

# Assessment Of Hemoglobin, Iron and Total Iron Binding Capacity to Gauge Health Status of Adolescents from Urban Slum

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**Abstract:** - The age where girls and boys need additional nutrition for the development of their body is termed adolescence. Childhood undernourishment is a major health problem in India, especially in slums. Hence hemoglobin, iron, and total iron binding capacity were estimated for nutritional status in adolescent population also pertaining its use as a screening method for iron deficiency anemia. The study comprised 50 healthy and 50 underprivileged adolescents as group (1) and group (2) within the age of 14-18 years. The study parameters were evaluated, and the results indicated significant differences in both the study groups.

**Key Words:** - *Adolescence, nutrition, anemia, iron.*

## I. INTRODUCTION

Adolescence is the most important phase in human development. It is a period of increased nutritional requirement and development of the body. Childhood undernourishment is a major health problem in India, especially in slums.

Slum is a highly populated urban residential area containing densely packed houses of weak built quality often associated with poverty. Mumbai holds 3rd largest slum in world and 1st largest in India- Dharavi (1). It is one of the most common causes of morbidity and mortality among children and adolescents throughout the world (2). Micro nutritional deficiencies are common in India (3).

Anemia is a condition in which the number of red blood cells or the Hemoglobin (Hb) concentration falls below the normal range. It is not a specific disease, but an indication of underlying pathological process or disease of various etiologies. Among all different etiologies nutritional anemia is the most common in adolescent.

Iron deficiency is responsible for most of the nutritional deficiency anemias. The prevalence of anemia is an important health indicator and when it is used with other measurements of iron status, the hemoglobin concentration can provide information about the severity of iron deficiency (4). Iron is an important micronutrient which is essential for cellular growth and differentiation. It is required for the synthesis of hem and non-hem compounds and thus helps in transport, storage and utilization of oxygen. It is involved in many enzymatic reactions, immune functions and physical growth (5).

Plasma transferrin, the most important glycoprotein, is synthesized in the liver and together with ferritin binds essentially all circulating plasma iron (6). The sum of all iron binding sites on transferrin constitutes the total iron binding capacity (TIBC). Iron deficiency anemia (IDA) is characterized by a defect in hemoglobin synthesis, resulting in hypochromic and microcytic red blood cells (7). Iron deficiency can result either due to less nutritional supply, or blood loss due to any reason. Increased levels of TIBC suggests that total body iron stores are low. (8).

## II. MATERIALS AND METHODS

This study was carried out At Govandi, a health care center run by TN Medical College and BYL. Nair Ch. Hospital, Mumbai. Total enrolled subjects were 100 out of which Group 1 had 50

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healthy controls and Group 2, 50 adolescents, in the age of 14-18 years, age and sex matched. The adolescents' subjects of group 2 belonged to the lower socioeconomic strata as they belonged to slums.

### 2.1 Inclusion and Exclusion criteria

50 healthy adolescents aged 14 to 18 years belonging to non-slum areas were assessed for nutritional status. 50 undernourished adolescents in the same age group belonging to underprivileged areas were included. The adolescents having systemic diseases like HIV, cancer, infectious diseases etc. were excluded from the study. The study was approved by the institutional Ethics Committee. Written consents were obtained from the subjects' parents as the study group included minors.

### 2.2 Sample Collection

Control Group (Gr1): 50 healthy adolescents in the age group of 14-18 years (Gr1) were assessed for the study of nutritional status. These adolescents were from good economic strata of society.

Test Group (Gr2): 50 adolescents undernourished, in the age group of 14-18 years (Gr2) children were assessed for the study of nutritional status. These children belonged to the lower economic strata of society, the slum area.

Participants were instructed for 12-14 hours fasting. Venipuncture collection with sterile disposable needle and syringe was done in heparin and clotted tube. The sample was allowed to clot at room temperature for 1-2 hrs. Then serum was separated and was used for analysis of iron and iron binding capacity by kit method. (9) Heparinized blood is used to check hemoglobin by Drabkin's method. (10)

Statistical analysis was done using student's 't' test. The values obtained were tabulated and mean and standard deviation of all the parameters were calculated.

## III. RESULTS AND DISCUSSION

The present study was carried out for the evaluation of hemoglobin, iron and iron binding capacity parameters in adolescents in Indian slum.

We observed hemoglobin and serum iron levels on the lower side in adolescent subjects as compared to the healthy controls. Serum levels of Total iron binding capacity were found to be on higher side compared to control group of healthy adolescents.

We observed levels of hemoglobin of test group (10.82gm/dl,  $\pm 1.55$ ) on lower side compared to control (13.32gm/dl,  $\pm 0.75$ ) of healthy adolescents ( $p \leq 0.001$ ). Our observations were at par with Veena Melawani et al (11), CH Simachal am et al (12), S. Kaur et al (13). We noticed normal levels of Iron in test group (81.06mg/dl,  $\pm 35.71$ ), but its range (23.07-169.23mg/dl) is slightly on lower side compared to control group of healthy adolescents (63.28-145.72) Our results were matched with R.D Urbano et al (14), Carl C Seltzer et al (15). serum levels of total iron binding capacity were seen to be on higher side in test adolescent (412.3mg/dl,  $\pm 44.27$ ) compared to control group of healthy adolescents (322.9,  $\pm 12.46$ ). Our findings were equipollent to studies of Carl C Seltzer et al (15), Venessa DE la Cruz et al (2006) (16) where total iron binding capacity levels were on higher side. This study is corelated with Carl C Seltzer et al study (15), Venessa De la Cruz et al 2006 (16), and Vasanthi G et al (17), where adolescents displayed lower serum iron levels and higher serum binding capacities.

Table.1. Hemoglobin levels and Serum Levels of iron and iron binding capacity

		Range	Mean	SD $\pm$	t	p-value
Hemoglobin(gm/dl)	Control	12 - 14.5	13.32	0.75		
	Test	8.6 - 13.5	10.82	1.55	10.85	$\leq 0.001$
Iron( $\mu$ g/dl)	Control	63.28 - 145.72	96.61	22.17		
	Test	23.0 - 169.23	81.06	35.71	27.28	$\leq 0.001$
TIBC( $\mu$ g/dl)	Control	250.54 - 398.75	322.96	12.46		
	Test	250.58 - 583.33	412.37	44.27	7.17	$\leq 0.001$

Iron requirement is met by diet that is adequate in dairy products, whole grain cereals, legumes and green leafy vegetables. Group 2 adolescents lack all this in their diet as they were from poor socioeconomic conditions.

In the present study nutritional iron deficiency is observed due to low hemoglobin and iron levels in association with high total iron binding capacity.

#### IV. CONCLUSION

This study recorded nutritional iron deficiency with high total iron binding capacity and low hemoglobin levels. This may be due to chronic undernourishment in adolescents staying in slums. The most important way to prevent anemia is to take good diet rich in iron. Adding vitamin C should also be provided for children to improve the absorption of iron (18). It is highly recommended for implementation of health program for all adolescent children on a regular basis. They should be advised about improvement in dietary habits, regarding consumption of green leafy vegetables in diet.

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