



ORIGINAL ARTICLE

Iron deficiency anemia among 3-year-old children and its management in primary health care in Bahrain

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Abstract

Background and objectives: Iron deficiency anemia (IDA) is the most common nutritional anemia in children, worldwide. No recent data are available about its prevalence in Bahrain. This study was conducted to measure the prevalence of IDA among 3-year-old children attending child screening clinic at healthcare centers and evaluate the adequacy of management interventions.

Methods: This retrospective study was conducted among 3-year-old children attending child screening clinics at local healthcare centers in Bahrain. A total of 450 children were included in the study using multistage stratified proportional sampling. The data were collected from child screening booklets, family medical records, and laboratory data. Data included demographic characteristics, capillary hemoglobin levels, additional tests for anemic patient such as complete blood count, reticulocyte count, serum iron and ferritin levels, management, and follow-up plans.

Results: The prevalence of anemia was 30%. Only 40% of children received treatment for anemia. The iron dose prescribed was adequate in the majority of cases (97%). Diet advice and follow-up plans were reported for one-third of the anemic patients. The percentage of defaulter was 33%.

Conclusion: A significant percentage of 3-year-old children in Bahrain suffer from IDA. This raises the need to increase adherence to IDA guideline and management protocols in local healthcare centers in Bahrain.

Keywords: Anemia, iron deficiency, hemoglobin, children, prevalence.

Introduction

Anemia is a global public health problem affecting both developing and developed countries with major consequences on human health as well as on socioeconomic development. It occurs at all stages

of the life cycle; however, it is more prevalent in pregnant women and young children. Among numerous causes of anemia, globally, the most significant contributor to the onset of anemia is iron deficiency.¹

Iron deficiency anemia (IDA) can affect the cognitive performance, behavior, and physical development in children.^{2, 3} It negatively affects the immune status, increases the morbidity from infections, and reduces the physical capacity and work performance.⁴

IDA remains an important public health problem in Bahrain. High prevalence of anemia was observed in school children aged 6-14 years. Gender-wise distribution showed a high prevalence of IDA among girls (46.1%) than boys (28%).⁵ A study conducted in 1995 found a high prevalence of anemia among children aged 6-9 months (59.8%) compared to children aged 6-59 months (48%) and children aged 36-47 months (27.2%).⁵ Apart from this, there is no recent study about the prevalence of iron deficiency among preschool children in Bahrain. Studying the social determinants of anemia among preschool children showed that IDA tends to be more common among socially disadvantaged children. A study conducted in Central India in 2008 found that higher educational status of both mother and father is significantly associated with lower risk of anemia.⁶

The current study was conducted to measure the prevalence of IDA and describe current anemia management in this particular age-group, as anemia affects the physical, mental and cognitive development of children at this critical age.

Materials and methods

This retrospective study was conducted at child screening clinics, under Ministry of Health, the Kingdom of Bahrain in 2010. Children born from January 2006 to January 2007 and completed 3 years of age were included in the study. Child screening booklets, family file, and computer laboratory results were used as the source of data. The sampling was done using a multistage stratified proportional method. Ethical approval was obtained from the Ministry of Health Research Committee, Kingdom of Bahrain. The data sheet was filled by the research team by two sections: A and B. Section A included the demographic data such as gender, nationality, the area of residence, diet history, and hemoglobin (Hb) level of the children who participated in the study. Parent's educational level and occupation also included in this section. Section B was filled with the

data of anemic children including complete blood count, reticulocyte count, blood indices and serum ferritin levels, dietary advice, iron supplementation and follow-up plan.

Children with hemoglobinopathies were excluded from the study. The data were collected and analyzed by SPSS statistical package version 18. Chi-square test was used to analyze the data. $P < 0.05$ is considered statistically significant. Hb level below 11 g/dL and serum ferritin level $< 12 \mu\text{g/L}$ was considered as anemic as per world health organization definition.⁴

Results

Distribution of children by nationality and gender is shown in Table 1. A total of 450 children had attended the child screening visit at 3 years of age. Among them, 50.9% were boy and 49.1% were girls. A total of 153 (34%) children had missed their further appointment (defaulters).

Table 1: Distribution of children by nationality and gender (N=450)

Variables	n (%)	
Nationality	Bahraini	361 (80.2)
	Non-Bahraini	89 (19.8)
Gender	Male	228 (50.9)
	Female	222 (49.1)

Anemia was found in 131 (30%) children, among them, 73 (32.9%) were boy and 58 (27.1%) were girls. The prevalence was higher among Bahraini children (31.9%) compared to non-Bahraini children (22.7%). The difference in nationality was not statistically significant ($P=0.094$; Table 2).

The prevalence of anemia was different among the different healthcare centers. It nearly affected half of the sample in both Jidhafs and A'ali healthcare centers (52.1% and 48.6%, respectively). Approximately, one-third of the sample was anemic in Naim, Shaikh Sabah, and Hamad town healthcare centers (34.1%, 32.5%, and 31.3%, respectively). In Sitra, one-fourth of the sample were anemic whereas the prevalence of anemia in the remaining healthcare centers was less than 20%. Prevalence of anemia among various health centers is shown in Table 3.

Table 2: Anemia among 3-year-old children attending primary healthcare centers in Bahrain in relation to gender and nationality (N=436^a)

Variables		Anemic, n (%)	Non-anemic, n (%)	P-value
Gender	Male	73 (32.9)	149 (67.1)	0.188
	Female	58 (27.1)	156 (72.9)	
Nationality	Bahraini	111 (31.9)	237 (68.1)	0.094
	Non-Bahraini	20 (22.7)	68 (77.3)	

^a14 Patient's data regarding hemoglobin level was missing due to either not done or patient's parents refuse to undergo the test.

Table 3: Prevalence of anemia among various healthcare centers

Health region	Healthcare center	Prevalence of anemia, n (%)
Health region 1	Shaikh Salman	4 (9.8)
	Arad	7 (18.4)
Health region 2	Al-Naim	15 (34.1)
	Shaikh Sabah	13 (32.5)
Health region 3	Jidhafs	38 (52.1)
	A'Ali	17 (48.6)
Health region 4	Hamad town	15 (31.3)
	Sitra	13 (25.0)
	Hamad Kanoo	9 (13.8)

Parent's education and occupation are shown in Table 4. The prevalence of anemia was examined against a number of socioeconomic determinants. Parent's education favorably affected the prevalence of anemia. Prevalence of anemia was lower among children of highly educated fathers (university level or more; $P=0.012$, OR=1.83). Mother's education showed marginal significance in relation to the prevalence of anemia ($P=0.052$; OR=1.54). The prevalence of anemia did not differ between employed and unemployed mothers ($P=0.829$).

Table 4: Parent's education and occupation^a

Variables		Anemic (n, %)	Non-anemic (n, %)	P- value
Father's education	Literate or less	95 (35.1)	176 (64.9)	0.012
	University or more	31 (22.8)	105 (77.2)	
Mother's education	Literate or less	83 (34.7)	156 (65.3)	0.052
	University or more	44 (25.7)	127 (74.3)	
Mother's occupation	Employed	40 (30.8)	90 (69.2)	0.829
	Unemployed	88 (29.7)	208 (70.3)	

^aDemographic data of few patients were missing

Anemia management at primary healthcare centers

Diet history was recorded for more than half of the children (58.9%). Investigations for anemic children included complete blood count (14.6%) and serum ferritin level (7.7%). Only 40% of the anemic children were given iron supplementation. The majority (97%) of the children received an adequate dose. Among anemic children who were given iron supplementation, 5.8% were given iron for a duration adequate to replenish the store. Follow-up investigations at first and third month after iron supplementation were documented for 8.5% and 7.7% of anemic children, respectively.

Discussion

There is a high rate of genetic blood disorders in Bahrain.^{7,8} All newborns undergo a neonatal screening for hemoglobinopathies since 2007.⁹ In addition, several interventions were implemented by the Ministry of Health to alleviate and prevent IDA including screening for IDA in pregnant women and preschool children, promotion of exclusive breastfeeding, and flour fortification.^{10,11} Ministry of Health Anemia Management Guideline for the

children aged less than 5 years recommend that children should be screened for IDA at 9 months, 18 months, 3 years, and 5 years using capillary Hb.¹²

The overall prevalence of anemia among 3-year-old children attending child screening clinics in Bahrain was 30%, which is categorized as a moderate severity level from public health perspective.⁴ These high rates are close to what has been reported globally (47.4%), in Eastern Mediterranean (46.7%), and Gulf regions.¹ Most of the anemia cases found in the study were most likely contributed to iron deficiency. However, due to limited data on recorded blood investigations such as iron profile and Hb response to treatment, other causes of anemia could not be very well excluded.

However, as hemoglobinopathies were excluded due to the routine newborn screening for hemoglobinopathies, IDA could be probably be identified. Compared to the 1995 data that showed that 27.2% of the 3-year-old children had anemia, this was slightly lower than what has been found in our study.⁵ This slight increase in the prevalence of anemia over the last 15 years can be explained by an increase in the prevalence of IDA or be due to different sampling methods.

The prevalence of anemia showed marked variations among health regions included in the study. It was highest in the health region-3. A similar rate was observed in the same region through quality improvement projects in 2009 with the prevalence of 46%.¹³ The majority of the population of this region is constituted of Bahrainis with a high prevalence of hemoglobinopathies due to consanguineous marriages. Despite excluding hemoglobinopathies in the beginning of the study, alpha-thalassemia trait can give a similar hematological picture to IDA.⁸ This disorder cannot be detected accurately by Hb electrophoresis alone and requires specific genetic study, which is not routinely available to mass screening purpose.⁴ This means the serum ferritin level or Hb response to iron supplementation is needed to conclude prevalence of IDA with high accuracy.⁴

Parent's education was found to favorably affect children Hb status. Diet history is an essential part of assessing children with IDA, as it may predict people at risk of anemia; however, it cannot be used as a first-stage screening test in high-risk population.¹⁴ Based on the results of current study,

diet history was discussed in more than half of children (58.9%), which shows the awareness of the physicians about the importance of diet history in predicting anemia.

Most of the anemic children were underinvestigated (85.4%) and undertreated (60%). Confirmatory tests such as serum ferritin or complete blood count with indices were conducted only among 7.7% and 14.6 % of children, respectively. This reflects that most of the physicians were dependent on capillary Hb measurement to diagnose IDA. Only 40% of children had prescribed iron supplementation. Among them, children who were given iron supplementation, the majority received an adequate dosage (97%); however, the duration was not clearly specified to replenish iron store except for few (2.3%). This can be due to the fact that the physicians provide proper treatment and follow-up; however, neglect to document it because of the short consultation time, whilst other physicians might prefer to do the blood investigations and wait for the results before starting treatment.

Management of IDA includes iron supplementation and nutritional counseling. Evidence suggested that nutritional education intervention was effective, as it improved the dietary iron intake and prevented the children from suffering the sharp decline in iron status.¹⁵ Only one-third (33.1%) of anemic patients received diet advice, as recorded in the study. An audit done in one of the health centers showed that treatment was documented in less than half of the patients and follow-up was given only to 20% of children.¹³ This means that evaluating anemia management through medical records underestimates the real practice. Similarly, many studies on traditional medical records showed similar problems with medical records.¹⁶

Alarmingly, defaulters constituted one-third (33%) of the sample. This could be due to no vaccinations had been given at this age and the absence of a recall system. The low attendance rate among non-Bahrain could be contributed to frequent travel and change in residence, as stated in some of the booklets. The two major limitations of this study were the reliance of any Hb measurement to estimate the prevalence and the use of the traditional medical records, as the main data source to evaluate anemia management in primary health center might have underestimated the real practice.

Our study provides valuable information and recommendations to:

1. Improve attendance rate (Example, develop a recall system and increase parent's awareness of anemia screening).
2. Improve case registry and follow-up.
3. Encourage physicians adherence to anemia management guideline and emphasize the importance of documentation
4. Conduct further studies to identify the real size of IDA in this age-group using serum ferritin level.

In addition, our study elucidates a number of valuable information that should be brought forward to policymakers:

1. Anemia prevalence was high for this age-group and there was a big problem of defaulters and loss of follow-up.
2. There was poor implementation of anemia management guidelines and inadequate documentations of it in the medical records.
3. Although serum ferritin is not suitable for mass screening from this study, it is highly recommended for anemic patients.

Conclusion

Anemia prevalence is still high for this age-group in Bahrain and a large number of defaulters and loss of follow-up remain a big problem. The study has also shown lack of strict implementation of anemia management guidelines and its poor documentation in medical records.

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