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The Effect of Iron Deficiency Anemia on Intelligence Quotient (IQ) in under 17 Years Old Students

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Abstract: The aim of this study was to evaluate the effects of iron deficiency on intelligence of 11-17 years students. This study conducted on the 540 students (11-17 years) that educated at guidance and high school of Boroujerd city. Laboratory investigations were included serum iron, TIBC (total iron binding capacity) and ferritin. Riven matrix was used in order to determine intelligence quotient. Data were analyzed using SPSS 13 and χ^2 and t-tests. Results showed that 78 (14.4%) students had iron deficiency and 14 (25.9%) had iron deficiency anemia. There was no significant difference between different sexes for iron deficiency distribution ($p>0.05$), while iron deficiency anemia was significantly higher in girls as compared with boys ($p>0.05$). Mean quotient was 115 ± 12.1 in iron deficiency students, while it was 113.7 ± 13.9 in patients without iron deficiency. There was also no significant difference between normal and iron deficient students for intelligence quotient ($p>0.05$).

Key words: Anemia, iron deficiency, Intelligence Quotient (IQ)

INTRODUCTION

Iron deficiency is an important worldwide disorder. Fifteen percent of world populations are suffering from Iron deficiency (Rahimzade *et al.*, 1992). Anemia, Iron deficiency, is common among the children of developmental countries and often its prevalence is 50% or more (Zimmermann *et al.*, 2005; WHO/UNICEF/UNU, 2001). The Iron balance in children and teenagers is kept (protected) by arrangement of Iron attracting in order to secure the growth and also to increase the amount of red blood cells and the replacement of lost Iron amount by skin and genital, urination system and digestion (Beutler, 1957; Beutler and Blaisedell, 1995).

Iron is one of the heavy metals with very important biological value which is not only a part of hemoglobin, but also a part of some enzymes of electron transmitter systems at Mitochondrion (Beutler, 1959). It is recognized that Iron deficiency causes different systematic diseases accompanied with decreasing of cytochrome in mitochondria. Lately it is reported that the bridge of cytochrome oxidase follows in learning deficiency and straightness of Hippo comp (Ogasahara *et al.*, 1986).

Iron deficiency is the most common anemia in the world and the most important reason for that is detective obtaining of Iron which follows dangerous results such as the death of mothers and Fetus, the decrease of children's growth, disorder growth and abnormality of development in children (Zimmermann *et al.*, 2005). The most important

reason for Anemia and Iron deficiency are: decrease in physical and mental activities in all ages, decrease in intelligence quotient decrease in effectiveness, change of behavior, impatience, decrease in physical resistance against the sickness early tiredness and bodily weakness (Rahimzade *et al.*, 1992). In the young people, the danger of iron deficiency is more than others, because they need more nutritive materials growth and mutation.

Regarding to the important role of iron as one of the psychological factor in intelligence quotient of people and since the danger of this illness is high in developmental countries; this study was done on students 11-17 years old in order to evaluate the effect of Iron deficiency on the intelligence.

MATERIALS AND METHODS

This study is Descriptive-Cross sectional and 540 were taken on the students between 11 to 17 who were studding at junior school and senior schools of Borujerd. In this study the sampling was done in cluster form Junior school and senior schools of Borujerd. For all of these children, in order to consider them. In view of serum Iron SI, total Binding capacity. TIBC and Ferritin Raven test was used in order to this test was made by PenRose and Raven in 1983 and has 60 picture questions. It is consisted of 5 dozen (A-E). Although the developing matorists are made for ages between 5 to 65, but the best application of them is between 10.18.

It is appropriate for measuring the rate of mental growth in children in both junior and senior school. In order to dispose of the test, a first for decreasing anxiety and stress, preparing the students and approximate familiarity with probable abilities of the students who have participated in the test, an interview in the form of advising the student is done and required information is registered then the test in particular processes is taken and at the end the answer papers are gathered and evaluated by the answer key. Eventuality the student's grade and the time of answering the questions were recorded and their rank in the percent form and the level in which the students taking exam is calculated according to charts and are written in answer papers. People in this research were divided in seven categories: superior, genius, intelligent, more intelligent, average, average weak, stupid, weak stupid and handicapped. Obtained information was analyzed statistically by SPSS and also by χ^2 and t-test.

RESULTS

Five hundred and forty students including 264 boys (48.9%) and 276 girls (51.1%) were studied in this research. The average age of the subjected persons was 14.9 ± 1.2 and the range of their ages was 12 to 17. Their average IQ was 113.9 ± 13.7 . Among the studied students 35.2% were at the third level, that is to say, they were very intelligent. Seventy eight students (14.4%) suffered from iron deficiency and 140 students (25.9%) suffered from iron deficiency anemia.

Among the 264 boy students in present research, 42 students (15.9%) suffer from iron deficiency and 56 students (21.2%) suffer from anemia iron deficiency; among the 276 girl students, 36 students (13%) suffer from iron deficiency and 84 students (30.4%) suffer from anemia iron deficiency; the case for both sexes were not significant ($5\% < p$), although iron deficiency in girls was far more than the boys. Differentiation was significant ($5\% \leq p$) (Table 1).

The average intelligent quociency of the students who were suffering from iron deficiency was 115 ± 12.1 and the one of those who were not suffering from it was 113.7 ± 13.9 . This difference was not so important to be considered by statistics. Also according to the result of the this research, the average intelligent quociency of the students who were suffering from iron deficiency differs from the ones of other students (Table 2).

The result showed that the classification of the students who were in research based on the marks of their IQ didn't differ from the ones who weren't suffering from iron deficiency anemia (Table 3).

Table 1: Comparison of multiple distribution of Iron deficiency and i.d. anemia among the students between 11 to 17 age in Borujerd

Disease	Sex	Sex		p-values
		Boy (N = 264)	Girl (N = 276)	
Iron deficiency	Positive	42 (15.9%)	36 (13%)	p = 0.30 df = 1 chi ² = 0.89
	Negative	222 (84.1%)	240 (87%)	
Anemia iron deficiency	Positive	56 (21.2%)	84 (30.4%)	p = 0.014 df = 1 chi ² = 5.97
	Negative	208 (78.8%)	192 (69.6%)	

Table 2: Comparison between the average IQ of students suffering from iron deficiency and anemia and other students

Disease	Mean±SD	p-values
Iron deficiency (N = 78) positive	115.0±12.1	p = 0.45, t = 0.75
(N = 462) negative	113.7±13.9	
Iron deficiency anemia (N = 140) positive	112.9±14.7	p = 0.32, t = 0.98
(N = 400) negative	114.3±13.3	

Table 3: Comparison between the marks of IQ of the students of both groups who are suffering from iron deficiency anemia and those who are not

Classification of IQ	Iron deficiency anemia		p-values
	(N = 400) negative	(N = 140) positive	
Superior	54 (13.5%)	22 (15.7%)	p = 0.22
More intelligent	82 (20.5%)	34 (24.3%)	
Intelligent	154 (38.5%)	36 (25.7%)	df = 6 chi ² = 8.15
Average	90 (22.5%)	40 (28.6%)	
Average weak	8 (2%)	4 (2.4%)	
Stupid	4 (1%)	2 (1.4%)	
Handicapped	6 (1.1%)	6 (1.1)	

DISCUSSION

Present results showed that 25.9 of under survey students in this essay were suffering from Iron deficiency and anemia. Unfortunately, it is estimated that there is a great difference in the amount of frequency of anemia and Iron deficiency between developed and developmental countries. The amount of spreading of anemia and Iron deficiency in developing countries is about 25-35% and in the developed countries is about 5-8%. The result of the present study also were showed the high frequency of anemia and Iron deficiency in the students of Broujerd city.

In the present study, the relationship between the IQ of 11-17 years old students with Iron deficiency and anemia was investigated. The result of this research didn't show a significant difference between the average of IQ and also between the classification of scores of IQ of students who are suffering from Iron deficiency and anemia with the students who didn't have these problems.

There are various factors impressing the amount of IQ of the people where seems that heredity has the most

important role in this case. Other factors such as nutrition conditions, environment conditions, the cares of mother in pregnancy period, suitable nutrition of pregnant mother, etc, also has an important role on IQ. The result of the this study shows that although Iron deficiency has a important role in the quality of IQ as an physiological factor, the IQ is not depended on just one factor and is under the influence of various factors and it is multi-factorial.

However, Iron has an important role in anemia etiology of Iron deficiency in developing countries; a few researches have approved this fact (Mashako *et al.*, 1991; Rahimzade *et al.*, 1992). The anemia and Iron deficiency is the most spreading kind of deficiency in the world and its most important reason is the impartial receiving of Iron which can have increasing danger of death of mothers andumberio, stopping or decreasing children growth, growth abnormality and children physical impartial growth, decreasing physical activities, mental concentration and productivity in all ages.

Therefore, it seems to provide necessary iron from different ways, like to use different kinds of iron complements, is helpful; for example, to use iron drop for 6 months 2 year old children, to use/eat suitable diet/food with high iron, take iron pill for pregnant women and young females and enrich usual food.

According to their growth and high need of necessary food in maturity period, kids and teens are exposed to iron deficiency; therefore, to use/eat iron food like meat, liver, grains and fresh vegetables everyday is effective to be away from iron deficiency.

Also to use eat good full of vitamin C with main meal increases the absorption of iron. Not to drink tea and coffee from 1 h before and 2 h after meal, to be familiar with symptoms of iron deficiency can help not to suffer from the illness.

CONCLUSION

This research declares that average quotient of teens (11-17) and iron deficiency are irrelevant and the Fact matter shows several elements affect on/influence person's quotient.

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