



## A Comparative Study on BMI, Antioxidant Intake and Hemoglobin Status of the Twin City Girls Students Involved in the Higher Education

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### ABSTRACT

Total 1500 adolescent girls involved in higher education were participated in the study. Only 719 girls found adequate to fulfill the required data. Result of our study on the basis of their BMI (Body Mass Index) indicates that nutritional status of only 33.10% girls was normal. Result of our study reports only 2.08% were obese girls and 9.9 % overweight girls. Significantly higher level of ( $p>0.05$ ) poor nutritional status was found in our study. The poor nutritional status in terms of under nutrition and underweight was totally 54.94%. Out of this 31.15% girls were undernourished and 23.78% girls were underweight. Dietary intake of the antioxidant found below the normal range. Hemoglobin content of the girls was also estimated to evaluate anemic condition. Hemoglobin content of 60.98% of the girls was found normal, where as 26.83% girls had marginal deficiency and 12.196 % girls were found anemic. Results of this study is obvious important for the formulation of health and development policies at the level of higher education. Study indicates urgent need to improve nutritional status of the adolescent girls either by providing nutritional education or by including diet rich in iron, folic acid, antioxidants and protein.

### INTRODUCTION

Diet composed of various foods; therefore food is a known basic key ingredient. Varieties of foods are available in the market. Selection of the food depends upon like and dislike of a person. A food which person eats is responsible for his/her health because nutrients available from that food impact on the health. Diet is a combination of the food which generally requires for good health and is capable to provide nourishment to the body. The term Balance Diet is an adequate diet which provides the entire nutrient for the body's need. Fast life has altered dietary pattern, different foods consumed by the people, just because of their like and fulfill the hunger. These may be fast foods, ready to eat foods, foods for fun etc. Most of these are non-functional food which does not provide proper nourishment to the body. Balance Diet is composed of functional food source whereas above food does not sure to composed a diet as Balanced Diet. Higher education forces the students to eat food rather than diet just to fulfill their hunger.

Antioxidants are essential and important for plants and animals' sustenance. Antioxidants are substances that protect cells from damage caused by unstable molecules known as free radicals. Antioxidants interact with them and stabilize free radicals and may prevent some of the damage [1].

Natural antioxidants present in fruits and vegetables have gained increasing interest among consumers and the scientific community [2].

Primary sources of naturally occurring antioxidants are whole grains, fruits and vegetables. Plant sources antioxidants like vitamin C, vitamin E, carotenes and Phytochemical have been recognized as having the potential to reduce risk by maintaining the balance between oxidants and antioxidants [3].

Hemoglobin is the iron rich protein present in red blood cells of vertebrates and in the tissues of invertebrates. The main function of hemoglobin is to transport oxygen from the lungs to the body tissues and Carbon dioxide, which is released as a byproduct of these chemical reactions is taken back to the lungs for exhalation. As the role of hemoglobin in the human body is vital for leading a healthy life, it is very necessary to maintain its level in the blood. An average Female should have a hemoglobin level which ranges between 12.1 to 15.1 g/dl. The level of hemoglobin in the blood is

less than normal, then the condition is called anemia. Anemia can be caused by various reasons, the most common being the deficiency of iron. Iron deficiency in the body affects the synthesis of hemoglobin and causes iron deficiency anemia [4]. Non-vegetarian sources of iron are chicken, liver; beef, fish, Eggs and Vegetarian source are dark vegetables, green leaves, dried fruits, nuts and beans.

Present investigation was planned to have clue on health status of the students, on the basis of their body mass index, Dietary intake of Antioxidants and blood hemoglobin level.

## OBJECTIVES

- 1) To collect the basic information by Questionnaire method.
- 2) To find out antioxidant intake using Questionnaire information.
- 3) To collect the blood sample by venipuncture from volunteers.
- 4) To categories girls according to their hemoglobin level into normal, moderate and anemic condition.

## MATERIAL AND METHOD

### Collection of the data

A cross-sectional study was carried out in the colleges running science and paramedical courses in Sardar Patel University at Anand and Vallabh-vidhyanagar, Gujarat through college to college visits. Two stage sampling method was used to reach the respond of students.

**In the first stage:** Questionnaire was given to all the students to fill up required answers.

**In the second stage:** Completely filled Questionnaire was screened out and systematic random sampling was used to select required number of the students from each criteria- hostilities, localities and commuter. First year and second year students were included for this study.

Data on family background and anthropometric variable were collected on pre-designed and pre-tested questionnaire.

Questionnaire filled was crossed checked. Data observed was entered in and analyzed using criteria [5]. Quetlet's index was used to classify nutritional status.

**Antioxidant intake** - It was calculated on the basis of food intake of the girls recorded in questionnaire.

**To collect the blood sample:** Blood was collected from volunteers at fasting condition by experts in EDTA bulb and stored in cool place.

**Heamoglobin level** - Heamoglobin level was estimated by using Drab kin's method [6]. For haemoglobin estimation, 20 $\mu$ l of capillary blood was taken in a Hb pipette and transferred to a pre-numbered glass bottle containing 5ml Drabkin's reagent. Haemoglobin estimation was done by the Cyanmethaemoglobin method using a photoelectric colorimeter with a green filter (500-570 nm wave length). Criteria for anemia are defined as a Hb level of less than 12g/dl in women [7].

**Statistical analysis** - Statistical significance is calculated by using ANOVA. Significance was tested and level of significance was used to report p-value.

## RESULT AND DISCUSSION

Total 719 adolescent girls involved in higher education were participated in this study. The basic objective of Quetlet's index at the adolescent community level is to provide information on prevalence and severity of malnutrition among literate adolescent involved in higher education. Result of our study, on the basis of their BMI (Body Mass Index) indicates that only 33.10% girls are normal having BMI 21.99, 2.08% obese girls and 9.9 % overweight girls having BMI 32.83 and 26.99 respectively. Significantly higher level of ( $p>0.05$ ) poor nutritional status was found than normal nutritional status. The poor nutritional status indicates that 31.15% girls were undernourished having BMI 16.15 and 23.78% girls were underweight having BMI 18.88 , in terms of poor nutrition value is 54.94%. (Table-1). High prevalence of thin adolescent and thinness reported from the developing world [8] is in agreement of present study. Under-nutritional status of rural adolescent in Bangladesh reports 67% thinner in body-length of girls [9]. Poor nutritional status of our study indicates correlation with the study carried out in rural area of Varanasi reported 54.94% adolescent possess 18.8 BMI [10].

Study presents that majority of the adolescent girl students engaged in higher education are malnourished. Poor nutritional status of the girls is serious and may prove an obstacle in achieving reproductive and child health program targets like reduction in proportion of low weight babies and in improving other reproductive outcomes [11].

Many workers have worked on obesity but cases of obesity found in this study are very less (2.09% girls). Lower family income is an important prediction of underweight [12].

Antioxidant intake calculated on the basis of data filled for the dietary intake found less than the normal value. Average antioxidant intake for cereal, legumes, vegetables, fruits, milk products was 5.87, 1.11, 12.5, 7.05, 16.08  $\mu\text{mol/day}$  respectively, which indicates total antioxidant intake is only 42.64  $\mu\text{mol/day}$  against 101.6  $\mu\text{mol/day}$ . (Table-2). Antioxidant intake in adolescent girls was very less than the normal value 101.6  $\mu\text{mol/day}$  according to standard RDA. Antioxidants may reduce risks of cardiovascular and neoplastic diseases based on basic, animal and epidemiological research. During adolescence phase of life, change in healthy dietary habits occurs. Dietary antioxidant protection against major illnesses is a lifelong requirement. So they must aware to increase intake of antioxidant in their diet [13].

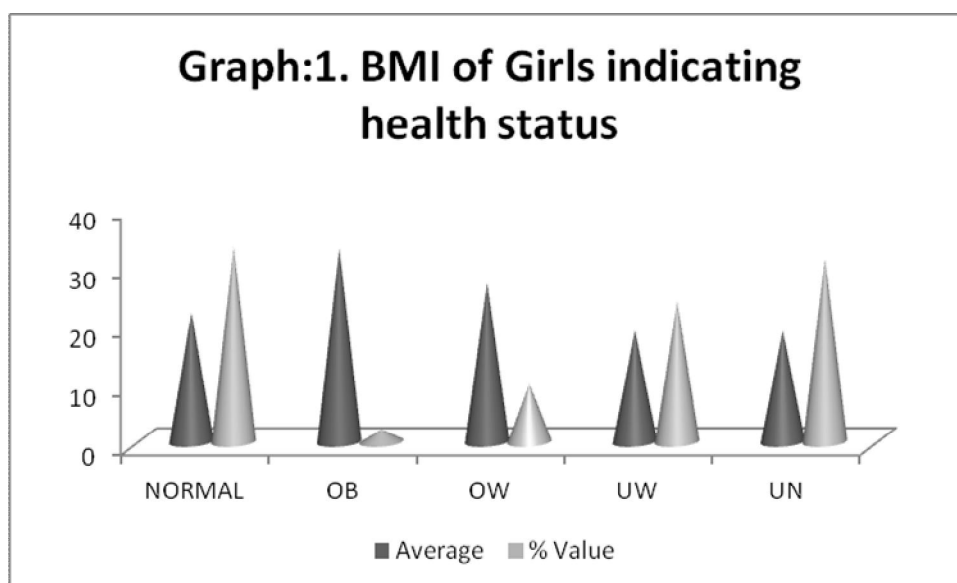
Haemoglobin content of the girls was also estimated to evaluate anemic condition. Haemoglobin content of 60.98% of the girls was found normal having Hb level 15.21gm%, where as 26.83% girls had marginal deficiency contain 10.97 Hb gm% and 12.19 % girls were found anemic having 7.96 Hb gm%. (Table: 3). A low haemoglobin level is referred to as anemia or low red blood count. The causes for anemia are loss of blood (traumatic injury, surgery, bleeding, colon cancer, nutritional deficiency, kidney failure and abnormal haemoglobin structure [4].

Anaemia among women causes increased risk of low birth weight, inadequate iron stores for the newborn, higher risk of maternal morbidity and mortality as well as a decline in mental concentration and physical activity [14, 15].

Results of our study are presented in the tables -3 and graph-3.

**Table: 1 Nutritional Categories on the basis of BMI of adolescent girls**

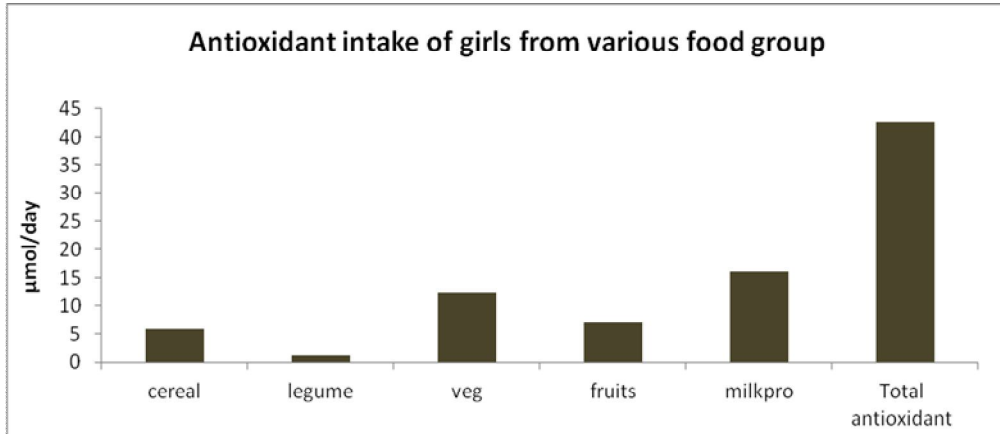
Nutritional Categories on the basis of BMI	
Normal	21.99±0.03
Obese	32.83±0.30
Overweight	26.99±0.16
Undernourished	16.15±0.27
Underweight	18.88±0.09



Graph 1- Categories on the basis of BMI of adolescent girls

**Table: 2- Antioxidant intake from various food group in Adolescent girls**

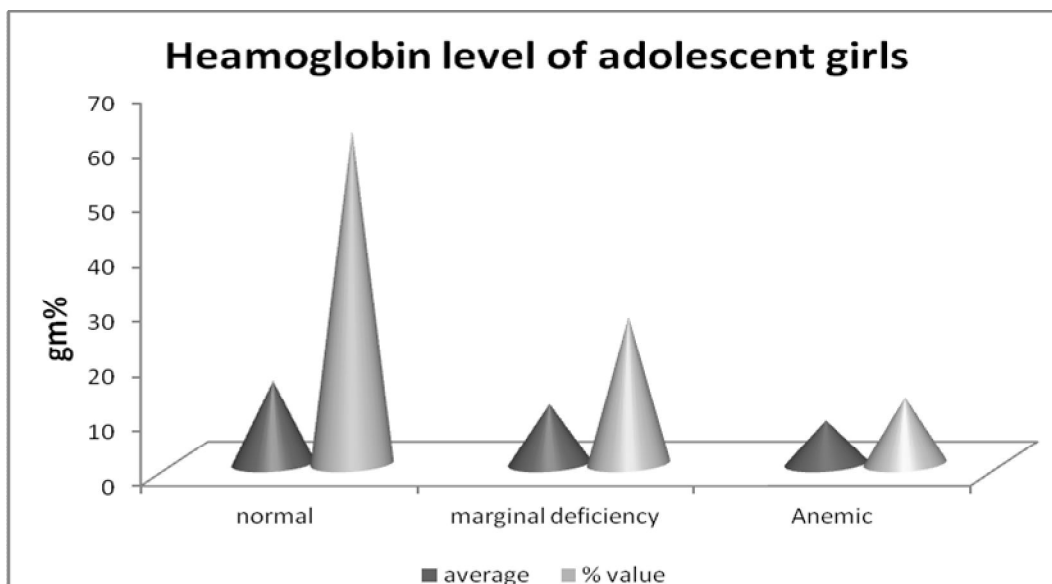
Antioxidant intake in Adolescent girls	
Antioxidant Intake	Average ( $\mu\text{mol/day}$ )
Cereal	5.87 $\pm$ 0.25
legume	1.11 $\pm$ 0.09
vegetables	12.5 $\pm$ 0.01
fruits	7.05 $\pm$ 1.59
milk product	16.08 $\pm$ 0.48
<b>Total antioxidant intake</b>	<b>42.64<math>\pm</math>3.49</b>



**Graph: 2- Antioxidant intake of girls from various food groups in Adolescent girls**

**Table: 3 Heamoglobin level of adolescent girls**

Hb. level in Adolescent girls	
Categories	Hb. (gm%)
Normal	15.21 $\pm$ 1.06
Marginal deficiency	10.97 $\pm$ 0.42
Anemic	7.96 $\pm$ 0.43



**Graph- 3 Hb level of adolescent girls**

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