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Anemia in relation to Body Mass Index and Blood Groups among College Students and Staff, Salem, Tamil Nadu

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ABSTRACT

***Objectives**: 1. To determine the frequency of different blood groups among students and staff members in anemia awareness camp conducted in Salem for the colleges. 2. To find out the association between blood groups, BMI and age with anemia: differences between height and weight with anemia.*

***Methods:** Study was performed at anemia awareness camp conducted for colleges in Salem district. After data editing out of 640, 465 participants' data were selected from various departments (strata) for this study based on the stratified random sampling technique. Anthropometric parameters, including height in centimeters and weight in kg, were taken by weighing scale and measurement scale, HP-Kit used to measure the hemoglobin and then BMI was calculated by BMI index: BMI= weight in kg/ height in m2. Blood groups were determined by simple conventional slide method. Data was analyzed using IBM SPSS 24.*

***Results**: Blood group B+ was the principal blood group. Chi-square indicates blood group have strong association with anemia: Paired samples test shows the association between BMI and anemia: Correlation indicates the association between age and anemia. Hence ANOVA shows significant differences in height and weight of participants with anemia.*

***Conclusion:** Blood group B+ was the principal blood group. Blood groups, BMI, age are closely associated with HB concentration on blood groups (anemia). Height and weights also influence the differences on the HB concentration.*

1. Introduction

Anemia still rests one of the public health challenges with global impacts, especially in developing countries and among the weak groups, such as pregnant and lactating women and children [1]. There are many prompting factors that boost the occurrence of anemia as dietary iron deficiency, parasitic infestations, infectious diseases such as malaria, vitamin B12 and vitamin A (or) other genetic conditions that affect red blood cells (RBS), such as thalassemia [2]. The increasing commonness of obesity is a global health alarm. Obesity increases the risk of type 2 diabetes, hypertension, heart disease, stroke, dyslipidemia, osteoarthritis, gynecological problems and respiratory problems [3]. In addition, studies have described that obesity has an adverse effect on HB status. In Caucasian populations, a strong association has been depicted between BMI and mortality. A similar association has also been demonstrated among Asian populations [4]. The problem of cardiovascular sickness is extraordinary in South Asian countries, in their progression of economic development [5]. India in a process of fast economic development and transformation with changing lifestyle influences has an increasing trend of hypertension, especially among the urban & students population [6]. Therefore research on anemia and its relationship with BMI and blood groups is of grate important, which highlights the importance of the study. The current study was designed to identify the frequency of different blood groups among the students and staff of colleges in Salem district to find out the association of blood groups and BMI with anemia.

2. Materials and Methods

A study was established at anemia awareness camp which was conducted among students and staff members of colleges in Salem district. After data editing 465 participants' data were selected from various colleges (strata) for this study based on the stratified random sampling technique.

The total number of students and staff members participated in the anemia awareness camp was 640. A list of selected students was entered on Microsoft Excel 2007. For further analysis on the basis of BMI, subjects were also categorized into 7 sub-groups: underweight (BMI<19 kg/m2), normal weight (BMI 19-25 kg/m2), overweight (BMI 26-30 kg/m2), obese (BMI 31-34 kg/m2), severely obese (BMI 35-39 kg/m2), morbidly obese (40-49) and super obese (BMI>49). Anthropometric parameters, including height in centimeters and weight in kg, were taken by weighing scale and measurement scale, HP-Kid used to measure the hemoglobin and then BMI was calculated by BMI index: BMI= weight in kg/ height in m2. Blood groups were determined by simple conventional slide method.

IBM SPSS 24 was used for data analysis. Demographic data of study population was evaluated by descriptive statistics. Continuous variables like BMI, Blood groups and anemia were articulated as mean, standard deviation (SD). Chi-square test was used to assess the frequency and percentages of various blood groups and anemia among the participants. Paired sample t test used to measure the association between BMI

level and anemia. Correlation also employed to examine the relationship between age and anemia. Analysis of variance (ANOVA) was applied to identify the difference of weight and height with anemia.

3. Result

1) ABO Blood groups

A total of 465 students screened for ABO and Rh blood group and BMI. Out of total students, In table 1, the distribution of ABO blood system consists A-, A+, A1-, A1+, AB-, AB+, B-, B+, O-, O+ are 12(2.5%), 66(14.2), 2(0.4%), 13(2.8%), 12(2.6%), 19(4.1%), 23(4.9%), 159(34.2%), 20(4.3%) and 139(29.9%). The percentages of blood groups are in descending manner as B+>O+>A+>B->O->AB>A1+> (A- & AB-)>A1- . High frequency of blood group identified is "B+" blood group and least blood group is A1-.

Blood Group	Frequency	Percent
A-	12	2.5
A+	66	14.2
A1-	2	.4
A1+	13	2.8
AB-	12	2.6
AB+	19	4.1
B-	23	4.9
B+	159	34.2
O-	20	4.3
O+	139	29.9
Total	465	100.0

Table 1.

2) Anemia in relation with Blood groups

The table 2 shows the frequency of anemia in study sample. For this study divide the anemia cases based on HB concentration of blood groups. Hemoglobin concentration <7 had been taken as severe anemia, >7<11 noted mild anemia and >=12 had been calculated Normal. The percentages of HB concentration are in descending manner as 299(64.3%), 144(31.0%) and 22(4.7%) such as Normal HB, Mild anemia and anemia as follows. The table 3 shows the relationship between anemia and blood groups. Calculated value (P= 0.958 >0.5) is there was significant relationship statistically between of anemia and blood groups.

Anemia	Frequency	Percent
Normal	299	64.3
Mild Anemia	144	31.0
Severe Anemia	22	4.7
Total	465	100.0

Table.2

Chi-Square Tests	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	10.527[a]	20	.958
Likelihood	13.569	20	.852
Ratio			
N of Valid Cases	465		
a. 16 cells (48.5%) have expected count less than 5. The minimum expected count is .05.			

Table.3

3) Anemia in relation with BMI

The table 4 shows the frequency of BMI in this study. Divided 7 groups of BMI levels based on the World Health Organization indicators: underweight (BMI<19 kg/m2), normal weight (BMI 19-25 kg/m2), overweight (BMI 26-30 kg/m2), obese (BMI 31-34 kg/m2), severely obese (BMI 35-39 kg/m2), morbidly obese (40-49) and super obese (BMI>49). The frequency of BMI was tabulated below. Out of 465 students 136 are severely obese, 115 come under overweight, 83 are obese, 50 participants are only in ideal weight, 37 from underweight BMI, 33 participants have Morbidly obese and 11 only in super obese category.

BMI	Frequency	Percent
Underweight	37	8.0
Ideal BMI	50	10.8
Overweight	115	24.7
Obese	83	17.8
Severely Obese	136	29.2
Morbidly Obese	33	7.1
Super Obese	11	2.4
Total	465	100.0

Table 4

Paired Samples Test	Paired Differences	t	df	Sig. (2-tailed)	
Pair 1	BMI Level - Anemia	Mean	Std. Deviation	95% Confidence Interval of the Difference	
				Lower	Upper
		3.400	1.638	.000	3.251

Table 5

Paired sample correlations	N	Correlation	Sig	
Pair 1	BMI Level & Anemia	465	-.117	.011

Table 6

The above table 5 & 6 paired samples test shows that there is statistically significance difference in anemia and BMI. Statistical P value is 0.00 is less than significance value 0.05. Correlation significance is .011.

4) Anemia in relation with Age

The correlation between age and anemia has been shown in the table 7. The P value 0.012<.05 so there is significant relationship between age and anemia has been proved through statistical analysis.

Correlations	Anemia	Age
Pearson Correlation	1	-.117*
Sig. (2-tailed)		.012
Pearson Correlation	-.117*	1
Sig. (2-tailed)	.012	
N	465	465
*. Correlation is significant at the 0.05 level (2-tailed).		

Table.7

5) Anemia in relation with Weight and Height

ANOVA statistical analysis applied to identify the difference between anemia in relation to weight and height. P values 0.010 and 0.031 expressed there is statistically significant differences between anemia with height and weight.

Weight	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	1399.024	2	699.512	4.663	.010
Within Groups	69306.375	462	150.014		
Total	70705.399	464			
Height	**Sum of Squares**	**df**	**Mean Square**	**F**	**Sig.**
Between Groups	.049	2	.024	3.505	.031
Within Groups	3.222	462	.007		
Total	3.271	464			

Table. 8

4. Discussion

Strong evidences from various studies suggested that the diversity of ABO blood group distribution across the population of whole world, including Pakistan and Gulf countries (7). This study proved B+ is the dominant blood groups in the total sample (34%). This diversity may reflect the difference in ethnicity and races (8). Obesity is a risk factor for many diseases such as type 2 diabetes, Knee pain, hypertension, heart disease, sleeping problems etc.(9). The Nigerians study express comparable anemia frequency among body mass index (BMI) group observed, anemia in this population is not related to BMI (10). Result of our study shows that anemia had strong relationship with BMI, Blood groups and age, this result is against the previous result that ware mentioned. A Saudi Arabia study exposed relevant of our result, that anemia was more prevalent among normal (45.7%), and underweight students (40%) with no significant association between hemoglobin status (anemia) and BMI status among studied population, ($p > 0.05$)(11). Obesity was having a total prevalence of 5%, frequency of obesity was also more in girls (6%) than boys (4%). (13). Present study shows 29.2% of samples having severely obese conditions they need to exercise to reduce their weight with healthy diet.

5. Conclusion

The study demonstrated that the ABO and Rh blood groups are unevenly distributed to the respondents. Blood group B+ was the principal blood group. Blood groups, BMI, age are closely associated with HB concentration on blood groups (anemia). Height and weights also influence the differences on the HB concentration. Although high educated urban population around the world were often believed to have no anemia and obese, but gradually with changing in food culture, socio-economic environment, marked increase in obesity level has been noted as was evident from the present study among the college students and staff in Salem district.

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