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# A COMPARATIVE STUDY OF THE MENTAL FATIGUE STATUS OF ANEMIC AND NON ANEMIC ADOLESCENT GIRLS

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**ABSTRACT**

**Background**: The past decades have witnessed that malnutrition in general and anaemia in particular strongly limits the physical endurance and causes mental fatigue among the adolescents. The ultimate work capacity of any individual can only be assessed by his/her mental and physical performance.

**Aim**: Keeping this aspect in mind present study has been designed to assess mental fatigue and energy expenditure of the anaemic adolescent girls, in comparison to their non anaemic counterparts.

**Material and Method**: The study proceeded with the selection of 300 adolescent girls among them 100 were non anaemic (Hb level > 12 gm %) and 200 were anaemic (Hb level < 12 gm %), aged 13-17 years, by random sampling method. All the subject girls belonged to different schools of Indore city. Mental fatigue has been assessed by using mental fatigue sorting chart in terms of letter ticked at 1$^{st}$ min, 5$^{th}$ min, and total and % of correct letter identification at during same intervals respectively.

**Results**: The study revealed that the mental fatigue level of the anaemic girls was higher than the non anaemic girls in terms of correct % of letters and no. of mistake made in mental fatigue shorting test. The anaemic group had lower mean no. of letters ticked in 1 min and with higher no. of mistakes done in identification of the right letters ticked which further repeated in the 5 min also.

**Conclusion**: Study reveals that anaemia has played some role in mental fatigue level of the girls. Proper strategies could be made to eliminate this nutritional problem amongst them with better pace and guide them to attain full potential growth and healthy life.

**KEY WORDS:** Mental fatigue, Iron, Letter cancellation test, Adolescent girls.

## INTRODUCTION

Prevalence of anemia among adolescents is a matter of great concern as these girls enter reproductive life soon after the attainment of their menarche. During the period of adolescence blood volume and muscle mass increase and this in turn is found to increase the need for hemoglobin formation if the diet does not contain sufficient absorbable iron and the adolescent cannot consume adequate amount

of food they become anemic. It is evident from the reports of several groups of workers that anemia is high in teenage girls. Moderate and severe forms of anemia, result in reduced endurance, i.e. individuals takes a longer time to complete tasks. Passi et al (2001) reported a close correlation between the degree of growth retardation and functional impairment on 1336 children between the ages of 6 to 9 years studying in rural schools of Utter Pradesh, India. The prevalence of anemia and growth retardation (85%) was extremely high in the population. Similarly impaired mental and psychomotor functions are also associated with anemia. The profound varied effects include delayed physical growth and motor development, general effects on cognitive development resulting in lower intelligence quotient, impairments of memory, less attention span, deficiency in learning and lower educational achievement. There seems to be a vulnerable period for these damages particularly between 9 to 18 months of age. An even more important issue is that as this damage may not always be reversible when iron stores are corrected even in early stage of iron deficiency. Of particular importance is the effect on central nervous symptoms which leads to defect in cognition and learning process in human. Iron is required for proper myelination of spinal cord and white matter of cerebeller folds in brain and is cofactor for a number of enzymes involved in neurotransmitter synthesis, organogenesis and others. Recent studies have established fact that anemia in school age children is related to poor mental capabilities, lower IQ, lowered scholastic performance and behavioral modification resulting in poor social interaction and other related problems. Lazoff (2002) has reported that iron deficiency adversely affects behavior by impairing cognitive development disturbances and by limiting activity and work capacity. It causes alteration in attention process. The behavioral effects of iron deficiency anemia have been associated with changes in neurotransmission.

## Material and Method

The study proceeded with the selection of 300 adolescent girls among them 100 were non anaemic (Hb level > 12 gm %) and 200 were anaemic (Hb level < 12 gm %), aged 13-17 years, by random sampling method. All the subject girls belonged to different schools of Indore city.

Required baseline information was collected from the subjects and from the records of school.

Mental fatigue has been assessed by using mental fatigue sorting chart in terms of letter ticked at 1$^{st}$ min, 5$^{th}$ min, and total and % of correct letter identification at during same intervals respectively. The chart was handed over to the students and was asked to strike out the letters given from them after the given interval of time.

## Result

***Mean no. of*** letters ticked in 1 min ***(27.36 and 29.98), %*** correct letters at 1 min ***(70.49 and 72.6) and no. of mistake*** at 1 min ***(9.62 and 7.77), Mean no. of*** letters ticked in 5 min ***(34.03 and 29.05), %*** correct letters at 5 min ***(65.54 and 67.96) and no. of mistake*** at 5 min ***(12.75 and 9.99), Mean no. of*** letters ticked totally ***(142.77 and 157.09), %*** correct letters totally ***(68.61 and 68.26) and total no. of mistakes (52.01 and 47.64) b***y anaemic and non anaemic girls respectively (Table 1).

From the table 1, it is clear that obtained that 't' value is significant for the mean difference in mean no of letters ticked in 1 min, no of mistake at 1 min, no of letter ticked in 5$^{th}$min, no of mistake at 5$^{th}$ min ticked and total no of letter ticked by the anaemic and non-anaemic adolescent girls in mental fatigue shorting test.

While, the 't' value for the difference in mean value of correct % at 1 min, correct% at 5th min, correct% of total no, total no of mistake, is not significant.

Furthermore, it is indicated from the table 1, that the non anaemic girls had ticked +2.61 letters at 1 min, +4.98 letter at 5th min and +14.31 letters in all more in comparison to the anemic girls group. The percentage of correct letters ticked by the anemic group was -2.11 at 1 min, -2.42 at 5th min and -0.35/ at total number. The number of mistake made by the anemic girls was +1.85 at 1st min, +2.75 at 5th min, and +4.37 in all lesser than their non anemic competitors.

**TABLE 1**

**Comparative** Mental **Fatigue Status of Anaemic and Non Anaemic Adolescent Girls**

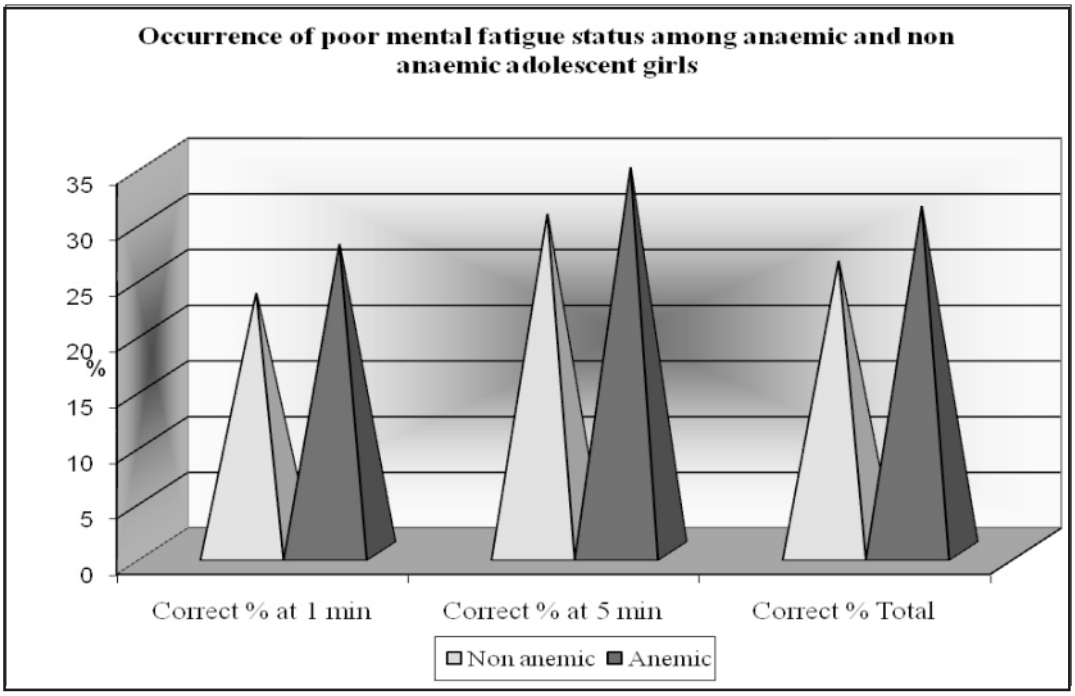
| Variable | Group | N | Mean | SD | Mean difference | 't' value | 'p' value |
|---|---|---|---|---|---|---|---|
| No of letter ticked in 1 min | Non anaemic | 100 | 29.98 | 10.71 | 2.61 | 2.14 | 0.03 |
| | Anaemic | 200 | 27.36 | 8.25 | | | |
| Correct % at 1 min | Non anaemic | 100 | 72.6 | 16.87 | 2.11 | .097 | 0.33 |
| | anaemic | 200 | 70.49 | 18.17 | | | |
| No of mistake at 1 min | Non anaemic | 100 | 7.77 | 6.43 | 1.85 | 1.97 | 0.05 |
| | anaemic | 200 | 9.62 | 8.20 | | | |
| No of letter ticked in 5th min | Non anaemic | 100 | 34.03 | 14.08 | 4.98 | 2.98 | 0.003 |
| | anaemic | 200 | 29.05 | 12.60 | | | |
| Correct % at 5th min | Non anaemic | 100 | 67.96 | 16.33 | 2.42 | 1.12 | 0.263 |
| | Anaemic | 200 | 65.54 | 18.25 | | | |
| No of mistake at 5th min | Non anaemic | 100 | 9.99 | 7.84 | 2.75 | 2.41 | 0.017 |
| | anaemic | 200 | 12.75 | 9.99 | | | |
| Total No. ticked | Non anemic | 100 | 157.09 | 43.13 | 14.31 | 2.69 | 0.008 |
| | anemic | 200 | 142.77 | 43.75 | | | |
| Correct % of total No. | Non anemic | 100 | 68.26 | 12.23 | .35 | .20 | 0.841 |
| | anemic | 200 | 68.61 | 15.44 | | | |
| No of mistake of total No. | Non anemic | 100 | 47.64 | 29.90 | 4.37 | 1.09 | 0.27 |
| | anemic | 200 | 52.01 | 33.73 | | | |

The table 2 reveals that the obtained '$t^2$' value is not significant for correct % at 1 min, correct % at 5th min, correct % of total number letters ticked by anemic and non-anaemic adolescent girls. Furthermore, the table indicated that majority of girls of both the group scored more than 75% marks in identification of correct letters at 1 min in mental fatigue shorting test. However, at 5min level the girls of both group scattered equally among 3 categories. In all majorities of girls of both the group scored more than 60 % marks in mental fatigue test and the anemic girls were legging behind in general but was not significant statistically

**TABLE 2**
**COMPARATIVE MENTAL FATIGUE STATUS OF ANEMIC AND NON-ANEMIC ADOLESCENT GIRLS**

| Variable | Status | Groups | | Chi value | P value |
|---|---|---|---|---|---|
| | | Non anemic (N = 100) | Anemic (N = 200) | | |
| Correct % at 1 min | ≤ 60% | 23.2 | 27.6 | .49 | .481 |
| | 60-75% | 25.4 | 25.9 | | |
| | > 75% | 51.4 | 46.6 | | |
| Correct % at 5th min | ≤ 60% | 30.3 | 34.5 | .08 | .77 |
| | 60-75% | 33.8 | 29.3 | | |
| | > 75% | 35.9 | 36.2 | | |
| Correct % of total No. | ≤ 60% | 26.1 | 31.0 | .19 | .65 |
| | 60-75% | 38.7 | 34.5 | | |
| | > 75% | 50 | 34.5 | | |

**Figure 1.1**




***The above figure is showing the % of girls scored <60% marks in Mental Fatigue Sorting Test.***

## Discussion

Nutrition is one of many factors that affect development of the brain, and therefore, the cognitive development of children. Investigating the role that nutrition, plays in cognitive development is likely to be challenging because nutrition is likely to be an outcome, correlated with internal and external environmental factors such as demographic, socioeconomic, health, social, behavioral and motivational influences. Nutrition is likely to have a number of influences on the development of the brain. So in present study data regarding mental fatigue of the girls was collected and processed.Obtained results of the present study regarding mental fatigue of the anaemic girls in relation to their hemoglobin status showed agreement with these studies. The table no.1 and 2 clearly indicated that in all, the mental fatigue level of the anaemic girls was higher than the non anaemic girls in terms of correct % of letters and no. of mistake made in mental fatigue shorting test. The anaemic group had lower mean no. of letters ticked in 1 min and with higher no. of mistakes done in identification of the right letters ticked which further repeated in the 5 min also. In this way from the results it can be said that anaemia has played some role in mental fatigue level of the girls.

Several mechanisms linked to anaemia can possibly lead to altered cognition. The most direct one are the changes that occur in structure and function of CNS deduced by Taneja, et al (1986). A significant decrease in non heme iron both in liver and brain without changes in hematocrit are observed and they clearly suggest appreciable decrease in content of iron in certain tissue. The significant effects on neurotransmitter receptors during early stages of iron deficiency indicate that deficits in both excitatory and inhibitory pathways of central nervous system as suggested by Mittal, R.D. et al (2002).

Sen A. and Kanani S.J. (2006) revealed that the non anaemic girls scored higher than their counterparts, the difference was significant in digit span and visual memory test. According to Lozeff B. (1998) there is reasonable good evidence that mental and motor developmental test scores are lower among infants with iron deficiency anaemia. Although the research on cognitive function in iron deficient older children and adults is sparse and diverse, it suggests that there may be alterations, intentional processes associated with iron deficiency. Iron therapy has not yet been shown effective in completely correcting many of the observed disturbances. A variety of non-cognitive alterations during infant developmental testing has also been observed, including failure to responds to test stimuli, short attention span, unhappiness, increased fearfulness, withdrawal from the examiner, and increased body tension.

So above facts, very well indicate that anemia is a major public health problem of adolescent girls. adolescent girls have been an under privileged group in Indian society, sufficient care and attention is not given to them and they are often over burdened with work both at home and outside added to these, is the stress of physical changes taking place in them. The onset of the menstrual cycle and the growth spurt of Adolescence increase the demand for nutrients on one side and also leads to a loss of essential micronutrients like iron on the other side. The deficiency of various nutrients in the adolescent girl could lead to impaired immune competence, reduced cognitive function and scholastic performance, achievement, increased morbidity and delayed menarche. If proper nutrition is provided on time, there is a potential for catch up growth. Thus, the adolescent girl is at the cross roads where if she get the path of good nutritional and health care,

she can achieve optimum growth and a healthy reproductive life, which in turn will affect the health and life on her off spring at a later date. On the other hand, if she continues with a deficient diet not only will her health and nutrition be compromised, but also her offspring will in turn be affected. Therefore, it is essential that special care be taken for these "mothers to be".

The findings of the study provides good information to understand the physical, mental and other health implications of anemia on adolescent age girls so that proper strategies could be made to eliminate this nutritional problem amongst them with better pace and guide them to checkup full potential growth and healthy life.

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