



**Prevalence of Nutritional Anemia's associated with Body Mass Index and Hemoglobin Concentration among Young University Females, Karachi, Pakistan**

F. AZIZ, B. SIDDIQUI, F. JABEEN

Department of Biochemistry, Jinnah University for Women, Nazimabad, Karachi – 74600, Pakistan

Received 13<sup>th</sup> June 2016 and Revised 8<sup>th</sup> February 2017

**Abstract:** The research work is intended to assess the anemia's prevalence and its relationship with body mass index among 160 young (18-24 years) female students of university. The austerities of anemia were identified by estimating the blood hemoglobin concentration. Assessment forms were prepared to gather information that includes age, height, body weight, and socioeconomic status. An eating habits and food frequency feedback form was utilized to compute the food habits and food choices of young girls of university. In this study according to WHO BMI classification, 48.12% of girls were found to be under weight, 31.25 % of girls were found to be normal, 20.62 % of girls were found to be overweight. The study showed that only 36.87% female students were normal (Hb > 12 mg/dl of for female), 63.12 % of girls were anemic (Hb <11.0 g/dl). Among anemic young girls 23.14% of girls were mild anemic (Hb <12mg/dl), 30.62 % moderate anemic (Hb 8–10 gm/dl), and 9.37 % severe anemic (<8 gm/dl). Diet pattern of girls were analyzed by using food frequency questionnaire. It was found that majority of students were used to skipped breakfast and irregular consumption of meat, fish, poultry, eggs, leafy greens vegetables, nuts, and seeds due to lack of knowledge on health, balance diet and negative effect of anemia.

**Keywords:** Anemia, Prevalence, University Females, BMI, Hemoglobin

## 1. INTRODUCTION

Anemia is a condition that occurs due to lack of Hemoglobin in the blood. Iron is an essential trace mineral within the hemoglobin molecule, oxygen-carrying protein found in red blood cells, transports oxygen to tissues. It is known to be a most common public health problem in developing countries (Bagchi 2004; Talpur, *et al*; 2012; Noronha *et al*; 2012; WHO 2011).

Anemia is affecting 1.62 billion people worldwide. The prevalence of anemia is 43% in developing countries and 9% in developed countries (World Health Organization, 2008). Iron deficiency anemia is a type of anemia with the highest prevalence in young adolescent girls, children and among women of child bearing age in developing countries ( Neelam , 2013; Saeed *et al*; 2013; Mohammad *et al*; 2012; Verma *et al*; 2013; WHO, 2001; Nair *et al*; 2009; McLean, *et al* 2009).

The WHO suggested the following cutoff points to determine whether iron deficiency anemia was a major common universal problem (**Table-1**) (Luis 2010).

**Table – 1: Classification of anemia as a problem of public health significance**

Prevalence of anemia (%)	Category of public health significance
≤ 4.9 %	no public health problem
5.0–19.9 %	mild public health problem
20.0–39.9 %	moderate public health problem
≥40.0 %	Severe public health problem

Major factors contributing high risk of anemia in females are low inadequate intake or poor bioavailability of dietary iron and folic acid intake (Talpur, 2012). In adolescents particularly girls unhealthy dietary patterns such as high fast food consumption, a low meal frequency, skipping breakfast, and a increase consumption of sugar sweetened beverages are the causes of high prevalence of anemia (Rifat-uz-Zaman1, *et al*; 2012; Devi, *et al*; 2015) Pakistani young girls are rapidly changing their diet pattern by an increased consumption of animal food sources, saturated fat and added sugars (Kaur and Kaur 2015). The nutritional anemia in young girls may results in high incidence of maternal mortality , low birth weight babies, high prenatal mortality and the resulting high fertility rates (National Rural Health Mission, 2013; Braithwaite, *et al*; 2014).

## 2. MATERIALS AND METHODS

A cross sectional study was conducted during the year of (2015–2016) among young (18-24 years) female students of Jinnah University for Women (JUW), Karachi, Pakistan. A total number of 160 girls were randomly selected from university campus to obtain relevant information on anthropometric, socioeconomic, dietary condition of the adolescent girls. A questionnaire was developed to obtain general information, sign and symptoms regarding anemia, dietary habits, and data for BMI. The general information including parent's education, occupation, income, family structure and socio economic status of

\*Corresponding author: farha aziz email: farahtariq2@hotmail.com; farah786star@yahoo.com

participants. Body Mass Index (BMI) is a simple index of weight-for-height that is usually used to classify underweight, overweight and obesity in adults. Body mass index (BMI) was calculated as body weight/height<sup>2</sup> (kilogram per meter square).

$$\text{BMI} = \frac{\text{Weight in kg}}{\text{Height in m}^2}$$

According to World Health Organization (WHO) approved BMI cutoff values students were classified as Underweight (BMI below 18.5 kg/m<sup>2</sup>), Normal (BMI 18.5 to 24.9 kg/m<sup>2</sup>) Overweight (BMI 25-29.9 kg/m<sup>2</sup>) and Obese (BMI ≥30 kg/m<sup>2</sup>) (World Health Organization, 1995).

For the estimation of blood hemoglobin concentration by the cyanmethemoglobin (CMG) method, a venous blood was drawn with disposable syringe in EDTA vacuum tubes. Automated Hematology Analyzer, ABX Micro 60 (open tube) manufactured by HORIBA ABX Diagnostics (France) was used to estimate Hb concentration. The observations were interpreted as per WHO criteria. Anemia is established if the hemoglobin is below the cut off points as recommended by WHO (for adult males-13.0 gm/dl and for adult non pregnant females-12.0 gm/dl).

The severity of anemia is categorized by the following hemoglobin concentration ranges:

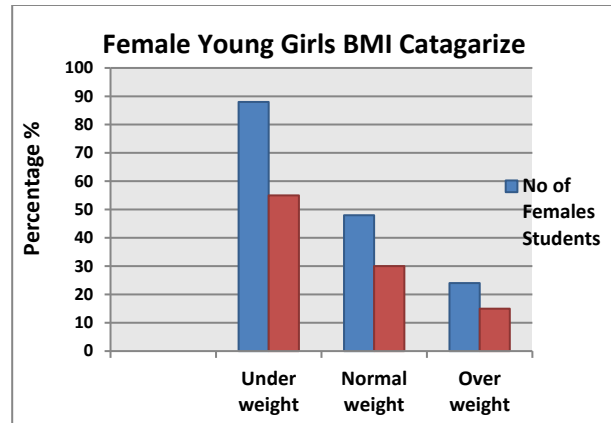
- Mild anemia is considered when hemoglobin is between 9.5 - 13.0 g/dL
- Moderate anemia is considered when hemoglobin is between 8.0 - 9.5 g/dL
- Severe anemia is considered for hemoglobin concentrations below 8.0 g/dL

### 3. RESULTS

In the present study, 160 female students of age 18-24 years of Jinnah University for Women, Karachi, Pakistan were randomly selected and revealed that 48.12% of female students were under weight, 31.25 % of females were normal, 20.62 % of girls were overweight according to WHO classification for BMI (Table 2; Fig 1).

**Table 2: Categorize Female Young Girls according to WHO BMI Classification**

BMI (Kg/m <sup>2</sup> )	No of Females Students	Percentage (%)
Under weight	77	48.12
Normal weight	50	31.25
Over weight	33	20.62
Total	160	100

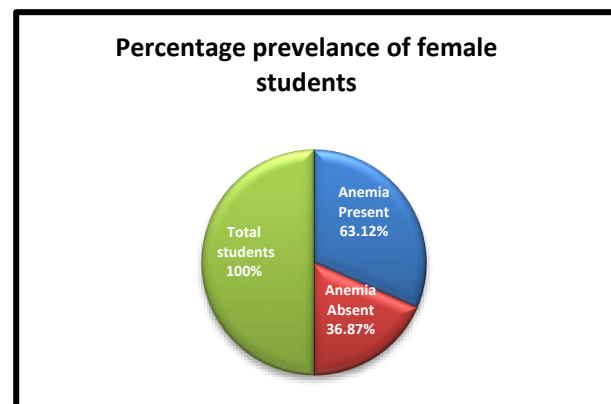


**Fig, 1: Percentage correlation between young female students and BMI classification**

In the present study, it was observed that out of 160 young females, 101 (63.12 %) were suffering from anemia and that 59 (36.87 %) were found non-anemic (Table 3; Fig 2). This indicated that anemia was a public health problem at high level as per the WHO guidelines (WHO, 2008).

**Table 3: Prevalence of anemia among female students**

Anemia	No. of students	Percentage (%)
Present	101	63.12
Absent	59	36.87
Total	160	100

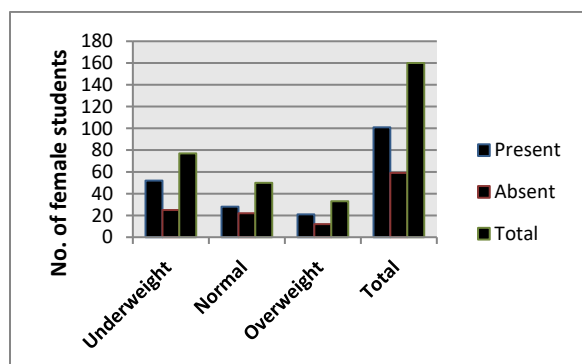


**Fig. 2: Percentage Prevalence of anemia among young female students**

Among these anemic females, 32.50% girls were underweight 17.50% were normal, 13.12% anemic girls belong to overweight. The present study showed overweight girls having a BMI >24 kg/m<sup>2</sup> have a lower prevalence of any degree of anemia as compared to the normal weight and underweight girls (Table 4; Fig 3).

**Table 4: Prevalence of anemia among female students belonging to different nutritional status**

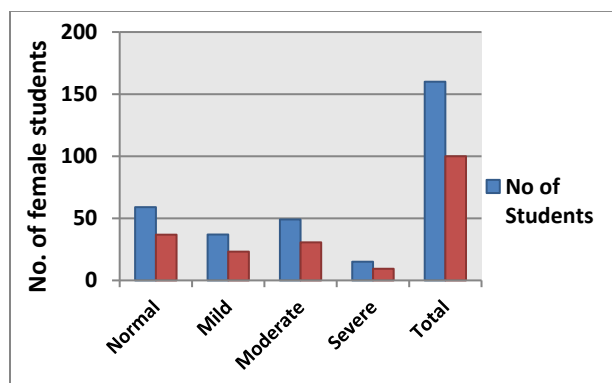
Anemia	Underweight (%)	Normal (%)	Overweight (%)	Total (%)
Present	52 (32.50 %)	28 (17.50 %)	21 (13.12 %)	101 (63.12 %)
Absent	25 (15.62 %)	22 (13.75 %)	12 (7.5 %)	59 (36.87 %)
Total	(77)	(50)	(33)	(160)

**Fig. 3: Prevalence of anemia in female students according to BMI classification**

The severity of anemia was determined through the concentration of hemoglobin in blood, which showed a prevalence of severe anemia (<8 gm/dl) among females were 9.37 % while 30.62 % and 23.14 % of girls were moderate (8–10 gm/dl) and mild anemic (<12mg/dl) respectively (Table 4; Fig 4).

**Table 4: Distribution of female students in relation to severity of anemia**

Severity of Anemia	No of Students	Percentage (%)
Normal	59	36.87
Mild	37	23.14
Moderate	49	30.62
Severe	15	9.37
Total	160	100

**Fig. 4: Prevalence of Severity of anemia in female university students**

#### 4.

#### DISCUSSION

The present study revealed anemia is a common serious health problem among young girls. Results showed that majority of university females, age 18-24yr were suffering from anemia as compare to non anemic girls. This suggested that anemia was a common public health issue at high level according to WHO guidelines (WHO, 2008). Among these young females 48.12% subjects were under weight, 31.25 % were normal and 20.62 % of girls were overweight.

Globally healthy balance diet and dietary patterns have been replaced by unhealthy irregular eating behaviors in youth. Adolescents are more likely to eat fast food frequently. High intake of fast food, soft drinks, coca cola, tea in adolescent diet showed strong correlation with BMI (Niemeier, *et al*; 2006; Rosenheck 2008; Taveras, *et al* 2005; Duffey, *et al*; 2007; Milosavljević, *et al*; 2015; Szajewska, *et al*; 2010). Adolescents have inadequate knowledge and information about dietary sources, recommendations, diet-disease relationships, and dietary habits or choices (Yasemin, *et al*; 2012).

The present study showed over weight girls having a BMI >24 kg/m<sup>2</sup> have a lower prevalence of any degree of anemia as compared to the normal weight and underweight girls. High prevalence of anemia in under nourished and low BMI <18 kg/m<sup>2</sup> females may be due to absence of iron rich foods including red meat and green vegetables in the diet of young girls. Various studies revealed prevalence of anemia in youth was higher in breakfast skippers and lower intake of animal source foods (Nora *et al*; 2015; Farghaly, *et al*; 2007; Rampersaud, *et al*; 2005).

The severity of anemia was determined through the concentration of hemoglobin in blood. The present study showed a remarkably high prevalence of anemia might be associated to unhealthy life style of female students. Majority of students skipped breakfast, an essential important morning meal to provide energy for a better start of a day (Hania and Marek 2010; Matthys, *et al*; 2007). Skipping breakfast may produce adverse health effects including obesity, menstrual irregularities, hormonal disturbances, memory, cognition functions and mood elevation. It also increases the risk of hypoglycemia or low-blood sugar level (Hanan, *et al*; 2010, Becker, *et al*; 2004).

#### 5.

#### ACKNOWLEDGEMENT

The authors are grateful to the administration of Jinnah University for Women Karachi for providing the resources for conducting the research work.

**REFERENCES:**

- Aabroo, T, A. K. Aftab, and A. L. Zulfiqar, (2012). Prevalence of anemia in adolescent girls. *Pak J Physiol*; 8 (suppl 1).
- Bagchi, K. (2004). Iron deficiency anaemia--an old enemy. *East Mediterr Health J*. 10(6) 754-60.
- Becker, W., D. Brasseur, J. Bresson, A. Flynn, A. Jackson, P Lagiou, (2004). Opinion of the scientific panel on dietetic products, nutrition and allergies on a request from the commission relating to the evaluation of allergenic foods for labelling purposes. *EFSA J*. 32, 1-197.
- Duffey, K. J., P. Gordon-Larsen, D. R Jr, Jacobs, O. D Williams, and B. M Popkin, (2007). Differential associations of fast food and restaurant food consumption with 3-y change in body mass index: the Coronary Artery Risk Development in Young Adults Study. *Am J Clin Nutr*. 85(1):201-8.
- Farghaly, N. F., B. M. Ghazali, H. M. Al-Wabel, A. A. Sadek, and F. I. Abbag, (2007). Life style and nutrition and their impact on health of Saudi school students in Abha, Southwestern region of Saudi Arabia. *Saudi Medical Journal*, 28, 415-421.
- Hanan, S., A. H. Gilani, and I. U. Haq, (2010). Anemia in adolescent college girls: effect of age, nutritional status and nutrient intake. *Pakistan Journal of Science*. Vol. 62 No.4. .207-210.
- Hania S and R Marek, (2010). Systematic Review Demonstrating that Breakfast Consumption Influences Body Weight Outcomes in Children and Adolescents in Europe, *Critical Reviews in Food Science and Nutrition*, 50:2, 113-119.
- Irene, B., W. Alistair, J. H. Robert, B. Richard, Rinki, and M. A. M Edwin, (2014). And the ISAAC Phase Three Study Group. Fast-food consumption and body mass index in children and adolescents: an international cross-sectional study. *BMJ Open*. 4 (12). 45 Pp
- Janet, R. H (2003). Bioavailability of iron, zinc, and other trace minerals from vegetarian diets. *Am J Clin Nutr* .78(3):633-639.
- Kaur, T., and M. Kaur, (2015). Anemia a Health Burden among Rural Adolescent Girls in District Karnal: Prevalence and Correlates. *International Research Journal of Biological Sciences*. Vol. 4(7), 34-41.
- Luis, A. M., R. Gerardo, F. Jesus B.L, Manuel, L Aurora and B Gloria, (2010). Trends of dietary habits in adolescents. *Crit Rev Food Sci Nutr* . 50(2):106-12.
- Lundberg, O. (1993).The Impact of Childhood Living Conditions on Illness and Mortality in Adulthood *Soc Sci Med* 36 (8), 1047-1052. 4.
- Matthys, C., S. De Henauw M, De Bellemans, M, De Maeyer, and G. Backer (2007). Breakfast habits affect overall nutrient profiles in adolescents. *Public Health Nutr*. 10: 413-421.
- McLean, E. M., I. Cogswell, D, de Egli and B. Wojdyla, (2009).Worldwide prevalence of anaemia, WHO vitamin and mineral nutrition information system, 1993-2005. *Public Health Nutr*. 12(4):444Pp.
- Milosavljević, D, M L Mandić, and I. Banjari, (2015). Nutritional knowledge and dietary habits survey in high school population. *Coll Antropol*. 39(1):101-7.
- Mohammad, I., Q. Mahmood, A. K. Shujaa,t F. Kalsoom, M. Ghulam, A. Saira, S. Noreen, S. Tauqir A. S, Amara, M. S. Haider, S. Abdul, M. Nisar, A. Rehmana, R. Rabia and H. H. Muhammad A. Bin (2012). Prevalence of iron deficiency in adult population: A case study from Khyber Pakhtunkhwa (KPK), Pakistan, *International Journal of Physical Sciences*, 7(11), 1874 -1877.
- Neelam S. D. Deshpande, S. Karva, and S. D. Agarkhedkar, (2013). Prevalence of anemia in adolescent girls and its co-relation with demographic factors *International Journal of Medicine and Public Health* , 3 (4),235-239.
- Nair K. M, and V. Iyengar (2009). Iron content, bioavailability & factors affecting iron. *Indian J Med Res*. 130(5):634-45.
- National Rural Health Mission. (2013). Guidelines for Control of Iron Deficiency Anaemia. Niemeier HM, Raynor HA, Lloyd-Richardson EE Fast food consumption and breakfast skipping: predictors of weight gain from adolescence to adulthood in a nationally representative sample. *J Adolesc Health* 39:842-9.
- Nora, N., Al Hassan, (2015). The prevalence of iron deficiency anemia in a Saudi University female students, *Journal of Microscopy and Ultra structure*, 3 25-28.

- Noronha, J. A., A. I. Khasawneh, E. Seshan, and S. Ramasubramaniam, (2012). Anemia in pregnancy-consequences and challenges: a review of literature. *Journal of South Asian Federation of Obstetrics and Gynecology*. 4 (1), 64-70.
- Niemeier, H. M., H. A. Raynor, and E. E. Lloyd-Richardson, (2006) Fast food consumption and breakfast skipping: predictors of weight gain from adolescence to adulthood in a nationally representative sample. *J Adolesc Health* 39:842-9.
- Rampersaud, G. C., M. A. Pereira, B. L. Girard, J. Adams, and J. D. Metzl, (2005). Breakfast habits, nutritional status, body weight, and academic performance in children and adolescents. *J Am Diet Assoc*. 105 (5): 743-760.
- Rifat-uz-Zaman, I. Zafar, and A. Usman, (2013). Dietary Intakes of Urban Adolescents of Sialkot, Pakistan Do Not Meet the Standards of Adequacy *Pakistan Journal of Nutrition*. 12 (5): 460-467.
- Rosenheck, R. (2008). Fast food consumption and increased caloric intake: a systematic review of a trajectory towards weight gain and obesity risk. *Obes Rev*. 9(6):535-47.
- Saeed, A., A. Anwaar, A. Asif, A. Zulfiqar, R. Muhammad, and I. Tariq (2013). Iron status of the Pakistani population-current issues and strategies *Asia Pac J Clin Nutr* 22(3) 340-347.
- Shanti D., D. Vidya, and R. Verma. (2015). Prevalence of anemia among adolescent girls: a school based study *International Journal of Basic and Applied Medical Sciences*, 5 (1) 95-98.
- Szajewska, H, and M. Ruszczynski, (2010). Systematic review demonstrating that breakfast consumption influences body weight outcomes in children and adolescents in Europe. *Crit Rev Food Sci Nutr*. 50 (2):113-9.
- Taveras, E. M., C. S. Berkey, S. L. Rifas-Shiman, D. S. Ludwig, and M. W. Gillman, (2005). Association of consumption of fried food away from home with body mass index and diet quality in older children and adolescents. *Pediatrics*. 116(4): 518-24.
- Tseng, M, H. Chakraborty, and L. Kohlmeier, (1997). Adjustment of iron intake for dietary enhancers and inhibitors in population studies: bioavailable iron in rural and urban residing Russian women and children. *J Nutr*. 127(8):1456-68.
- Verma, R, V. Govila, K, Kuldeep, and M. Kharb, (2013). Prevalence of anemia in college going youths in rural blocks of a dist. of northern India. *EXCEL International Journal of Multidisciplinary Management Studies*, Vol. 3 (2); 15-22.
- World Health Organization, (2001). Iron deficiency anaemia: assessment, prevention, and control. A guide for programme managers. Geneva,
- World Health Organization. (2011). Strategic directions for improving adolescent health in South-East Asia Region.
- World Health Organization, (2008). Worldwide Prevalence of Anaemia 1993-2005: WHO Global Database on Anaemia.
- Yasemin I. B, and E. C İbrahim, (2012). Prevalence and Risk Factors of Anemia among Adolescents in Denizli, Turkey *Iran J Pediatr*. 22(1): 77-81.