

Distribution of Blood groups and BMI Evaluation among school student of

Tiruchirappalli, Tamil Nadu

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Abstract

The knowledge of distribution of ABO and Rh blood groups at local and regional levels are helpful in the effective management of blood banks and safe blood transfusion services. Collecting and monitoring BMI in children and youth is a powerful tool in the effort to improve the overall health of the community. A total of 2395 students are screened for ABO and Rh blood group and BMI. ABO and Rh blood typing results reveal that O group is most frequent and AB is the least frequent groups and 93.98% are Rh Positive while 6.02% are Rh negative. Out of 76 colour blind, 61 are males; 15 are females. The percentage of blood groups in students follows as O> B>A1>A1B>A2>A2B. Results of BMI showed high frequency underweight category, which reflects the nutritional deficiency among the school students.

Keyword: ABO, Rhesus factor, BMI

1.Introduction

A blood group (also called as blood type) is a classification of blood based on the presence or absence of inherited antigenic substances on the surface of red blood cells (RBCs) (Garraty et al., 2000). A total of 30 human blood group systems are now recognized by the International Society of Blood Transfusion (ISBT). The ABO system is the most important blood group system in human blood transfusion (Anthea et al., 1993). ABO blood groups are genetically determined by the presence of agglutinogens on the red blood cell walls.

Rhesus (Rh) blood group system was the second system, if RhD antigen present on the surface of their red cells are considered as positive and lack of RhD antigen considered as negative (Landsteiner and Weiner, 1940). Rhesus incompatibility can pose a major problem in pregnancies when the mother is Rhesus negative and the foetus is Rhesus positive. Identification of Rh system is important to prevent the Erythroblastosis foetalis, which commonly arises when a Rh negative mother carries an Rh positive fetus. During first pregnancy, the fetal blood leaks through the placenta and mixes with the mother's blood, the mother becomes sensitized to Rhesus antigen. In second pregnancy, the mother produces Rh antibodies that cross the placenta and cause agglutination and haemolysis of fetal red blood cells. This is called haemolytic disease of the newborn (HDN) and its severity may worsen in subsequent pregnancies if not properly managed (Dennis et al., 1998). The knowledge of distribution of ABO and Rh blood groups at local and regional levels are helpful in the effective management of blood banks and safe blood transfusion services (Enosolease and Bazuaye, 2008).

Body Mass Index (BMI) is the ratio of an individual's weight to height squared (kg/m^2) and is used to estimate a person's risk of weight-related health problems. Collecting and monitoring BMI in children and youth is a powerful tool in the effort to improve the overall health of the community. It is well-documented in both scientific and educational literature that

reducing the risk of chronic diseases associated with obesity – Type 2 diabetes, cardiovascular disease, asthma, sleep apnea. BMI is an important indicator of these long-term health outcomes (Dietz and Bellizzi, 1999).

World Health Organization (WHO) also recommends BMI as the most useful population level measure of overweight and obesity, and is used as the same for both sexes and in all ages of adults. So BMI of $>25 \text{ kg/m}^2$ and $>30 \text{ kg/m}^2$ are considered to be overweight and obese in adults irrespective of gender and age (WHO, 2012). Measuring school-based body mass index (BMI) and reporting the result to parents has been recommended as a way to prevent obesity (IOM 2005).

BMI screening and reporting programs can help increase public and professional understanding of children's weight issues and can be a useful vehicle for engaging with children and families about healthy lifestyles and weight problems (Nihiser et al., 2007). The major objective of this study is to screen the blood group and Rh type of the students in 6-17 years of age and also evaluating the Body Mass Index with the help of height and weight of each student.

2. MATERIALS AND METHODS

2.1. Study Design

The study is carried out on Primary, High and Higher Secondary students of Government schools in and around Tiruchirappalli district, Tamil Nadu from October 2013 to September 2014. A total of 2395 students from various Government schools in the age group of 6-17 years are screened for ABO and Rh blood group, Body Mass Index (BMI).

2.2. Blood Group Determination

Blood groups are determined by tile agglutination method, by using commercially available Anti sera A and anti sera B (Tulip Diagnostics (p) Ltd). On a labelled slide a drop of each of figure prick blood is placed onto which a drop of anti-A, anti-B and anti-D are added and

mixed. Results of agglutination are recorded immediately. Agglutination with anti-A showed group A, with anti-B showed group B, with both anti-A & anti-B showed group AB and with neither of these showed O group (Race and Sanger, 1968). The blood samples are also classified as Rh positive or Rh negative according the presence or absence of the anti-D. Screening for Rh type is conducted by using anti-D sera.

2.3. BMI Evaluation

The Body Mass Index (BMI) or Quetelet index, is a measure of relative weight based on an individual's mass and height. It is defined as the individual's body mass divided by the square of their height (Table 1) with the value universally being given in units of kg/m^2 (Nihiser et al., 2007).

S. No	BMI Range (Kg/m^2)	Category
1.	< 14.9	Under weight
2.	15.0-24.9	Normal weight
3.	>25.0	Over weight
4.	>30.0	Obese

Table 1. Categorical differentiation of Body Mass Index (BMI) and their values

2.4. Statistical Analysis

The data collected are statistically analyzed with help of SPSS software 17.0 version. For statistical analysis the students are grouped based on gender. Chi-Square (χ^2) test is performed to determine the significance between blood group and gender of the students and the graphical representation of the results was prepared with SPSS software.

3. RESULTS

3.1. ABO Blood Group

A total of 2395 students screened for ABO and Rh blood group and BMI. Out of total students, 1241 (51.81%) are males and 1154 (48.19%) are females. In table 2, the distribution of ABO blood system consists of O, A₁, A₂, B, A₁B, A₂B are 897 (37.45%), 474 (19.79%), 37 (1.55%), 812 (33.90%), 146 (6.10%), 29 (1.21%). The percentage of blood groups are in descending manner as: O> B>A₁>A₁B>A₂>A₂B. High frequency of blood group identified is 'O' blood group and least blood group is A₂B.

S.No	Blood groups	No of students observed	Percentage (%)
1.	O	897	37.45
2.	A ₁	474	19.79
3.	A ₂	37	1.55
4.	B	812	33.90
5.	A ₁ B	146	6.10
6.	A ₂ B	29	1.21
	Total	2395	100
	Mean	399.16	16.66

Table 2. Distribution of ABO blood groups among school students in Tiruchirappalli District

Among male students, blood group 'O' is found to be most prevalent group (446) followed by group 'B' (423), 'A₁' (228), 'A₁B' (73), 'A₂' (16) and 'A₂B' (15). In female students, the prevalence of blood group are 'O' (451), 'B' (396), 'A₁' (241), 'A₁B' (71), 'A₂' (19) and 'A₂B' (16) (Table 3). There is no discrimination of ABO blood group distribution between male and female school students. The chi-square analysis ($\chi^2 = 1.575$, df = 5) showed that there is insignificant ($P > 0.05$) difference between gender and blood group of the students (Figure 2).

S.No	Blood Groups	Gender	Frequency
1.	O	Male	446
		Female	451
2.	A ₁	Male	228
		Female	241
3.	A ₂	Male	16
		Female	19
4.	B	Male	423
		Female	396
5.	A ₁ B	Male	73
		Female	71
6.	A ₂ B	Male	15
		Female	16
	Total		2395
	Mean		199.58

Table 3. Gender wise distribution of ABO blood group system and their frequency

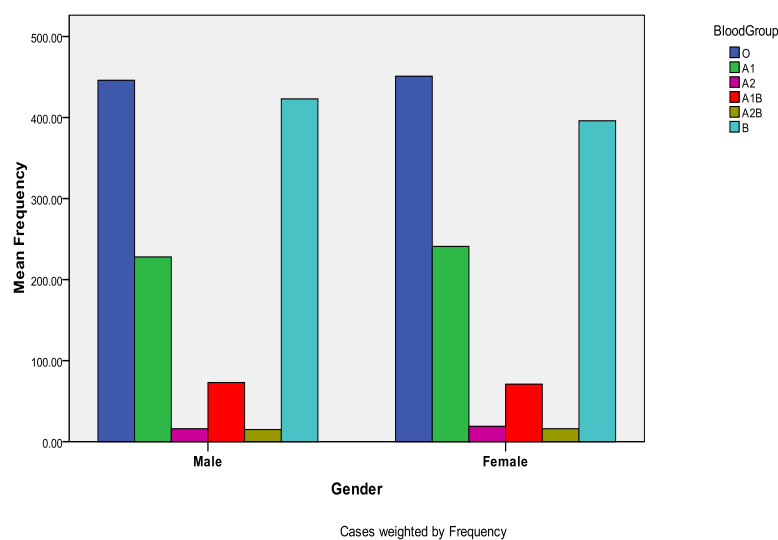


Figure 2. Frequency distribution of ABO blood group system in School students

Out of 2395 students, 2251 (93.98%) are Rh positive and 144 (6.02%) are Rh negative. Table 4 indicates that 1122 males and 1129 females are Rh positive while 79 males and 65 females are Rh negative. Frequency of Rh positive factor is higher in Female students than male while Rh negative factor found higher in male students (Figure 3). The chi-square analysis ($\chi^2=1.362$, $df = 1$) showed that there is insignificant ($P>0.05$) difference between gender and blood group of the students.

S.NO	Rh Factor Type	Gender	Frequency
1.	Positive	Male	1122
		Female	1129
2.	Negative	Male	79
		Female	65
	Total		2395
	Mean		598.75

Table 4. Distribution of Rh – Factor among school students in Tiruchirappalli District

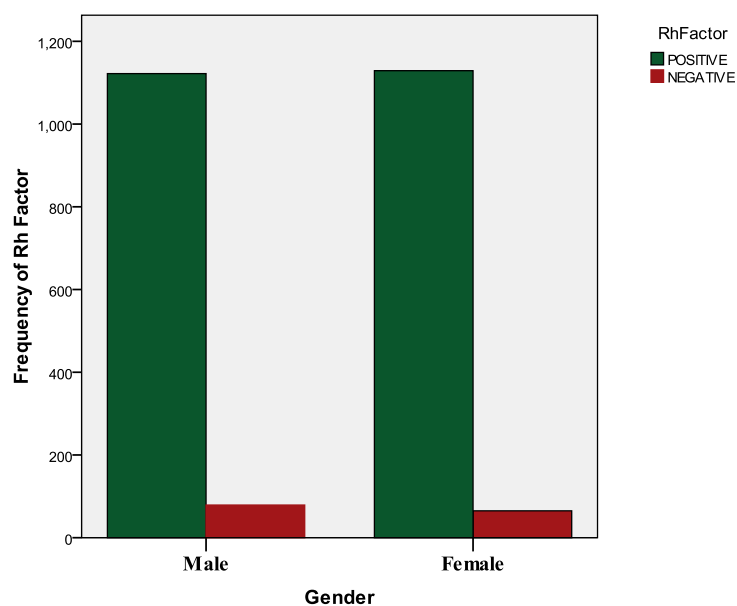


Figure 3. Factor among school students in Tiruchirappalli District

3.2. Body Mass Index

Out of 2395 students, 1499 (62.59%) are belonged into underweight category and 87 (3.63%) are categorized as overweight, 58 (2.42%) are obese compared to 751 (31.36%) normal weight students (Table 5). Results of BMI screening showed that high frequency of students prevailed in underweight category, followed with moderate weight and obesity. The prevalence of nutritional deficiency among the school students are high (Figure 4).

S. No	BMI Range (Kg/m ²)	No. of Students	Percentage
1.	Under weight (< 14.9)	1499	62.59
2.	Normal weight (15-25)	751	31.36
3.	Over weight (>25)	87	3.63
4.	Obese (>30)	58	2.42
	Total	2395	100
	Mean	598.75	25

Table 5. Prevalence of body mass index variation among school students in Tiruchirappalli District

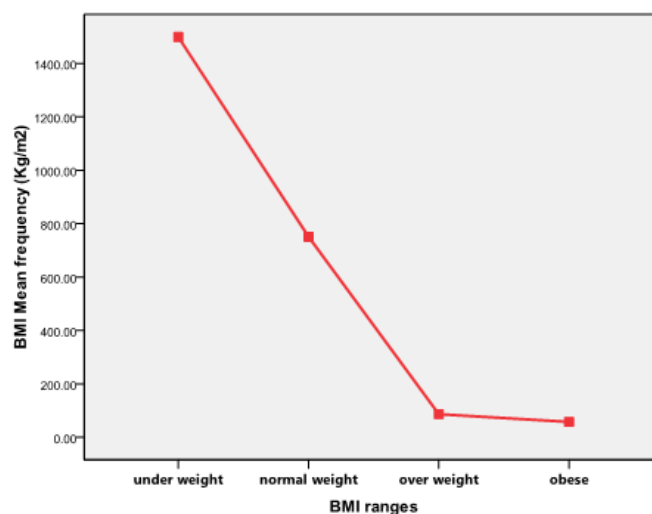
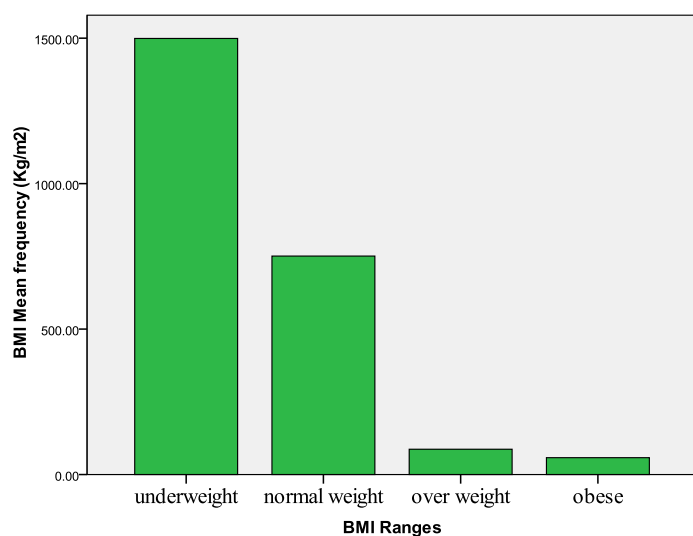


Figure 4. Prevalence of body mass index variation among school students in Tiruchirappalli District

4. Discussion

There is a wide variation of blood group frequency in different parts of the world due to the influence of genetic and environmental factors. Comparison of data among the different studies in the Indo-Pak sub-continent revealed that there was an equal dominance of group B and O (Khan et al., 2004). Studies in North India showed group O is the predominant followed by B, A and AB (Das et al., 2001; Reddy and Sudha 2009; Periyavan et al., 2010). Other studies in South India showed group B is the most prevalent followed by group O, A, and AB (Nanu and Thapliyal, 1997; Chandra and Gupta, 2012). Study in neighboring country Nepal showed different picture of higher frequency of group A (Pramanik and Praminic, 2000).

The prevalence of Rh-D positive remains very high compared to the Rh-D negative blood throughout the world. This study also followed the global trend of much higher Rh-D positive than Rh-D negative. Frequencies of Rh-D positive among the Caucasians, Blacks and Asian were 85%, 92% and 99% respectively (Bethesda, 2005).

Blood groups are known to have some association with diseases like duodenal ulcer, diabetes mellitus, urinary tract infection, Rh incompatibility and ABO incompatibility of newborn (Skaik and El-Zyan, 2006). Blood group O is a risk factor for duodenal ulcer (Romshoo, 1997). Blood group B has highest frequency of Diabetes Type II, since diabetes is common in our population, persons with blood group B who are at high risk should have screening for diabetes earlier than normal population. Coronary artery disease (CAD) is also very common here but risk of CAD is same in all blood groups (Qureshi and Bhatti, 2003).

BMI evaluation studies helps to find a student population with a statistically insignificant variance in academic background and in conjunction with a wide variability in age, BMI and fitness indices (Franz and Feresu, 2013). Regular physical activity has been shown to improve

muscle function, cardiovascular function and physical performance (Centers for Disease Control and Prevention, 2011) which improves the BMI in students.

Limiting the caloric intake of children who have not gone through puberty is problematic in that it can result in stunting growth in height (Ebbeling and Rodriguez, 1998). The NNMB survey also reported the poorer intakes of meat and other flesh foods (7-9g), the rich sources of heme iron by the pre-school children (Arlappa et al. 2012). This correlates with observations made by Allen et al. (2006).

5. CONCLUSION

The ABO blood group study results reveals there is no relationship between the gender and blood group & Rh type of the students. BMI evaluation indicates nutritional deficiency is commonly observed among the students though they are in upper and middle economic families.

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