

# A study on effect of nutritional variables in children with iron deficiency anemia in south Indian population

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## Abstract

**Background:** Iron Deficiency (ID) is the most prevalent nutritional disorder in the world. The prevalence of Iron Deficiency Anemia (IDA) is about 9% in toddlers, 9-11% in adolescent girls and less than 1% in teenage boys. IDA presents when there is not sufficient iron for haemoglobin synthesis. In particular it has negative effects on the behavior, cognitive performance, immune system and physical growth of infants, preschool and school age children. **Material and Methods:** Blood samples of 337 randomly selected children (6-59 months) visited to Pediatrics OP at MIMS Hospital, were taken in the study. Serum ferritin, Complete Blood Cell (CBC) and hematological indices were measured. **Results:** In this study (61.1%) of the children had serum ferritin less than 12mcg/dl. Prevalence of IDA were (29.1 %). The results showed that most children with IDA were at (12-23) months. Families with more than 6 children had (4.49) times greater chance of IDA. The mean of breast-feeding in non-IDA children was higher than IDA children (17.6 and 16.3 months respectively,  $P > 0.05$ ). In this study families who gave tea to their children for (1-11) months had the highest prevalence of IDA. **Conclusion:** There are several main risk factors for ID and IDA in the children. Parent's illiteracy, family income and using cow's milk before 12 months are among most important risk factors for iron deficiency for children.

**Key Word:** Anemia, Iron Deficiency, Children, Nutrition.

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## INTRODUCTION

Iron deficiency is the most prevalent nutritional disorder in the world (1). Nearly two billion people are suffering from anemia<sup>2</sup>. Iron deficiency is the most frequent cause of the anemia, affecting more than 500 million people around the world<sup>3,5</sup>. Iron deficiency anemia (IDA) presents when there is not sufficient iron for hemoglobin synthesis<sup>3</sup>. In particular it has negative effects on the behavior, cognitive performance, immune system and

physical growth of infants, preschool and school age children<sup>1</sup>. The prevalence of iron deficiency is about 9% in toddlers, 9-11% in adolescent girls and less than 1% in teenage boys<sup>6</sup>. It is estimated that about 18 to 38 percent of the under 5 years old Indian children are anemic<sup>7</sup>. Evidence indicates that the prevalence of anemia in infants and 6 years' old children in south- India were 51.4% and 21.5% respectively<sup>7</sup>. Due to the high prevalence rate of anemia in under 5 years old Indian population and all its adverse effects on children, as there was no comprehensive study in the Vijayanagaram, this research was carried out to evaluate the prevalence of iron deficiency anemia (IDA) in children aged 6-59 months.

## MATERIALS AND METHODS

In the current study, the main variable was IDA, which is a categorical variable. So based on the previous studies, power was based on this variable to calculate sample size. According to similar studies prevalence of IDA estimated 30%. For sample size calculation, power was determined as 0.80 and  $\alpha$  was equal to 0.05 (according to the

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previous studies), our estimation for the sample size is as follow  $N = Z^2 P (1-P) / D^2 = (1.96)^2 (0.3) (0.7) / (0.05)^2 = 322.69$  Finally eight Health Centres were randomly selected, four in urban and four in rural areas. In current study, databases of the health centres were used for choosing forty children in each region by random selection. Children who had history of liver infectious disease, liver cancer or high fever were excluded from the study. Blood samples of 337 randomly selected children (6-59 months) living in the urban and rural areas of the Vijayanagaram were taken. Serum ferritin, CBC and hematological indices were measured. Demographic information, cultural and nutritional information were also collected through a questionnaire. Data were analyzed using SPSS13 software.

### RESULTS

Among 337 participants, there were 98 IDA cases (29.1%) (Hb<11g/dl and SF<12mcg/dl). 206 out of 337(61.1%) were iron deficient (serum ferritin <12mcg/dl), and 148 of 337 (44 %) were anemic (hemoglobin <11 g/dl). IDA was more frequent in males (30.9%) than females (27.3 %). The association between IDA and gender was not significant (P>0.05). Prevalence of IDA children was highest in the families that mother had higher education degree (33.3%), in the urban areas; higher educated and illiterate mother had the equal chance of having IDA child (33.3%). But in the rural areas it was mostly seen in the families that their mother had a high school degree (44.4%). Breast-feeding and

bottle - feeding (powder milk): For some certain reasons such as inadequacy or lack of mother's milk, families use powder milk for their infants. In this study, the majority of mothers gave powder milk to their babies for 7-12 months. According to the survey results, the majority of mothers breastfed their babies for (13-24) months duration. Investigating the relation between breast-feeding and IDA indicated that children in the total population who had mother milk between (12-23) months had more percentage of IDA. On the other side, families who bottle-fed their children for (13-24) months had the highest range of IDA in the total population and urban areas (24.3% and 22.7% respectively). In the rural areas families who gave powder milk there to child between (7-12) months were the most prevalent group for IDA (57.1%). 11 families (3.26 %) used both breast-feeding and cow's milk at the same time (Mean =10.55, SD= 8.4). According to parents' statements, 15 families (4.4 %) gave cow's milk to their children (Mean= 11.13, SD= 6.19). Just one family had used goat's milk for their child. The families in the survey had between 1-4 children. There were 3 groups among them; majority of families (63.5%) had 1-2 children. Highest range of IDA was seen in the families with 3-4 children (47.1% in total population). 60% of rural families with IDA child had 6 or more children in their family while in the urban areas IDA was mostly seen in the families with 1-2 children. Logistic regression analysis indicated the association in the families with more than 6 children and IDA (95% C.I. 1.30-15.45) (Table 1).

**Table 1:** Distribution of anaemia according to the family size (number of children in each family)

Family size (Number of children)	Total study population	Anaemic cases					
		Total		Urban		Rural	
		No (%)	% of anaemic cases in each group	No	%	No	%
1-2	214	96 (64.9)	44.9	55	25.7	41	19.2
3-5	106	44 (29.7)	41.5	14	13.2	30	28.3
6-9	17	8 (5.4)	47.1	2	11.8	6	35.3
Total	337	148 (100)	43.9	71	21.1	77	22.8

### DISCUSSION

IDA is a widespread and preventable micronutrient deficiency. In primary health care, the priority is upon

prevention rather than treatment<sup>8</sup>. According to the results of this study, 61.1% of the children had serum ferritin less than cut off value (SF <12). Prevalence of IDA (SF<12 and Hb <11) among (6-59) months children were 29.1 %.

In this study prevalence of IDA in urban (28%) and rural (30.1) areas were very similar to the results of previous studies. In previous study carried out by Bahrami *et al*<sup>8</sup> prevalence of IDA in infants (<1 year old children) in the whole country (by provinces) was reported as 37.8% in total population. Prevalence was very similar in the rural (37.5) and urban (38.1%) areas. The results from this study showed that most children with IDA were in the 12-23 months (second year of life) group, where in the urban areas 6-11 months infants had the highest prevalence of IDA (breast-fed and formula-fed). In another study in the Yazd province rural areas, showed prevalence of IDA was also higher in 6-23 months old children and IDA rate decreased as age increased<sup>9</sup>. The number of children was also another important variable in the research. Families with more than 6 children had 4.49 times greater chance of having children with IDA in comparison to families with 1-2 children. Breast-feeding is recommended for the first six months of life<sup>1,4,6</sup> and IDA is less common in breast-fed infants than bottle-fed because iron in mother's milk has better absorption. Although the amount of iron in human milk is low but it is more biologically available than cow's milk<sup>4,6</sup>. Fifty percent of iron found in breast milk is absorbed compared to only 10% for cow's milk therefore cow's milk is not recommended for under 1 year old infants<sup>6</sup>. In our study there was no statistical significance between breast-feeding and IDA in urban and rural areas, although the mean of breast-feeding in non-IDA children was higher than IDA children (17.6 and 16.3 months respectively,  $P>0.05$ ). Our findings correlate with those of Heidarnia *et al*<sup>10</sup> who also reported Mean and SD of Breast-feeding in their study 17.4 and 6.3 months, respectively.

## CONCLUSION

In this survey, results of the fieldwork showed that in many rural areas of vijayanagaram, there was a high prevalence of IDA among infants and children. The prevalence seems to be the same in urban and rural areas and similar in both sexes. Statistically it was proven that young mothers and families with 6 or more children were the best predictors for increased prevalence of IDA among fewer than 5 years old children in this research. It was shown that there are several main risk factors for iron deficiency and anemia in the children. Parent's illiteracy, family income and using cow's milk before 12 months are among most important risk factors for iron deficiency for

children. In our study we found that young mothers who do not consider adequate time spacing between two pregnancies for any reason including poverty, cultural beliefs, lack of knowledge, or unavailability/unwillingness to use contraceptives for birth control, help this easily preventable nutrition disease to turn into a major health problem in the south Indian population.

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