Iron deficiency anemia among children at Benghazi Libya

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Published on: 28 Sept. 2022

Abstract

Background : Iron deficiency anemia is the most common type of anemia and nutritional deficiency in many developing countries and has significant health, social and economic consequences. In Libya, iron deficiency anemia represents one of the most serious public health problems, especially in children. However, data on the prevalence and risk factors for nutritional iron deficiency anemia, especially in school-age children in Libya, are limited. The study aimed to determine the prevalence of iron deficiency anemia among children at Benghazi during 2018 -2019 and to identify some environmental and social factors may be associated with iron deficiency anemia in children in Benghazi ,Libya. **Methodology** : a cross-sectional study

was conducted in two setting. A sample of children from pediatrics hospital and a primary school children samples conducted for two years, 2018 -2019. The study samples from pediatric hospital were divided into three age groups (- < 1year), (≥1-6 years) (> 6 -12 years). A structured questionnaire was designed and used to gather the sociodemographic and clinical examination was carried out for the second group of children at primary school children by an accompanying physician. **Results** : f the study of hospital cases revealed that about 50 % of children had iron deficiency anemia , iron reserves of males are 46 m/dl higher than that of females 34 m/dl, no statistical significance. The second group of the study, 27.3% of school students had anemia , 60% of age group (4-6 years) were suffering from iron deficiency and there was a statistically significant relationship between the prevalence of anemia and the educational level of the parents and no statistical differences between children's anemia and family income. **Conclusion**: the study revealed that prevalence of iron deficiency was high in children, there should be a special program for the government education and nutritional support, specifically from the Ministries of Education and Health, and the program includes educational programs targeting both children and parents.

Keywords: Iron deficiency anemia, school-age children, iron reserves.

* **Introduction**

Anemia is a global public health problem. Being one of the most affected population groups, more than 273 million school-age children are suffering from anaemia over the world. Anemia is associated with age, gender, ethnicity, lower mother education, and low house-hold wealth index (1). In Low and Lower-Middle-Income countries, the prevalence of anaemia in infancy remains high. In early childhood anaemia cause irreversible cognitive deficits and represents a higher risk of child mortality (2,3,4).

The main nutrients of concern for nutritional anemia are iron, vitamin A, vitamin B12 and folate. Increasing the intake of foods that are rich in these nutrients will help to meet nutrient requirements and thus prevent anemia, though the extent to which nutrient needs can be met by food-based approaches varies by nutrient as well as by target group. dietary diversification through increasing consumption of

vegetables, fruits and animal-source foods, and accompanying strategies to improve the bioavailability of nutrients in the diet, should always be part of strategies to prevent anemia, since inadequate dietary intake is the primary pathway for development of nutritional anemia. There are also benefits of dietary diversification beyond prevention of anemia, including improved growth among children and reducing the consumption of less nutritious foods that are related to overweight and chronic disease (5,6).

Anaemia is a preventable condition, and its control needs reliable data and continuous monitoring and evaluation process at the country level to establish a baseline, identify the barriers, develop sound interventions, and assess the progress (7). The most recently available nationally representative prevalence data on childhood anaemia in Sudan, which was obtained via selected states' survey in 1995, revealed a prevalence of more than 80%(8).

Anemia is a serious global public health problem that particularly affects young children and pregnant women. WHO estimates that 42% of children less than 5 years of age and 40% of pregnant women worldwide are anemic (5)?

The most common causes of anemia include: nutritional deficiencies in (Proteins, iron , folate, vitamins B12 and A), Haemoglobinopathies and Infectious diseases, such as malaria, tuberculosis, HIV and parasitic infections(4).

* Aims of the study

1- To find out the prevalence of iron deficiency anemia and serum iron reservoir among children during years 2018 & 2019 .

2- To identify some socio-demographic and nutritional factors may be associated with iron deficiency anemia in children in Benghazi ,Libya.

* Objectives of the study

1- To identify the prevalence of anemia and gender differences among children in the city of Benghazi year 2018, 2019.

2- Find out which age groups are most affected anemia.

3- Knowing the extent of iron deficiency anemia among school children of the age group between (6-14 years), and the factors might associate with occurrence of anemia among children.

* Subjects and Methods

A cross-sectional study was conducted in the two setting :-

1- A sample of children from pediatrics hospital for two years, 2018 and 2019

2- A primary school children samples conducted.

3- The study samples from pediatric hospital were divided into three age groups (<1 year), (1-6 years) (> 6 -12 years).

The study was conducted at General Children's Hospital at city of Benghazi, in the year 2018 &2019. A 458 child in the year 2018 and 309 were admitted to hospital 2019 . The children were divided into three groups according to age , the first group contains samples from the age (< 1 year), the second group (1-6 years) and the third group (> 6-12 years),

* Interview Questionnaire

A semi- structured interview questionnaire was designed and used to gather the sociodemographic and nutritional data and clinical examination was carried out for the second group of school children by an accompanying physician.

Section A : personal characteristics of the student such as (age, gender, type of foods, educational qualifications of the parents, and family income)

Section B: is for the initial examination by the accompanying physician of the apparent signs and symptoms of anemia.

The interview questionnaire included three nutrition levels

there are 5 common food types that increase iron stores in the body, such as (meat, spinach, egg yolk, white beans, lentils).

Accordingly, the nutritional levels of the children were divided into:-

1- Poor nutrition: They are children who eat small amounts of food items from (1_2) of the previous items that contain iron.

2- Medium nutrition: They are children who consume (2-4) food items

3- Good nutrition: They are children who eat most foods containing iron according to the World Health Organization (WHO) the diagnosis with these symptoms is uncertain, due to the lack of laboratory tests that must be done, the anemia was divided based on the initial symptoms symptoms, which are (pale skin color, poor appetite, breathing quickly and irregularly, poor ability to pay attention, Frequent infections and

infections, desire to eat non-food items such as snow, dirt, paint, starch, difficulty in learning, according to the World Health Organization (WHO)

1- Not anemic : not show any of the previous symptoms of anemia

2- Anemic: child shows 4 or more of the symptoms of anemia

3- Possibility of infection: 1-3 symptoms of anemia appear

An amount of 2 ml of venous blood was withdrawn, then the drawn blood was placed in a tube of type EDTA K3, to conduct the analyzes needed by whole blood sample:-

1- Hb(g\dl)

Table 1: WHO recommendations of Normal HB level according to child age

Child age	Normal Hb gm/dl
6-59 months	>11
5-12 years	>11.5
> 12-15 years	≥12

Table2: The hemoglobin cut-off as recommended by WHO according to child age

Child age	Levels of anemia/mg/dl		
	Mild anemia	Moderate	Sever
Children 6 - 59 months of age	10- 11	7-10.9	< 7
Children 5- 11 years	<11-11.5	8-11.4	< 8
Children 12 - 14 years	<11-12	8-11.9	< 8
15 years of age and above	<12	8-11.9	< 8

* Limitations

Data from pediatric Hospital not classified and not coded by ICD -10 also poor file information and data collection was not easy. Data from school not accurate

Especially dietary habits and difficult to collect from interview of children parents .

* Results

The sample size of Pediatric hospital was 827 children, 511 children 2018 and 311 children 2019. The study revealed that 256 (49.1%) were males and 260 (50.9%) were females during year 2018 , while 177(56.9%) male children and 134 (43.1%) children females during year 2019 (figure 1) . Age distribution of the pediatric study group 2018-2019 , below 1 year were 267(32.3), nearly half 390 (47.1) of the study sample were 1-6 years , and 170(20.6) aged > 6-12 years (figure1).

The Prevalence of anemia in the children admitted to pediatric hospital in years 2018-2019 was about 50 % , 56.7% among females and 43.3% among males . The sample divided into 3 groups according to age , (- < 1year), (≥1-6 years) and (> 6 -12 years). The figure 2 showed that 50.8% of cases of anemia were among

children 1-6years , 36% below one year, and 13.5 % at age 6-12 years. The study reported no significant differences between cases of anemia according and age ,where t-test & P= 0 .208   . There was a Significant difference in the Hb level between males and females   where   T-test P=0.000

Figure 3 showed the iron reservoir of cases admitted to pediatric hospital , the mean s. iron ±SD was = 79.7± 43.6 micro/100ml   minimum value = 11 and max = 266 micro/100ml, low s. iron reservoir (< 50 microgame /100ml)   were 200 (25.7%) had normal S. iron level (50=120   micro/100ml)   were 433(53.7%), and 137(17.6%)had high S. iron level (> 120 microgame/100ml). the study reported a significant difference between s. iron level and age and sex where, X62 = 48.08& P <.0001 and X22=15.00 & P value = 0.0006 respectively table . The study of secondary level of education and more for the mother was associated to childhood anemia

The study of 121 school children revealed that 88 were normal (72.7) and 33(27.3 %) of them had anemia by clinical examination , among anemic children 18(54.5%) were boys and 15(45.5%) were girls .as regard the family income the present study reported that 69(57%) of school children their had middle   family income 500-<1000 L.D , 40 (33.0%) had high income ≥ 1000 L.D, and 12 (9.9 %)had poor income < 500 L.D (figure 3) . as the parent education as concerned   the study found that 66(54.5%)   had   preparatory   and secondery schooling ,   32(26.4%) had university and higher , 12(9.9%)   had primary education level and 11(9.1%) were illiterate (figure 4) . The present study reported a statistically significant relationship between the prevalence of anemia and the educational level of the parents (X32 & P Value = 0.001) and no significant statistical differences with family income.

The present study of school children reported that 69 (56.2%) ate eggs , 61(50.4%) ate meat, 50 (41.3%) ate lentils 45(37.2%) eat white beans add 36 (29.8%) ate Spanish and only (9.1%) had vitamin supplementation (figure 5).

As regard the dietary level and gender differences , the current study reported that 18 (14.8%(percent of the school children had excellent diet, 50 (41.4%) had moderately good diet ,and 53(43.8) had poor diet . Among males

the study revealed that 32(45.7%) had poor diet as compared to 21(41.2 %) of female's school children. The present study reported no statistically significant differences between male and female as the level of dietary intake (figure 6).
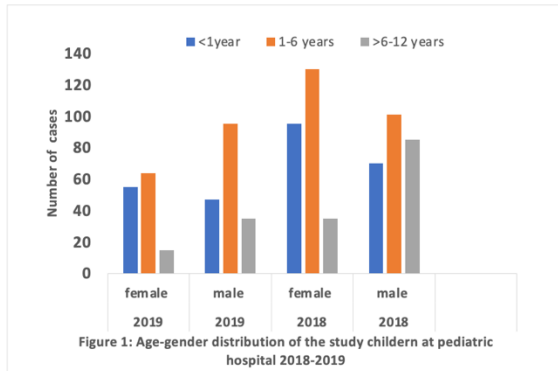
2. Child sex				
· Female	104(52)	240(55.4)	50(36.5)	394(51.2)	X^2_2=15.00
· Male	96 (48)	193(44.6)	87(63.5)	376(48.8)	0.0006
Total	200(100)	433(100)	137(100)	770(100)	

Figure 3: Distribution of Family income of the school children at Benghazi , Libya 2018- 2019

Figure 1: Age-gender distribution of the study childern at pediatric hospital 2018-2019
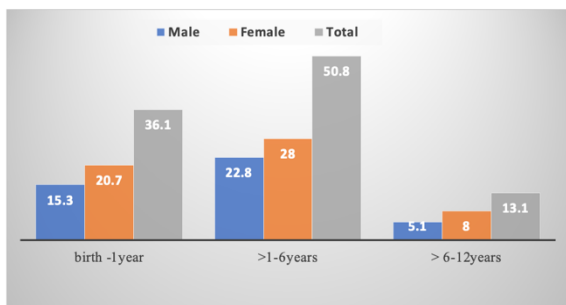
Figure 2: Age distribution of cases of anemia admitted to pediatric hospital 2018-2019

Table 1 : Age -sex distribution of serum iron among children admitted to pediatric hospital at Benghazi , Libya 2018-2019

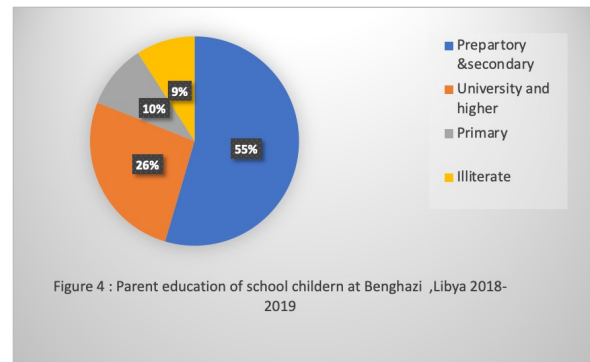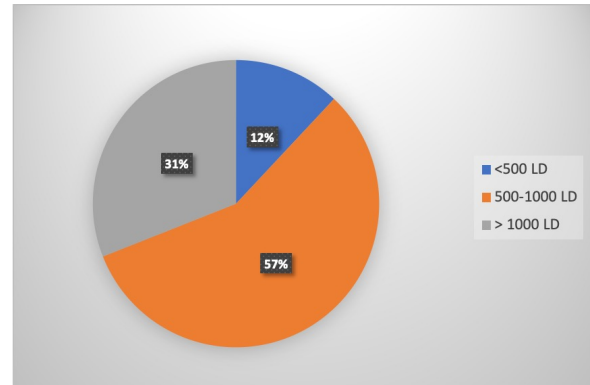| Child age / months	Serum iron microgram/100ml			Total	Chi-Square Tests P value
	< 50	50-120	> 120		
1. Child age /year	No.(%)	No.(%)	No.(%)	No.(%)	
· < 1	145(72.5)	263(57.7)	50 (36.5)	458(59.5)	X_6^2 = 48.08 <.0001
· 1-2	27(13.5)	75(16.4)	38(27.7)	140(18.2)	
· > 2-5	14(7)	59(12.9)	24(17.5)	97(12.6)	
· > 5	14(7)	36 (7.8)	25(18.2)	75(9.7)	
Total	200(100)	456(100)	137(100)	770(100)	
Mean s. iron ±SD = 79.7±43.6					57 missed answers

Figure 4 : Parent education of school childern at Benghazi ,Libya 2018-2019

Figure 5: Diatery behavior of the primary school childern at Benghazi

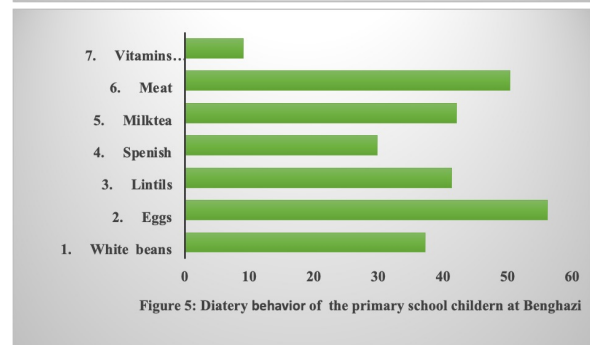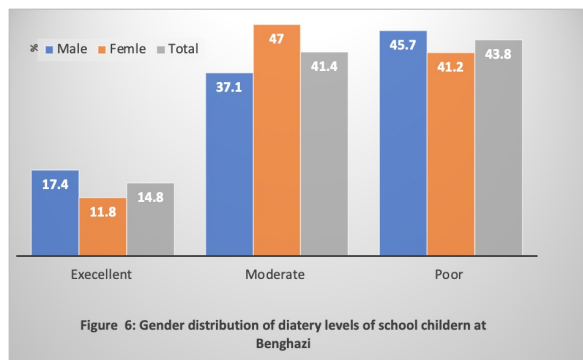Figure 6: Gender distribution of diatery levels of school childern at Benghazi

* Discussion

The World Health Organization (WHO) reported that in 2011 the prevalence of anaemia among 6–59 months-old children were 42.6% globally (9). The highest prevalence rates were observed in African (62.3%), South-East-Asian (53.8%) and the Eastern-Mediterranean (48.6%) regions. The adverse health consequences of anemia among pre-school children are well documented, some having an impact over a lifetime (3,4). The present study found that prevalence of anemia in the children admitted to pediatric hospital in years 2018-2019 was about 50% . Nearly a similar result was reported by Jaber, N.H et al (7). They reported that iron deficiency anemia was the most common form of anemia among children aged less than 5 years and the prevalence of iron deficiency anemia was 109 (49.5%)(4). Jbireal. J. M. et al (2020)(8) reported that 67% females

and 8.92% males were having Iron deficiency anemia at Saberat West Libya. Data from the Standard Demographic Health Survey (DHS) that was collected from 2005 to 2016 in Asia, North-Africa, the Middle East, Sub-Saharan Africa and Latin America. Reported that 70% of the 6–23 months-old children were anemic. Child anemia was strongly associated with maternal anemia, household wealth, maternal education and low birth weight. Children fed with fortified foods, potatoes and other tubers had significantly lower rates of anemia (9).

Anemia among school aged children is known to be an important global public health problem in both developing and developed countries. It affects the physical and intellectual functions of the affected children(). The present study found that more than one quarter of school children had anemia (27.3 %), among anemic children 18(54.5%) were boys and 15(45.5%) were girls . The prevalence of anemia in the current study is higher with that concluded in Saberata study reported lower level of anemia over all percentage of anemia was 12.90, 11.08% male children and 12.9% among female children aged 6-14

years (8). Also, higher than in Egypt (12%), [40, 41, 42]. Also, El-Hioui et al(4) reported that the overall prevalence of anaemia was 12 % in 295 Schoolchildren aged between 6 and 16 years old in a rural coastal region of Morocco ().

As regard the family income the present study reported that 69(57%) of school children their had middle family income 500-<1000 L.D , and as the parent education as concerned the study found that 66(54.5%) had preparatory and secondary education level. The present study reported a statistically significant relationship between the prevalence of anemia and the educational level of the parents (X & P Value = 0.001)and no significant statistical differences with family income. Several studies also have shown that low parental education levels, low household incomes, and demographic factors including age, sex, and family size have been associated with development of anemia [4, 42, 75-77].

The present study of school children reported that 69 (56.2%) ate eggs , 61(50.4%) ate meat , 50 (41.3%) ate lentils 45(37.2%) eat white beans add 36 (29.8%) ate Spanish and only

(9.1%) had vitamin supplementation (figure 5).

As regard the dietary level and gender differences , the current study reported that 18 (14.8%(percent of the school children had excellent diet, 50 (41.4%) had moderately good diet ,and 53(43.8) had poor diet . Among males the study revealed that 32(45.7%) had poor diet as compared to 21(41.2 %) of female's school children. The present study reported no statistically significant differences between male and female as the level of dietary intake

* Conclusion

The study revealed that prevalence of iron deficiency was high in children especial at age 2-5 years . Parents education and dietary habits had a significant impact of childhood anemia. the study revealed that prevalence of iron deficiency was high in children, there should be a special program for the government education and nutritional support, specifically from the Ministries of Education and Health, and the program includes educational programs targeting both children and parents. Poor health information system and child file documentation at pediatric hospital

* Recommendations

A special program for the government for education and nutritional support, specifically from the Ministries of Education and Health. Its s recommended that use of fortification of complementary foods with iron-containing micronutrient powders in infants and young children aged 6–23 months. Also , the study recommended that distribution of Fortified school meals for school children .

Improving overall household living conditions, increasing maternal education, delaying childbearing and introducing iron rich foods at six months of age may reduce the likelihood of anemia in toddlerhood

* Acknowledgement

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