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A Study of Relation between ABO, RH Blood Groups and Obesity in Eastern Part of India

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Abstract: *Obesity and overweight are known to be harmful to health.Several researchers in the past have reported the association of obesity, hypertensionwith ABO blood groups with controversial results. Studies considering an association betweenABO,Rh blood groups with obesity are not adequate particularly in eastern India. Therefore, the present study is aimed to evaluate the relationship of BMI with ABO & Rh blood group. 200 medical students between 18 and 23 years werechosen for the study. Their blood group and BMI were determined.Results were analyzed by using Graph pad prism 5, comparison was done using independent group t test. Result did not showany significant association of blood group with BMI.*

Key words: *blood group, BMI,Obesity*

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I. Introduction

ABO blood group and body mass index (BMI) have individually been appraised as risk factors for certain diseases as well as genetic marker of obesity,[1]which has long been associated with poor quality of life and reduced life expectancy.

The magnitude of the upswing in overweight and obesity prevalence has also become an important health problem in developing countries particularly in India.[1] It has been associated with a wide range of maladies such as cardiovascular disease, type 2 diabetes, COPD and bronchial asthma which cannot be overlooked.In addition, metabolic syndrome is widespread and a complicated disorder directly related to obesity [2]

Physiological functions of ABO blood group antigens remain a mystery. Numerous associations have been made between particular ABO phenotypes and an increased susceptibility to disease. For example, group O individualsare susceptible to stomach ulcers and the high prevalence of H. pylori, may explain the increased risk of stomach cancer among blood type A patients.[3]. New studies are needed to validate the association between blood groups and BMI, as the curiosity in this matter is unabated

II. Aims & Objectives

The aim of this study is to find any potential relation between ABO blood groups and high BMI among Indian population especiallyin eastern India.

III. Materials and Methods

A cross sectional study was conducted with a sample size of 200, 1[st]Prof MBBS students aged 18-23 years, from CNMC, Kolkata. Height in meters and weight in kg were measured by stadiometer &weighing machine respectively. BMI was calculated using Quetelet's formula:(BMI=weight in kg/height $m^{2.(4)}$ ·Blood groups were determined by finger prick method, and blood typing wasdone by slide agglutination method using Anti sera-A, Anti sera-B, and anti-D antibodies. The data was analyzed through Graph Pad prism 5. Descriptive statistics of the mean, standard deviation and standard error was used to examine the data. Student's t-test for nonparametric data was used to compare the difference between the means of the two investigated parameters. P value ≤ 0.05 deemed statistically significant.

BMI was classified according to the proposed criteria of the WHO where BMI of the following values$<18.5\ kg/m^2$, $18.5–24.9\ kg/m^2$, $25–29.9\ kg/m^2$, and $\geq 30\ kg/m^2$, is categorized as underweight, normal weight, overweight, and obese, respectively[(4)].

Analysis: Statistical analysis was done using Microsoft Windows Excel software. Data were analyzed and given as percent and absolute number of frequency.

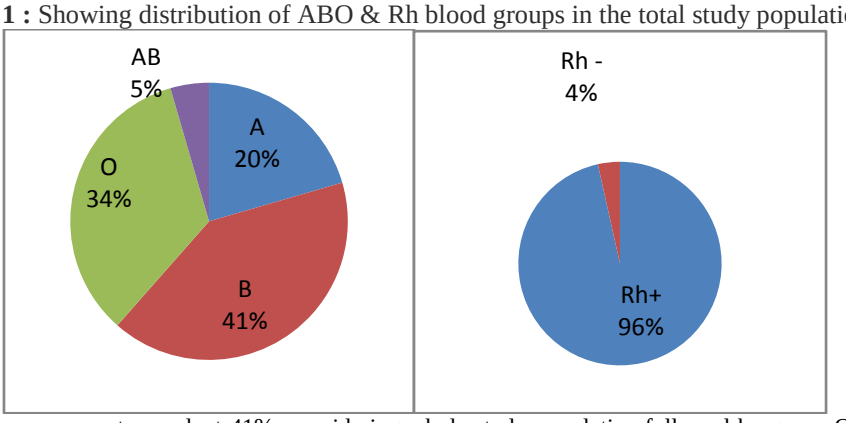
IV. Results

In our study 60% of the participants were male and 40% were female. Theage of the participants were between 18-23years (mean age 20.43 ± 8.9 years). Blood group B was the most prevalent (41%), followed by O (34%), A (20%), and AB (5%). 96% of individuals were Rhesus-positive, while 4% were Rhesus-negative. Also, 10% (20/200) of the participants were obese, while 22.5% (45/200) were overweight,rest had BMI within normallimits.

Table1: Standard anthropometric measurements of the study population (n=200) with respect to BMI

Category	BMI: (18.5-24.9) Mean ± SD	BMI:(25-29.9) Mean ± SD	BMI ≥ 30 Mean ± SD
Height	164.48± 8.46	163.97 ±7.85	163.04±7.76
Weight	58. 5 ± 7.59	72.13 ±12.87	77.52±1 8.27
Avg. BMI	21.56 ±2.06	27.25 ±1.32	32.53± 3.42

Fig 1 : Showing distribution of ABO & Rh blood groups in the total study population



In this study B group was most prevalent 41%, considering whole study population;followed by group O (34%), A(20%), AB(5%).Majority (96%) are Rh+.

Table 2 Distribution of BMI in male & female subjects in different blood groups

	Male Mean ± SD	Female Mean ± SD	P value
A	N=10 28.732± 2.748	N=5 29.239± 1..84	0.85
B	N=16 29.239 ± 1.84	N=13 28.32 ± 2.389	0.251
O	N=14 29.814 ± 5.50	N=8 28.45 ±2.447	0.517
AB	N=4 23.87 ±1.53	N=4 23.225 ± 1.436	0.562

p≤0.05:statistically significant.

Table 2 shows no statistically significant difference between overweight &obese male & female subjectsconsidering ABO blood groups.

Fig 2:Prevalence of ABO blood groups in male & female subjects.

Fig 2a) **Fig 2b)**

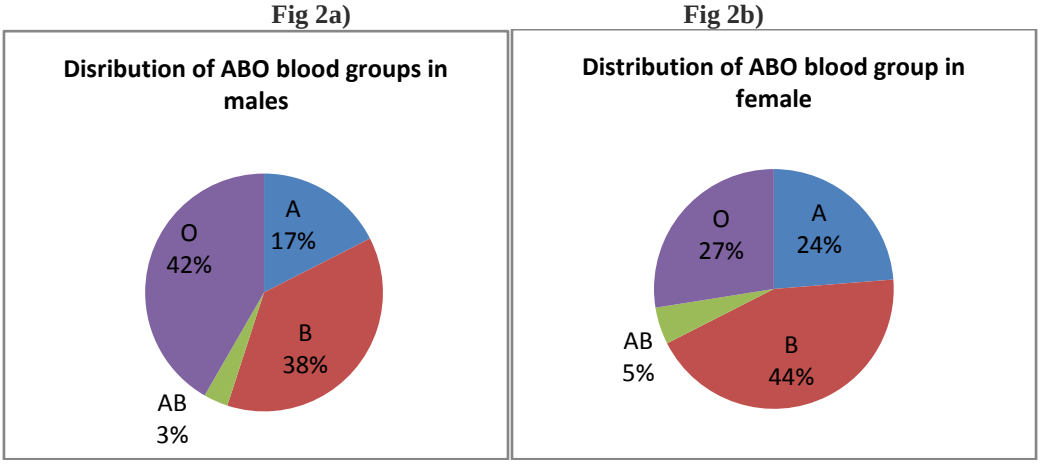
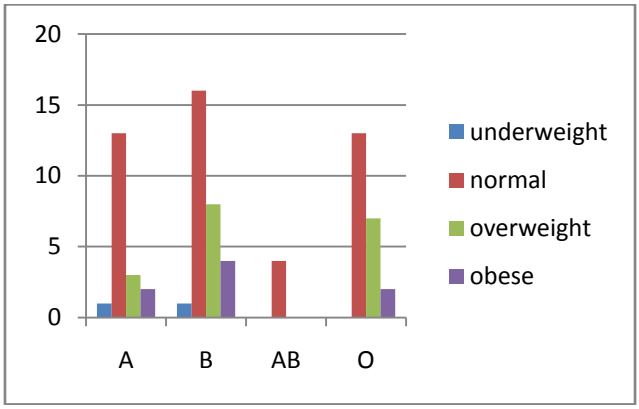


Figure 2a& 2b shows O blood group isthe most prevalent in males (n=120) whereasit is the B group in females (n=80) in our study.

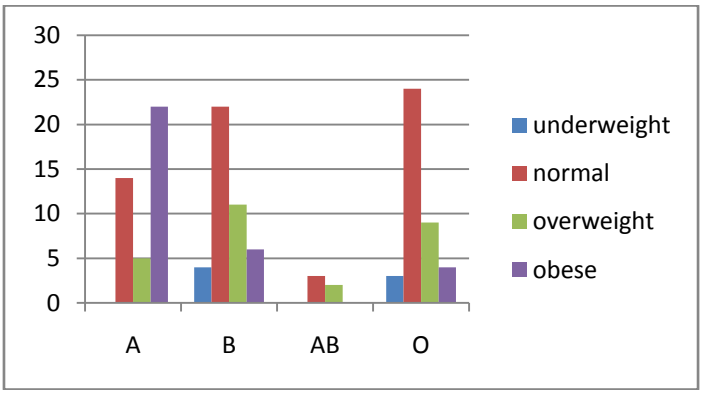
Figure 3: Distribution of BMI in males & females

In female



In Females Bgroups aremore prone to be overweight & obese than other groups.

In male



In males B groupsare prone to overweight but obesity was foundmore in A group in males as observed by Behera, Sahoo et al[11] in their study.

Table 3: frequency of overweight & obesity in different blood groups in whole study group.

Blood group	BMI<18.5	BMI: (18.5-24.9)	BMI(25-29.9)	Obese BMI ≥ 30
A	N=1	N=27	N=8 (20%)	N=5(12%)
B	N=6	N=44	N=21(25%)	N=11 (13%)
O	N=4	N=42	N=16 (23%)	N=6 (8%)
AB	N=0	N=7	N=2 (20%)	N=0

Table 3 shows B group subjects are more prone to beoverweight andobese. Overweight is more common than obese in both B & O blood group.

Table 4: Distribution of ABO groups according to their mean ± SD in relation to BMI

Parameters	Control BMI: (18.5-24.9) Mean ± SD	Overweight BMI: (25-29.9) Mean ± SD	Obese BMI ≥ 30 Mean ± SD
A	21.26± 1.84	27.08 ± 1.72	32.38 ±1.052
B	21.75±1.94	27.56±1.23	31.358 ±0.997
O	21.32±2.27	27.25 ±1.21	34.833 ±5.871
AB	23.24 ± 1.20	23.87 ± 1.53	

Table 3 Inter group comparison of different blood groups

parameters	Control vs overweight	Control vs obese	Overweight vs obese
A	Yes**	Yes**	Yes**
B	Yes**	Yes**	Yes**
O	Yes**	Yes**	Yes**
AB	no	no	

V. Discussion

This cross-sectional study involved 200 MBBS students participants aged 18 to 23 years at Kolkata. Blood group B was the most prevalent (41%), while Rhesus-positive individuals constituted 96%. Due to the racial and ethnic differences among different people globally, population-based studies are relevant.Overweight and obesity are linked to more morbidities and mortalities worldwide than underweight.[14,15]

Reports in literature with various authors on the relationship between ABO blood group and BMI are inconsistent.Worldwide distribution pattern has shown blood type O to be the most prevalent blood group followed by group B, group A, and group AB[17].which is consistent with the findings in this present study considering the male population only.

Our results regarding the prevalence of ABO blood group types showed more overweight and obesity in B group followed by O blood group,

Egyptian population demonstrated blood group O to be strongly linked with increased BMI,[5,6] In India Chandra T et al.[7] showed B to be the most common blood group associated with obesity, their finding is most probably because of presence of more lipid contents. WhileSarbjit Singh et al [8] found the prevalence of overweight was more in O blood group, while obesity was in B blood group.

Kumar and Gani [10] have found blood group O and Rh-positive members having an association with obesity. Krishnakanth et al.[12], and Chuemere et al.[[13]] have found blood group O to have the highest number of obese members.

However, Ganeshan and Sukalingam [9]found blood group B, and Rh-positive was more likely to be obese as compared to blood group O and A, whereas AB blood group had a lesser chance of getting obesity. Studies from India by Chandra T et al.[7] showed blood group B to be most commonly associated with obesity. All the above researchers have used BMI to assess obesity and not the body composition.

Overweight and obesity were not significantly associated with ABO blood groups or Rhesus in this study. However, the prevalence of overweight and obesity, mainly among the younger generations requires more awareness and educational programs for lifestyle changes as a means of primordial prevention.

Researchers postulated that ABO blood type and body weight may be biologically related probably through a pathway that involves thrombotic factors like FVIII,the non-blood group O individuals have higher FVIII. Increased BMI was associated with a higher level of FVIII [16]Another observation is that individuals with blood type O tend to have lower levels of the von Willebrand Factor (vWF), which is a protein involved in blood clotting.

Also, obesity is considered to be an inflammatory disease[14], and this phenomenon may be linked to a hypothesized ABO blood antigen's regulatory effect on inflammation[15]. Nevertheless, such a molecular pathway or any others have not been established, suggesting that association between ABO and BMI may be arbitrary.Evidences suggesting the ABO system as a genotype marker for obesity[7] is still under investigation.

Conclusion

In this study we found that blood group B was most prevalent followed by blood group O. We did not find any significant correlation between blood group and BMI. However, small sample size is a limitation of the study hence difficult to address the problem in a large community . Future research with a larger sample is needed. However in schools, teachers should be encouraged to recommend healthy food and weight management. Students should be discouraged from using junk and spicy foods to avoid being overweight or obese.

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