Effects of Nutritional Variables in Children with Iron Deficiency Anemia

*Ali Ghassemi[1], Bijan Keikhaei[2]

[1]Assistant Professor of Pediatric Haematology Oncology, Faculty of Medicine, Mashhad University of Medical Sciences, Mashhad, Iran.

[2]Associate Professor of Pediatric Haematology Oncology, Jondishapour University of Medical Sciences, Research Centre for Thalassemia and Hemoglobinopathy, Ahvaz, Iran.

Abstract

Introduction:

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) living in the Ahwaz, Khuzestan province-Iran, were taken. 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.

*Corresponding Author:

Dr Ali Ghasemi, Assistant Professor of Pediatric Hematologist & Oncologist, Faculty of Medicine, Mashhad University of Medical Sciences, Mashhad, Iran. E-Mail: Ghasemial@mums.ac.ir.
Tel: 09155147816

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 anaemia (IDA) presents when there is not sufficient iron for haemoglobin synthesis (3).

In particular it has negative effects on the behaviour, 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 Iranian children are anemic (7).

Evidence indicates that the prevalence of anemia in infants and 6 years' old children in south-western Iran were 51.4% and 21.5% respectively (7).

Due to the high prevalence rate of anemia in under 5 years old iranian population and all its adverse effects on children, as there was no comprehensive study in the Khuzestan, 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 α was equal to 0.05 (according to the 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 Ahwaz, in Khuzestan province 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 $SPSS_{13}$ 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 their 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.

Tea consumption and IDA:

Tea is a very popular drink in south of Iran, especially in Khuzestan province. About 131 families (38 %) reported giving tea to their children (mean =18.11, SD =13.11). The majority of families gave at least one cup of tea per day (34.5%) for the duration of (1-10) months (34%) to their children.

About 61 % of families reported giving tea to their children. There was a negative effect between tea duration (month) and amount of drinking tea (by cups) per day. It means that as the amount and period of drinking tea increased, the prevalence of IDA decreased. Highest prevalence of IDA was seen in the families who gave tea to

their children between (1-11) months (31.5% IDA in total population) and gave their child 2 cups of tea (IDA=32.1%) (Fig.1).
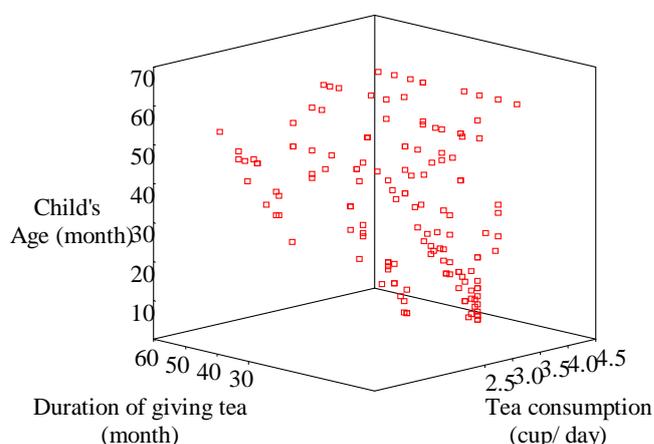

Fig1: Relation between Child's age and tea consumption.

Family size:

The families in the survey had between 1-9 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 6-9 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) (Table1).

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

Family size (Number o f children)	Total study population	Anaemic cases						
		Total		Urban		Rural		
		No (%)	% of anaemic casese 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 (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.

Tea is a very popular drink among Iranian people especially in rural areas. Zohouri and Rugg-Gun (11) carried out a survey for the purposes of determining the association between dietary intake and iron deficiency in 4 years old children. They concluded that consumption of tea varied between 63ml/day/child to 238-ml/ day/ child in urban and rural areas respectively. Nearly all of the children used to drink tea with their breakfast and usually immediately after lunch or dinner.

In this study families who gave tea to their children for 1-11 months and 2 cups per day had the highest prevalence of IDA children Comparing laboratory results among IDA and non-IDA.

Conclusion

In this survey, results of the fieldwork showed that in Ahwaz district located in Khuzestan province, 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 west of Iran.

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References

1. WHO/ UNICEF/ Iron deficiency anemia: assessment, prevention, and control. A guide for programmed managers. Geneva: World Health Organization (2001).

2. Verster A. Guidelines for the control of iron deficiencyin countries of the eastern Mediterranean, Middle East and North Africa. Alexandria, Egypt: World Health Organization, Regional Office for the Eastern Mediterranean 1996 (WHO-EM/NUT/177/E/G/11, 96).

3. Hoffbrand AV, Pettit JE, Moss PAH. Essential hematology, 5th ed. Oxford, UK: Blackwell Science, 31-34, 2001.

4. Saeidi M, Vakili R, Khakshour A, Taghizadeh Moghaddam H, Zarif B, Nateghi; S, Kiani MA. Iron and Multivitamin Supplements in Children and its Association with Growth rate. International Journal of Pediatrics 2013;1(1):13-17.

5. Esfandtari R, Baghiani Moghadam MH, Khakshour A, Faroughi F, Zarif B, Saeidi M. Study of Maternal Knowledge and Attitude toward Exclusive Breast Milk Feeding (BMF) in the First 6 Months of Infant in Yazd-Iran. International J of Pediatrics 2014;2(3.1):175-81.

6. Norma B, Sills L, Sills R. Iron deficiency anemia In: Kliegman RM, Stanton BF, Schor NF, Geme JW, Behrman RE. Nelson textbook of pediatrics. 19th edition, Elsevier; 2011. pp. 1565-6.

7. Bahrami M. Malnutrition and its effects on development in Iranian children. J Pediatr Dis 2004; 14:149–56.

6. Hall DMB, Elliman D. Health for all children. 4th ed. Oxford: Oxford University Press, 2003.

8. Karimi M, Mirzaei M, Dehghani A. Prevalence of anemia, iron deficiency and iron deficiency anemia in 6–60 month old children in Yazd's rural area. International Pediatr 2004; 19: 180–4.

10. Heidarnia A, Jalili Z, Dabiri S. The prevalence of iron deficiency anemia in 1–5 years old children referring to Kerman medical care and health centers in 1998.Journal of the Kerman University of Medical Sciences 1999; 6: 214–21.

11. Zohouri F V, Rugg-Gunn A J. Sources of dietary iron in urban and provincial 4-year –old children in Iran. Asia Pacific J Clin Nutr 2002; 11(2):128-32.