Prevalence of Iron Deficiency Anemia among Adolescents Intermediate School Pupils in Ramadi District

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Abstract:

Objective: To find out the prevalence of iron deficiency anemia (IDA) among adolescents intermediate school pupils.

Subjects & Methods: A study was carried out on 520 (320 boys and 200 girls) intermediate school pupils. Boys of less than 15 years old and girls were characterized anemic if their packed cell volume (PCV) were < 36% , and < 39 in boys of 15 years old or above. Iron deficiency anemia was considered if anemic pupil shows TS < 5% or SF < 15% when TS were 5% or above.

Results: The prevalence of IDA was found to be 20.35%, with a higher prevalence in girls than in boys. It is mostly noticed at age of 15 in girls and 17 in boys. IDA was diagnosed by TS > 5% in 56.19% pupils and low SF in 43.81%.

Conclusion: This study clarified that IDA is a health problem of moderate severity among adolescent intermediate school pupils in Ramadi district. To overcome this health problem we recommend to detect and treat the anemic pupils in addition to ensure them about the iron rich diet are important measures.

Key Words: Anemia, Iron deficiency, prevalence of iron deficiency anemia, adolescent, intermediate school pupil, Ramadi.

Introduction:

Iron deficiency anemia is the most common nutritional disorder in the world [1]. It is widely prevalent affecting about 700 to 800 million people in less developed countries and 60 to 70 million in developed countries [2,3] with a total of 149 million people in the Eastern Mediterranean Region (EMR) are iron deficient or anemic according to World Health Organization (WHO) criteria [4].

On a regional basis, South Asia and Africa have the highest prevalence with an estimated rate of more than 40% in all age groups except for adult males and pregnant women. The later group is the most vulnerable to anemia with an estimated prevalence rate of more than 65% in South Asia [1,2,4]. Adolescents may be at an increasing risk for developing anemia because of increased iron demands during puberty, menstrual losses, limited dietary iron intake and faulty dietary habits [5,6]. In Iraq there is paucity about the prevalence of IDA in adolescents and up to our knowledge no study was conducted on the intermediate school pupils. The present study, therefore designed to assess the prevalence of IDA in intermediate school pupils.

Subjects &Methods:

This study was carried out between October 2002 and January 2003 at the Intermediate school pupils in Ramadi District. There were 50 Intermediate schools (33 of them for boys and 17 for girls) during the academic year 2002-2003. In which 10387 pupils representing 7598 boys and 2789 girls Permission to conduct a study in these schools was sought from Al-Anbar General Directorate for Education. By a stratified random sampling taking in consideration area and sex. Eight schools (4 for each boys and girls) were selected. Five hundred and twenty pupils (320 boys and 200 girls) were included in this study using systematic random sampling taking every 5th [7].

PCV were performed for all pupils using standardized [8]. TS of the anemic pupils was calculated by dividing the concentration of serum iron (SI) by the total iron binding capacity (TIBC) which are measured spectrophotometrically using special kits [9,10]. Serum ferritin (SF) assay was performed using ELIZA technique [11]. Hb A_2 was estimated using high performance liquid chromatography (HPLC) in anemic pupils with out iron deficiency status.

Diagnosis of anemia was considered in boys of less than 15 year sold and girls if their PCV < 36%, and PCV < 39% in 15 years age boys or above [12]. Criteria for IDA was considered in anemic pupils with TS < 5% [13], or 5% SF < 15 ng/ml in those having TS equal or more than 5% [14]. Hb A_2 above 3.7% was considering the diagnosis of β-thalasemia trait [15].

Statistical analyses of the data were performed using qui square and t-test.

Results:

A total of 516 pupils (324 boys and 192 girls) with their ages ranging between 13 and to 17 years old, were enrolled in this study. Anemia was found in 124 (24.03%) pupils. One hundred five of them fulfilled the criteria of IDA, giving a prevalence of 20.35% (fig 1).
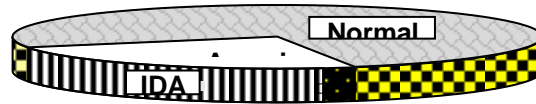
Fig 1: Prevalence of anemia among intermediate school pupils in Ramadi District.

It was observed that IDA is significantly higher in girls than in boys (p= 0.0001) with a ratio of 1.93:1 (table 1). At the same time IDA was found to be significantly more prevalent in rural than in urban areas (P= 0.0001) (table 2).

IDA was diagnosed by low TS (<5%) in 59 (56.19%) pupils, while low SF was observed in the remaining 46 (43.81%) of the pupils with TS values of equal or more than 5%. Two (1.77%) pupils with TS values of 5-16% exhibited normal SF.

Hb electrophoresis was performed for 19 (15.32%) of the anemic students not fulfilled the criteria of IDA, only 1 of them showed elevated A_2 value. Figure 2, demonstrates that ida is mostly noticed at age of 15, among both boys and girls. However, among girls another peak was noticed at age of 17.

The mean PCV value of the pupils with IDA is significantly lower than that of the screened pupils (table 3).

Table 1: Prevalence of IDA among intermediate school pupilsin both sexes in Ramadi district.

	Boys	*Girls*	*Total*
Subject	324	192	516
IDA*	49 (15.12%)	56 (29.17%)	105 (20.35%)

* P-value = 0.0001

Table 2: Prevalence of IDA among intermediate school pupilsin rural and urban areas in Ramadi district.

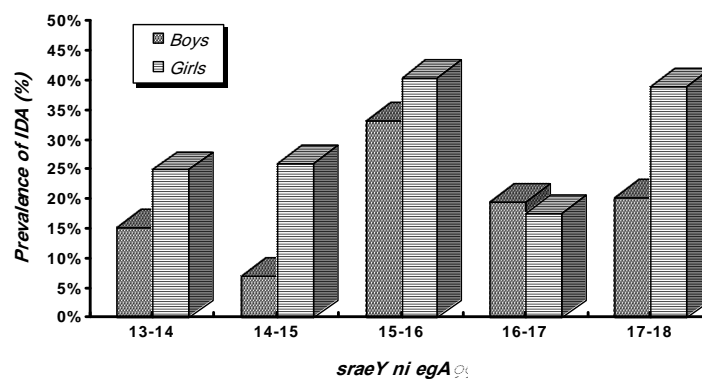|	*Rural*	*Urban*	**Total**
Subject	264	252	516
IDA*	79 (29.92%)	29 (10.32%)	105 (20.35%)

* P-value = 0.0001

Figure 2; The prevalence of IDA in different age groups among Intermediate School pupils in Ramadi.

Table 3: The mean (±SD) PCV (%) values for the studied pupils.

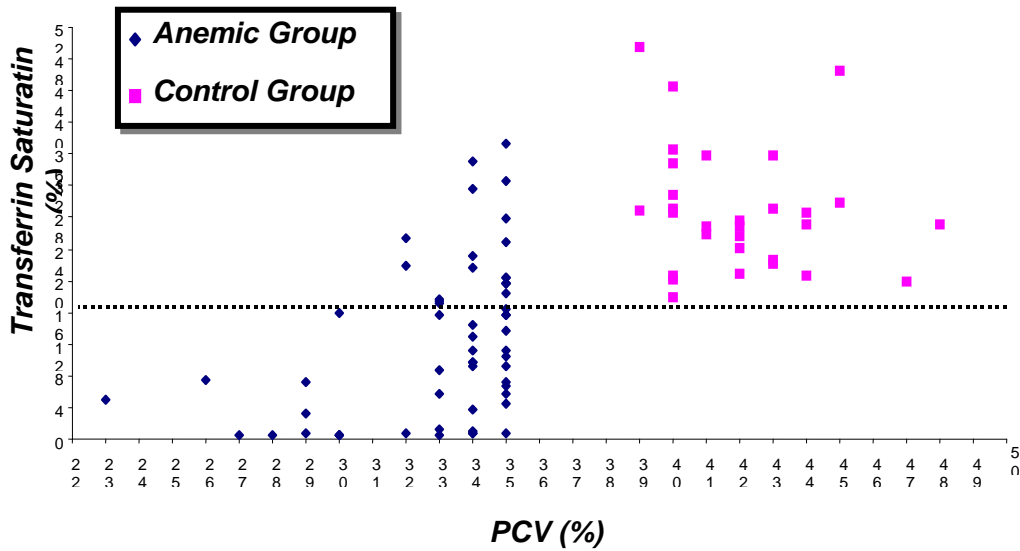| Studied pupils	Boys	Girls	P value
Subject	40.25 ± 3.71	37.47 ± 4.52	0.0001
IDA	35.00 ± 3.07	32.80 ± 2.83	0.0001
P value	0.0001	0.0001	

Fig 3: Frequency distribution of transferrin saturation in girlss for both anemic and control group in relation to their PCV.
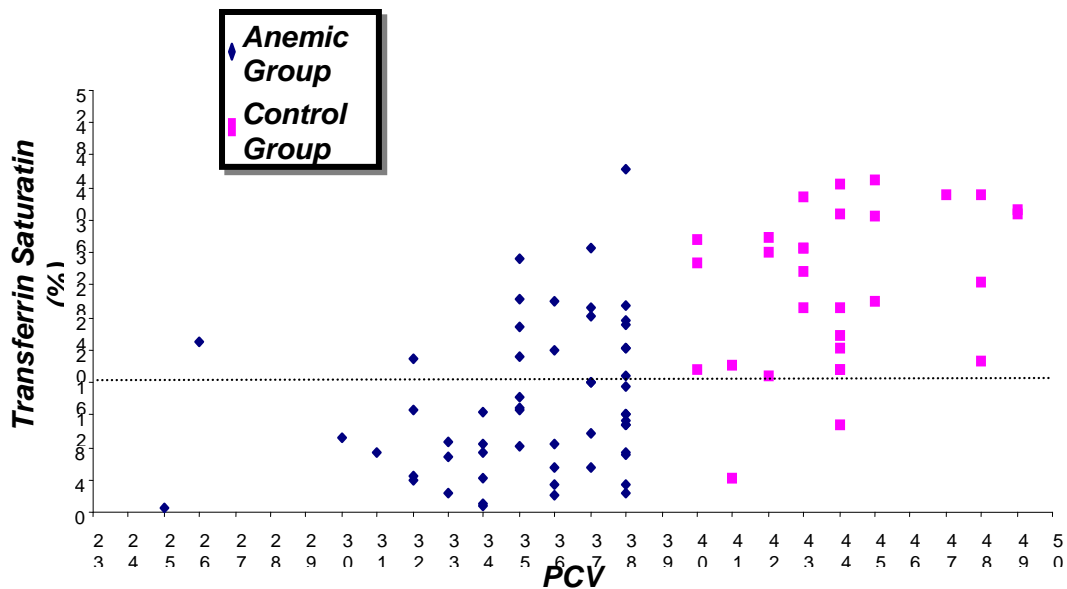

Fig 4: Frequency distribution of transferrin saturation in boys for both anemic and control group in relation to their

DISCUSSION:

The age group enrolled in this study lies in the adolescent period (10-19 years age) [16], which was characterized by an exceptionally rapid rate of growth and development [17]. Iron has been documented to be an essential nutrient needed for growth at this period [18]. Iron deficiency was mentioned to be the main cause of anemia [2,19] and it is the most common and widespread nutritional disorder in the world [20]. The result of the present study is consistent with this observation. The high prevalence of IDA in Ramadi (20.35%), was found to be a health problem of moderate severity according to the WHO classification [21]. This high prevalence was in accordance with the result of Al-Sharbatti in Baghdad [22] and WHO reports for the developing countries [12], but it was higher than that reported in the developed countries [19,20]. This may be due to the causes concerned for the high prevalence of IDA in the developing countries including the low socioeconomic status causing the ignorance for the diet quality and the nutritional factors including low iron containing diets or low bio-availability of the dietary iron as the hem iron intake is lower or even negligible [3,23,24]. In addition to that, the economic embargo imposed on Iraq for more than 10 years with low family income may act as an additional cause for this disorder. The lower socioeconomic status may be also the cause responsible for the higher prevalence of IDA in the rural areas, as this was mentioned in both developing [25] and developed countries [26].

The higher prevalence of IDA in girls than in boys is consistent with those observed in other studies [5,20,22,24,27,28], this was due to the excess physiological demand of iron in girls which is needed to compensate the menstrual loss in girls[26,29].

The highest prevalence of IDA among different age groups in the present study are in agreement with other studies, as this due to the increasing demand for iron attributed to the adolescent growth spurt as the highest iron requirement is at the ages of 15-17 years in boys and 12-16 years in girls [3,12,16,17,22,30].

The mean PCV values of boys and girls exhibited values consistent with those reported by Al-Sharbatti [22], but were lower than reported in developed countries [5,31], which may due to the nutritional status. At the same time, the higher mean PCV values for boys compared with girls observed in this study was also observed in other studies [5,22,31] that may reflect the physiological sex difference [32].

TS value of less than 5% is almost certainly due to iron deficiency, but values of 5 up to 16% may be noted in IDA or anemia of chronic disorders [13]. This was observed in 3 (2.65%) pupils who showed SF values of more than 15% that exclude the diagnosis of iron deficiency and the possibility of anemia of chronic disorders was raised. The 27 (25.71%) pupils who showed normal TS with low SF may due to the diurnal variations of TS or presence of concurrent infections in pupils with IDA [33].

In conclusion, this study clarified that IDA is a health problem of moderate severity among intermediate school pupils in Ramadi district, and it was found that iron deficiency is the main cause of anemia. So detection and treatment of the anemic cases followed by supportive measures including iron supplementation for the pupils to overcome this problem are recommended. In addition to that it is advisable to ensure the pupils about the iron rich diets and the bioavailability of the dietary iron.

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