartoskova A, Faldyna M. **Lactoferrin: a review.** *Veterinarni Medicina* 2008;53(9):457-68.
11. Xanthou M. **Immune Protection of human milk.** *Biol Neonate* 1998;74(2):212-33.
12. Yi M, Kaneko S, Yu DY, Murakami S. **Hepatitis C Virus envelope Proteins bind lactoferrin.** *J Virol* 1997;71:5997-6002.
13. Havard J, Robert EW, Hancock. **Anti-microbial properties of lactoferrin.** *Biochimie* 2009;91(1):19-29.
14. Omata Y, Satake M, Maeda R, Saito A, Shimazaki K, Yameuchi K, Uzuka Y, Tanabe S, Sarashine T, Mikami T. **Reduction of the Infectivity of Toxoplasma gondii and Eimeria stiedai sporozoites by treatment with bovine lactoferrin.** *J vet Med Sci* 2001;63:187-190.
15. Legrand D, Ellass F, Carpentier M, Maurier J. **Lactoferrin:**

- a modulator of immune and inflammatory responses.** Cell and mol life sci 2005;62:2549-59.
16. Cornish J, Caplon KE, Naot D, et al. **Lactoferrin is a potent regulator of bone cell activity and increase, bone formation in Vivo.** Endocrinology 2004;145:4366-74.
  17. Fairweather – Tait SJ, Balmer SE, Scot PH, Minski MJ: **Lactoferrin and iron absorption in new born infants.** Paed Res 1987; 22:651-4.
  18. Takakura N, Wakabayashi H, Ishibashi H, Teraguchi S, Tamura Y, Yamaguchi H, Abe S. **“Oral lactoferrin treatment of experimental oral candidiasis in mice”.** Antimicro Agents Chemo 2003;47(8):2619-23.
  19. Masci, JR. **“Complete response of severe, refractory oral candidiasis to mouthwash containing lactoferrin and lysozyme”.** AIDS 2000;14(15):2403-4.
  20. Crouch SP, Slater KJ, Fletcher J. **Regulation of cytokine release from mononuclear lab by the iron binding Protein.** Blood 1992;80:235.
  21. Machnicki M, Zimecki M, Zagulski T. **Lactoferrin regulate the release of Tumour necrosis factor alpha and interleukin 6, Vivo.** Int J Exp Path 1993;74:433.
  22. Asghar Z, Fatemeh T, Towebeh C, Gholemreza S, and Mohsin K. **Antioxidant and Redical Scavenging activity of human Colostum, Transitional and mature milk.** J din Bio Nuto 2009;45(2):150-4.
  23. Ella EE, Ahmad AA, Umoli VJ, Ogala WN, and Balogun TB. **Lactoferrin levels in human breast milk among lactating mother with sick and healthy babies in Kaduma State, Niegeria.** Int J Med and Med Sci 2009;1(11):495-500.

Article received on: 24/03/2012

Accepted for Publication: 08/05/2012

Received after proof reading: 00/00/0000

**Correspondence Address:**

Dr. Syed Qaiser Husain Naqvi,  
Bungalow NO P – 6,  
New Doctor's Colony, Nawabshah  
qaisernaqipk@yahoo.com

**Article Citation:**

Naqvi SQH, Khan MS, Siyal AA, Sehto MM, Qazi RA, Shaikh RB, Akhund AA. Lactoferrin levels in mother's milk. Professional Med J Aug 2012;19(4):527-530.

“Great souls have wills;  
feeble ones have only wishes.”

*Will Quotes*