Prevalence of Nutritional Anaemia with Association of (BMI) Body Mass Index among Karachi University students, Pakistan

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Abstract

Objective: The main objective of the study was to evaluate the health of University of Karachi students (aged 19 to 21) by observing the correlation of hemoglobin level with underweight BMI.

Methods: In this study 151 students were enrolled from the Department of Biotechnology, University of Karachi, Sindh Pakistan. Blood samples were collected and Haemoglobin estimation was performed by Sahli's Haemoglobinometer. BMI of each student was calculated as per WHO criteria for South Asian.

Results: Out of 151 students, 60 (39.7%) students had anaemia, among which 41(27.1%) were showing grade 1 anaemia and 19(12.5%) were showing grade 2 anaemia. BMI results showed that 50 (33.1%) students were underweight whereas, 19(12.5%) students were overweight and 12(7.9%) students were obese. Correlation showed that 34 (22.5%) students had anaemia with underweight BMI.

Conclusion: This study concluded that Anaemia with underweight BMI is more prevalent among females especially adolescent girls. This could be as they

28 followed poor dietary habits and had some infections. This data evaluated the
29 health status of University students on a small scale.

30 **Keywords:** Nutritional Anaemia, Haemoglobin, BMI, Sahli's Method, WHO.

31

Introduction

33 Pakistan is ranked sixth in the list of most populous country in the world, with
34 about 201 million people. High population, lack of primary necessities,
35 unfavorable climatic conditions and lack of educational and economic
36 development place Pakistani citizens in a challenging environment (1).

37 Youth of Pakistan, which makes up about 70% of total population are facing
38 different health problems (apart from different infectious diseases) including
39 diabetes, obesity, high and low blood pressure, tachycardia, bradycardia,
40 anemia, leukemia, lack of apatite etc (2). Anaemia (Low hemoglobin level) is a
41 basic problem around the world with developing countries facing its high
42 prevalence. It frequently occurs due to insufficient supply of iron, excessive
43 blood loss or disease, malabsorption or a combination of all these factors. Iron
44 deficiency can also occur due to poor bioavailability of dietary iron or because
45 of excessive losses of iron from the body. Most commonly reported symptoms
46 in people suffering from anaemia are weakness, fatigue, general malaise, and
47 sometimes poor concentration (3). In developing countries, its prevalence is
48 higher in girls mainly aged from 18 to 25 years (4).

49 Present study was designed to determine the hemoglobin level against BMI
50 (body mass index) to evaluate the health status of the university students. BMI
51 (also known as Quetelet Index) is an important tool to evaluate the health status.
52 BMI is calculated as the weight in kilograms divided by the square of the height
53 in meters (kg/m²). A BMI with less than 18.5 kg/m² categorized as underweight
54 and value more than 22.9 kg/m² is placed in overweight category. Values
55 between these are considered as normal. These days body mass index (BMI) has

56 become the choice for many researchers and health professionals, to measure

57 health status of certain age group (5).

58 In Pakistan, very few studies have been carried out to determine the correlation

59 of anaemia with BMI (body mass index). Therefore, in the present study an

60 attempt has been made to report the prevalence of anaemia among university

61 students of Karachi, Sindh and to draw its correlation with their body mass

62 index.

63

64 **Methods**

65 A cross sectional study was conducted from 07th December 2018 to 15th

66 February 2019 among the students of Department of Biotechnology, University

67 of Karachi, Sindh, Pakistan between the age group of 19 to 21 years.

68 A total of 151 students were enrolled in this study, out of which 33 were males

69 and 118 were females. Sample size calculation was done by n = [DEFF*Np(1-

70 p)]/ [(d2/Z21-α/2*(N-1)+p*(1-p)] (OpenEpi. v.3) (6).

71 Procedure of study was explained to the students and written consent was also

72 taken. A structured proforma was used to collect and record information on age,

73 gender, dietary pattern, height in meters and weight in kilograms.

74 The blood samples were drawn from students under study with sterile needle

75 syringe and used for both blood group and blood hemoglobin level

76 identification. Blood group identification was done by using antisera A, B and

77 D (Merck pvt limited). Hemoglobin levels were estimated with the help of

78 Sahli's Haemoglobinometer (7).

79 The results were interpreted according to the WHO criteria. Anaemic condition

80 was recoded if the hemoglobin is below the cut off value as recommended by

81 WHO that is for adult males-13.0 gm/dl and for adult nonpregnant females-12.0

82 gm/dl (8)(9).

83 WHO Criteria for detection of various grades of Anaemia

84 •   Non anaemic ≥13 (for male) ≥ 12 (for female)

85 •   Grade 1 (mild) anaemia 10.0 – 11.9

86 •   Grade 2 (moderate) anaemia 7.0-9.9

87 •   Grade 3 (severe) anaemia ≤ 7

88 Anthropometric measurements, including height measured without shoes

89 against a wall-fixed tape and weight measured without shoes on a platform scale

90 with light clothing; a 1.0 kg subtraction to correct for weight of the clothing,

91 were taken. The body mass index (BMI) was calculated as weight/ height²

92 (kg/m²). BMI measuring criteria for Asian population are: less than 18.5 kg/m²

93 categorize as underweight, 18.5-22.9 kg/m² as healthy, 23-27.4 kg/m² as

94 overweight and 27.5 kg/m² as obese (10)(11).

95

96 **Results**

97 In this cross-sectional study, data was collected from 151 students (19–21 years

98 with a mean age of 20.36 years), out of which 33 were male and 118 females

99 enrolled from 07th December 2018 to 15th February 2019.

100 In the present study, B+ blood group seemed to be more common in students 63

101 (42%), followed by O+ blood group 40 (26%), A+ blood group 30 (20%), AB+

102 blood group 8 (5%), O- blood group was observed in 4 (3%) students, B- blood

103 group in 3 (2%) students and A- was identified in 2 students whereas AB- was

104 only found in 1 student.

105 It was observed that out of 151 students, 60 (40%) students showed anemia in

106 which mild grade 1 anemia observed in 41 (27.1%) students whereas 19

107 (12.6%) students showed grade 2 moderate anemia with alarming Hb values.

108 Mean Hb level was 12.39gm/dl and gender wise grading of Anaemia among

109 University students (as per WHO Criteria) are shown in table 1.

110 Gender wise distribution of BMI is shown in table 2. Mean height and weight

111 calculated were 1.61m and 53.18kg, respectively. Mean BMI according to

112 definition used, was 20.49 (SD±3.69) while descriptive analysis revealed that 50

113 (33.1%) of the study population was classified as underweight, 70 (46.3%) as

114 normal weight, 19 (12.5%) as overweight and 12(7.9%) as obese.

115 After gathering all the data, it was noticed that Anaemia was more prevalent in

116 underweight students whereas lesser prevalence was observed in overweight

117 students, as shown in table 3. Statistics showed that over all 50 students were

118 underweight, out of which 34 students were suffering from anemia of grade 1

119 and grade 2, as shown in figure 1.

120 The dietary questionnaire of students was also taken, which revealed that out of

121 118 girls that we enrolled in the study only 30 (25.4%) girls consumed proper

122 diet, while 88 (74.5%) girls had poor dietary habits. They did not take breakfast

123 at home and depended on snacks offered in the university canteen, which

124 consisted mostly of biscuits, chocolate bars, potato chips and carbonated cola

125 drinks. Out of these 88 girls, 50 (56.8%) girls showed anemic health condition

126 and 40 (45.4%) girls were with BMI less than 18.5 kg/m². Similarly, 3 boys also

127 showed mild anaemic condition (grade 1 anaemia) because of improper diet. No

128 association between education of mother and father or any financial issues were

129 detected.

130

131 **Discussion**

132 Anaemia among young population is of more concern in developing countries

133 like Pakistan, Iran, India and Afghanistan as compared to developed countries.

134 In Asian countries, not only rural areas but urban areas are also being under its

135 high prevalence. In Pakistan, very few studies are available to evaluate the

136 health status of adult students on BMI and hemoglobin parameters. A study

137 carried out in Karachi indicated 52% students were underweight (12). Another

138 study was conducted in Aga Khan university, which indicated 27.2% young

139 females were in underweight category (13). One more important study by

140 Hakeem in 2001 indicated that under developed areas where income was not

141 enough, the rate of underweight was significantly higher (14).

142 Dow University of Health Sciences conducted a study which found that 29.9%
143 medical college students were underweight (15). Comparison to BMI with
144 hemoglobin level, our neighboring country, India, Kamal Mehta carried out a
145 study, which showed drastically high ratio of underweight females
146 approximately 76.67% suffered from anemia (16). Similarly, in Bangladesh,
147 63.5% girls were observed to be anaemic with poor diet and lower BMI (17).
148 Another cross-sectional study was conducted in Yemen, where it was found that
149 30.4% students were anaemic, out of which more than 50% were females (18).
150 Contradict to these results, Akram Ghadiri-Anari fromIran mentioned that there
151 is no correlation observed between BMI and hemoglobin level (19).
152 In this current study, 60 (38%) students out of 151 were found anaemic. Out of
153 these 60 anaemic students, 55 (91.6%) were females with grade 1 and grade 2
154 anaemic condition. Another important aspect of this study was BMI of students.
155 One-third 50 (33%) students were underweight, out of which 34 (22.5%)
156 students were anaemic as well. Anaemia with underweight category of BMI is
157 more prevalent among girls due to poor diet and under nutrition as compared to
158 males, which is consistent in this present study (20).

159

160 **Conclusion**

161 Nutritional anaemia is one of the major health problems among students. Its
162 prevalence increases in females especially adolescent girls due to menstrual
163 blood loss, poor diet and under nutrition as compared to males. This health issue
164 could be minimized if certain control measures be taken like students specially
165 adolescent girls are prescribed iron supplements on daily basis, students should
166 be motivated or instructed by their teachers or mothers to take proper diet rich
167 with iron, vitamins and minerals etc, a proper diet plan should be given to them
168 by the health physicians, parents should strictly advise their young ones to take
169 regular breakfast before leaving for colleges or universities.

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172 **Conflict of interest:** None to declare.

173 **Funding disclosure:** None to declare.

174

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240 **Table 1: Anaemia among University students.**

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Grading of Anaemia	Males	Females	Total
Mild (Grade 1)	5(3.3%)	36(23.8%)	41(27.1%)
Moderate (Grade 1)	nil	19(12.6%)	19(12.6%)
Severe	nil	nil	nil
Total	5(3.3%)	55(36.4%)	60(39.7%)

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245 **Table 2: Gender-wise distribution of Body mass index among enrolled students.**

Gender	Normal	Underweight	Overweight	Obese
Male	11(7.2%)	8(5.3%)	9(6%)	5(3.3%)
Female	59(39%)	42(27.8%)	10(6.6%)	7(4.6%)
Total	70(46.3%)	50(33.1%)	19(12.5%)	12(7.9%)

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249   **Table 3: Correlation of BMI with Anaemia among students.**

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Anaemia	Body Mass Index (BMI)				
	Normal	Underweight	Overweight	Obese	Total
Present	20(13.2%)	34(22.5%)	4(2.6%)	2(1.3%)	60(39.7%)
Absent	50(33.1%)	16(10.5%)	15(9.9%)	10(6.6%)	91(60%)
Total	70(46.3%)	50(33.1%)	19(12.5%)	12(7.9%)	151(100%)

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254   **Figure 1: Anaemia association with BMI among University students.**

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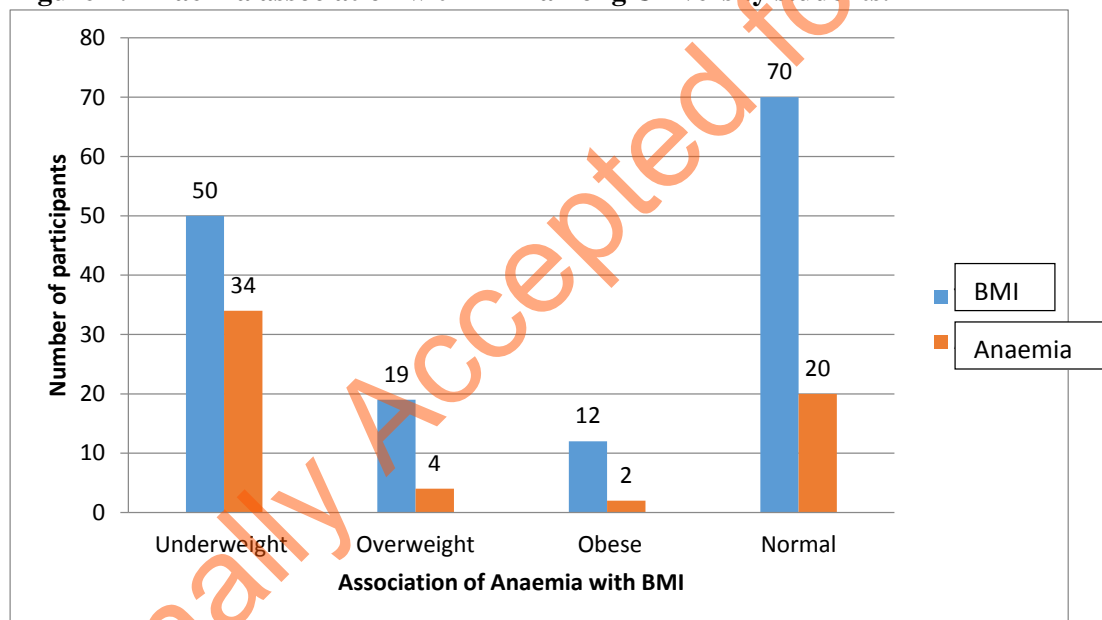
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