Journal of Cardiovascular Disease Research

ISSN: 0975-3583,0976-2833 VOL12, ISSUE 10, 2021

A STUDY ON IMPACT OF NUTRITIONAL FACTORS ON CHILDREN SUFFERING FROM IRON DEFICIENCY ANEMIA IN SOUTH INDIAN POPULATION

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Received: 18/09/2021 Accepted: 12/10/2021 Published: 07/12/2021

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ABSTRACT

Background: Iron Deficiency (ID) stands as the most widespread nutritional disorder globally. The occurrence of Iron Deficiency Anemia (IDA) is approximately 9% among toddlers, ranges from 9% to 11% in adolescent girls, and is below 1% in teenage boys. IDA manifests when there is an inadequate supply of iron necessary for the synthesis of hemoglobin. Notably, it adversely impacts the behavior, cognitive abilities, immune function, and physical development of infants, as well as preschool and school-aged children. **Material and Methods:** Blood samples of 337 randomly selected children (6-59 months) visited to Pediatrics OP at SIMSRH, 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 & 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.

Keywords: Anemia, Iron Deficiency, Children, Nutrition.

INTRODUCTION

Iron deficiency is the most prevalent nutritional disorder in the world (1). Nearly two billion people are suffering from anemia (2). Iron deficiency is the most frequent cause of the anemia, affecting more than 500 million people around the world (3-5). Iron deficiency anemia (IDA) presents when there is not sufficient iron for hemoglobin synthesis (3). In particular it has negative effects on the behavior, cognitive performance, immune system and physical growth of infants, preschool and school age children (1). The prevalence of iron deficiency is about9% in toddlers, 9-11% in adolescent girls and less than 1% in teenage boys (6). It is estimated that about 18 to 38 percent of the under 5 years old indian children are anemic (7).

Evidence indicates that the prevalence of anemia in infants and 6 years' old children in south- India were 51.4% and 21.5% respectively (7). Due to the high prevalence rate of anemia in under 5 years old Indian population and all its adverse effects on children, this research was carried out to evaluate the prevalence of iron deficiency anemia (IDA) in children aged 6-59

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months.

MATERIALS AND METHODS

In the present investigation, the primary variable of interest was Iron Deficiency Anemia (IDA), classified as a categorical variable. Drawing from prior research, the power associated with this variable was utilized to determine the required sample size. Similar studies have indicated a prevalence rate of IDA at approximately 30%. For the calculation of sample size, a power of 0.80 was established, with an alpha level (α) set at 0.05, consistent with previous studies. The sample size was calculated using the formula $N = Z^2P(1-P)/D^2$, resulting in $N = (1.96)^2(0.3)(0.7)/(0.05)^2 = 322.69$. Ultimately, eight health centers were randomly chosen, comprising four located in urban settings and four in rural areas. In this study, databases from the health centers were employed to randomly select forty children from each region. Children with a history of liver infectious diseases, liver cancer, or elevated fever were excluded from the analysis. Blood samples were collected from 337 randomly selected children aged 6 to 59 months residing in both urban and rural areas. Measurements included serum ferritin, complete blood count (CBC), and various hematological indices. Additionally, demographic, cultural, and nutritional data were gathered through a questionnaire. The data analysis was conducted using R software.

RESULTS

In a study involving 337 participants, 98 cases of iron deficiency anemia (IDA) were identified, representing 29.1% of the sample (with hemoglobin levels below 11 g/dl and serum ferritin levels below 12 mcg/dl). Among the participants, 206 individuals (61.1%) exhibited iron deficiency, indicated by serum ferritin levels below 12 mcg/dl, while 148 individuals (44%) were classified as anemic, with hemoglobin levels below 11 g/dl. The prevalence of IDA was higher in males (30.9%) compared to females (27.3%), although the relationship between IDA and gender did not reach statistical significance ($P>0.05$). The prevalence of IDA among children was notably higher in families where the mother held a higher education degree (33.3%), particularly in urban areas. Interestingly, both higher educated and illiterate mothers had an equal likelihood of having a child with IDA (33.3%). Conversely, in rural areas, IDA was predominantly observed in families where the mother had completed high school (44.4%). Regarding feeding practices, some families resorted to formula milk due to insufficient maternal milk supply. In this study, a significant number of mothers provided formula milk to their infants for a duration of 7 to 12 months. Survey findings revealed that most mothers breastfed their infants for a duration of 13 to 24 months. An analysis of the relationship between breastfeeding and IDA showed that children who were breastfed for 12 to 23 months had a higher incidence of IDA within the overall population. Conversely, families that bottle-fed their children for 13 to 24 months exhibited the highest rates of IDA, particularly in urban areas (24.3% and 22.7%, respectively). In rural settings, families that provided formula milk to their children for 7 to 12 months represented the group with the highest prevalence of IDA (57.1%). Additionally, 11 families (3.26%) utilized both breastfeeding and cow's milk simultaneously (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

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and IDA (95% C.I. 1.30-15.45) (Table1).

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

					Anaemic cases				
					Total	**Urban**		**Rural**	
	population	**Total study**	**No**	**%**	**% of anaemic casese in each group**	**No**	**%**	**No**	**%**
Family size (Number of Children)	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
population	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 (8). 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 (8) 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 (9).

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 (1,4-6) 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 (4, 6). 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 (6). 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 (10) 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

ISSN: 0975-3583,0976-2833 VOL12, ISSUE 10, 2021

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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