

Frequency of Iron Deficiency Anaemia in Exclusively Breastfed and Infants Fed on Cow's Milk

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ABSTRACT

Introduction: Iron is the most prevalent nutrient deficiency in infants and young children around the world despite its importance for healthy brain development. Infants who drink whole cow's milk or other animal milks are at a greater risk of developing iron deficiency anaemia. In our culture, cow's milk consumption is widespread. There were no local studies available on iron deficiency anemia in infants using different types of milk so need for the present study was felt.

Objectives: The objectives of this study were to determine the frequency of exclusively breastfed and cow's milk fed infants at 3 month of age and to compare the frequency of iron deficiency anemia in exclusively breastfed and cow's milk fed infants.

Study Design: It was a cross-sectional study.

Setting and Duration: Research was conducted at the Medical Outpatient Department of The Children's Hospital and The Institute of Child Health Lahore from 08/02/2022 to 07/08/2022.

Material and Methods: This study involved 220 infants of both genders at 3 months of age presenting for vaccination. Outcome variables were frequency of exclusive breast feeding and iron deficiency anemia. All patients' guardians signed an informed consent form.

Results: There were 115 (52.3%) male and 105 (47.7%) female patients in the study group. The Hb of the patients ranged from 7.6 g/dl to 14.5 g/dl with a mean of 11.00±1.98 g/dl while the serum iron level ranged from 41 µg/dl to 115 µg/dl with a mean of 67.94±22.99 µg/dl. Majority of the parents (56.4%) belonged to poor class and 46.4% mothers were illiterate. The frequency of exclusive breastfed infants was 45 (20.5%). There was no significant difference in the frequency of exclusive breast feeding across gender ($p=0.873$), socioeconomic ($p=0.900$) and educational ($p=0.858$) status. 76 (34.5%) Infants had iron deficiency anemia. The frequency of iron deficiency anemia was higher among infants on cow's milk (37.7% vs. 22.2%) as compared to those on exclusive breast feeding however the observed difference was statistically insignificant ($p=0.051$). Similar insignificant difference was observed across gender, socioeconomic and educational status groups.

Conclusion: The frequency of exclusive breastfed infants was 45 (20.5%). There was no significant difference in the frequency of exclusive breast feeding across gender ($p=0.873$), socioeconomic ($p=0.900$) and educational ($p=0.858$) status. 76 (34.5%) Infants had iron deficiency anemia. The frequency of iron deficiency anemia was insignificantly higher among infants on cow's milk (37.7% vs. 22.2%; $p=0.051$) as compared to those on exclusive breast feeding. Similar insignificant difference was observed across gender, socioeconomic and educational status groups.

Keywords: Exclusive Breast Feeding, Cow's Milk Feeding, Iron Deficiency Anemia

INTRODUCTION

Although iron is important for proper mental development in children, it is also the most prevalent nutrient deficiency in the world's youngest population.¹ The prevalence of iron deficiency among preschool-aged children is estimated to be 8%, according to data from developed nations.^{2,3} Unfortunately, the bioavailability of the small amount of iron (0.15 ng/L) found in animal milk is remarkably low. Human milk is superior to both animal milk and infant formula in terms of absorption and tolerance. Cow's milk has the lowest iron content of any animal milk.⁴ Human milk is superior to other sources of nutrition because it is species-specific and provides babies with the nutrients and minerals they need, including calcium, phosphorus, and iron. Infants who take whole cow's milk or animal milk are more likely to acquire iron deficiency anaemia later in life.^{5,6} Iron deficiency anemia in exclusively breastfed infants was noted to be 23.9% patients at the age of 6 months.⁷ In infants given cow milk formula without added iron, the incidence of iron deficiency was 37.5%.⁸

Iron deficiency anaemia is typically thought of as an issue only in developing nations, and there hasn't been a great deal of research into how to determine iron status in otherwise healthy infants who are being fed formula or breast milk.⁹

In Pakistan, we come across many children in our Medical outdoors who are on different types of milk. The use of cow's milk is very common in our country. There are no local studies available on iron deficiency anemia in infants using different types of milk. In light of this, investigations assessing iron status in infants using criteria other than haemoglobin estimation are urgently required. Important markers of serum iron status include serum iron, transferrin-binding capacity (TIBC), and serum ferritin. The

purpose of this study is to determine the level of iron in cow's milk fed and breast milk fed babies.

MATERIALS AND METHODS

Study Design: It was a cross-sectional study.

Setting: Research was conducted at Medical Outdoor of The Children's Hospital and The Institute of Child Health Lahore.

Duration of Study: Duration of study was 6 months after the approval of synopsis from 08/02/2022 to 07/08/2022.

Sample Size: Sample size of 220 cases was calculated with 95% confidence level, 5% margin of error and taking expected percentage of exclusively breast fed infants to be i.e., 16% in infant of 3 months of age [2].

Sampling Technique: Patients were selected by Non-Probability, Consecutive Sampling.

Inclusion Criteria: Infants born at term of both genders presenting for vaccination at 14 weeks (3 months) of age

Exclusion Criteria: Infants in which exact feeding type could not be determined from history as well as infants not accompanied by mother.

Data Collection Procedure: Two hundred twenty (220) patients, fulfilling the inclusion criteria were selected for the study. They were enrolled after informed written consent from their parents and history was taken about the type of milk used till now. 4 ml of venous blood was drawn under strict aseptic measures. The laboratory investigations (Hb & Serum iron) were carried out at the main Pathology laboratory of our hospital under supervision of qualified Biochemist. Laboratory results were entered on already designed proforma (Annexure-I). Showing whether the patient was

having iron deficiency anemia or not. Iron deficiency anemia was treated as per hospital routine.

Data Analysis Procedure: Data was entered into SPSS version 17 and analysed. Numerical variables; hemoglobin and serum iron level were given in mean \pm SD. Categorical variables i-e gender, exclusive breast feeding, cow's milk feeding and iron deficient anemia were reported in frequency and percentage. Data was stratified with gender, socioeconomic status and education status of the mother to address effect modifiers. The post-stratification chi-square test was used, with a p-value of 0.05 being considered significant.

RESULTS

There were 115 (52.3%) male and 105 (47.7%) female patients in the study group. The Hb of the patients ranged from 7.6 g/dl to 14.5 g/dl with a mean of 11.00 ± 1.98 g/dl while the serum iron level ranged from 41 μ g/dl to 115 μ g/dl with a mean of 67.94 ± 22.99 μ g/dl. Majority of the parents (56.4%) belonged to poor class and 46.4% mothers were illiterate as shown in Table 8.1.

The frequency of exclusive breast fed infants was 45 (20.5%) as shown in Table 8.2. There was no significant difference in the frequency of exclusive breast feeding across gender ($p=0.873$), socioeconomic ($p=0.900$) and educational ($p=0.858$) status as shown in Tables 8.3 – 8.5.

Table 1: Baseline Characteristics of the Study Population

Parameters	Characteristics	Participants
Gender	Male	115 (52.3%)
	Female	105 (47.7%)
Lab. values	Hemoglobin (g/dl)	11.00 \pm 1.98
	Serum Iron Level (μ g/dl)	67.94 \pm 22.99
Socio-economic Status	Poor (<10,000/month)	124 (56.4%)
	Middle (10,000-50,000/month)	73 (33.1%)
	High (>50,000/month)	23 (10.5%)
Educational Status	Illiterate	102 (46.4%)
	Middle	91 (41.4%)
	Matric and above	27 (12.2%)

Table 2: Frequency of Exclusive Breast Feeding, n=220

Feeding	Frequency	Percent
Exclusive Breast Feeding	45	20.5
Cow's Milk	175	79.5
Total	220	100.0

Table 1: Frequency of Exclusive Breast Feeding across Gender, n=220

Gender	Feeding		Total	P value
	Exclusive Breast Feeding n=45	Cow's Milk Feeding n=175		
Male n=115	24	91	115	0.873
	20.9%	79.1%	100.0%	
Female	21	84	105	0.900
	20.0%	80.0%	100.0%	
Lower	24	100	124	0.900
	19.4%	80.6%	100.0%	
Middle	16	57	73	0.858
	21.9%	78.1%	100.0%	
High	5	18	23	0.858
	21.7%	78.3%	100.0%	
Illiterate n=102	22	80	102	0.858
	21.6%	78.4%	100.0%	
Middle n=91	17	74	91	0.858
	18.7%	81.3%	100.0%	
Matric or above n=27	6	21	27	0.858
	22.2%	77.8%	100.0%	

76 (34.5%) Infants had iron deficiency anemia as shown in Table 8.6. The frequency of iron deficiency anemia was higher among infants on cow's milk (37.7% vs. 22.2%) as compared to those on exclusive breast feeding however the observed difference was statistically insignificant ($p=0.051$) as shown in Table 8.7.

Similar insignificant difference was observed across gender, socioeconomic and educational status groups as shown in Tables 8.8– 8.10.

Table 4 Frequency of Iron Deficiency Anemia n=220

Iron Deficiency Anemia	Frequency	Percent
Yes	76	34.5
No	144	65.5
Total	220	100.0

Table 5: Frequency of Iron Deficiency Anemia across Feeding Type, n=220

Feeding	IDA		Total	P value
	Yes	No		
Exclusive Breast Feeding	10	35	45	0.051
	22.2%	77.8%	100.0%	
Cow's Milk Feeding	66	109	175	0.051
	37.7%	62.3%	100.0%	
Total	76	144	220	0.051
	34.5%	65.5%	100.0%	

DISCUSSION

Due to increased iron requirement in infancy, poor bio availability of iron in milk, insufficient weaning practises, and ineffective iron fortification programmes, iron deficiency anaemia in infancy is still widespread in the underdeveloped world.^{10,11} The regulation of cellular processes and the development of the brain, muscles, and red blood cells all rely on iron, making it a crucial component. Iron deficiency has been linked to a variety of neurocognitive and behavioural impairments in children, with some authors finding low IQ scores in the absence of anaemia.^{12,13}

The health benefits of exclusive breast feeding (EBF) for infants are well documented, making it the preferred feeding method for newborns in the first six months of life.¹⁴ However, the rate of exclusively breast fed infants in Pakistan is only 16%, according to a report by the United Nations Children's Fund (UNICEF). In our culture, cow's milk is widely used. Since no previous regional studies had compared the effects of various milk types on infants' risk of iron deficiency anaemia, the current investigation was deemed necessary.¹⁵ The objectives of this study was to compare the prevalence of iron deficiency anaemia in exclusively breastfed and cow's milk fed infants at 3 months.

The patients' haemoglobin levels ranged from 7.6 g/dl to 14.5 g/dl in the current research, with a mean of 11.00 ± 1.98 g/dl. Rosa et al. (2014) found identical mean haemoglobin levels of 10.04 ± 0.97 g/dl (range 7.60-13.0 g/dl) among infants who were exclusively breastfed at 3 months of age. 7 Infants who were exclusively breastfed were 45 (20.5%) in number. The frequency of exclusive breastfeeding did not vary significantly by gender ($p=0.873$), socioeconomic status ($p=0.900$), or educational level ($p=0.858$). Our findings are consistent with a UNICEF report that was earlier published and found that only 16% of Pakistani infants are exclusively breastfed.²

76 (34.5%) Infants had iron deficiency anemia. The frequency of iron deficiency anemia was higher among infants on cow's milk (37.7% vs. 22.2%) as compared to those on exclusive breast feeding however the observed difference was statistically insignificant ($p=0.051$). Similar insignificant difference was observed across gender, socioeconomic and educational status groups. Our results match with those of Pizzaro et al. (1991) who also observed similar insignificantly higher frequency of iron deficient anemia among cow's milk fed infants (37.5% vs. 26.5%; $p>0.05$) [8]. A similar frequency of 23.9% for iron deficiency anemia among breast fed infants have been reported by Rosa et al. in 2014.⁷

In the present study, the frequency of exclusive breast fed infants was 45 (20.5%) which is extremely low and is alarmingly as according to WHO guidelines all infants should be exclusively breast fed for at least first 6 months of life.¹ We also observed higher frequency of iron deficiency anemia among infants on cow's milk (37.7% vs. 22.2%; $p=0.051$) as compared to those on exclusive breast feeding. Though insignificant yet the results

confirm the advantage of breast milk which is also more hygienic and cost-effective.

While a positive correlation was found between iron deficiency and the duration of exclusive breast feeding, Burke et al. found no statistically significant link between the two.¹⁶ recent research by Cai et al. suggests that the lack of a membrane iron carrier in human lactating epithelial cells is to blame for the low iron content of breast milk.¹⁷

Infants who intake cow milk have a higher risk of developing iron deficiency anaemia, and this correlation has been well-established in the scientific journals.^{18,19,20} Cow milk is linked with occult intestinal blood loss and the suppression of dietary absorption of calcium and casein in addition to its low iron content and poor bio-availability. The introduction of cow milk too early in life has been linked by some researchers to a lag in child growth.

CONCLUSION

The frequency of exclusive breast fed infants was 45 (20.5%). There was no significant difference in the frequency of exclusive breast feeding across gender ($p=0.873$), socioeconomic ($p=0.900$) and educational ($p=0.858$) status. 76 (34.5%) Infants had iron deficiency anemia. The frequency of iron deficiency anemia was insignificantly higher among infants on cow's milk (37.7% vs. 22.2%; $p=0.051$) as compared to those on exclusive breast feeding. Similar insignificant difference was observed across gender, socioeconomic and educational status groups.

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