

Original Article

RELATIONSHIP OF ABO BLOOD GROUPS WITH BODY MASS INDEX AND HYPERTENSION IN MEDICAL STUDENTS

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Objective: To find out the relationship of hypertension (HTN), ABO blood groups and body mass index (BMI) in medical students of Continental Medical college, Lahore.

Methods: This is a prospective study done in department of Physiology. Total participants were 300. ABO blood group was determined by antigen- antibody reaction. Blood pressure (BP) was measured two times by standard mercury sphygmomanometer and mean was calculated. Height and weight of students were measured to calculate BMI.

Results: In total 164(55%) were females and 136(45%) were males and mean age was 19 ± 0.75 years (17-23 years). Most prevalent students were of blood group B i.e.101 (34%). Maximum obese students (≥ 30 BMI) were belonging to blood group B i.e 18 (6%) and minimum number of obese students were of blood group AB i.e 4(1%). Blood group B has maximum prehypertensive (52 or 16.2%) and stage1 hypertensive students (3 or 16.2%) and blood group AB have minimum prehypertensive(7 or 2%) and no stage-1 hypertensive students.

Conclusions: Blood group-B students were most prevalent and more prone to high BMI and prehypertension in given population.

Keywords: ABO, hypertension, Body mass index.

Introduction

The ABO blood group system was discovered by the Austrian scientist Karl Landsteiner in 1900.¹ Its regulation is under the control of ABO gene expression.² Genes for ABO antigens are located on chromosome number 9. The major blood groups of ABO system are A, AB, B and O. The A and B antigens are oligosaccharide, expressed on erythrocytes, platelets, vascular endothelium and tissue cells.³ Several epidemiological studies have reported that the distribution of different ABO blood groups vary markedly among the populations of different geographical areas reflecting racial differences.⁴ Since the discovery of the ABO system, its significance regarding evolution, paternity dispute and genetic study, as predictor of national suicide rate, are all well documented by pastresearches.^{1,5} The blood group systems are of interest to recent researchers of modern medicine due to its linkage with various diseases.⁶

BMI is a measure of excess body weight. It is useful for assessing aspects of health in children and adults. Based on the World Health Organization (WHO) classification of BMI, an individual may be clinically considered obese, overweight, normal, or underweight. BMI pattern of distribution differs within and between different populations globally; changing trends in BMI of individual populations are known and linked to changes in socioeconomic

status.⁷ Obesity and overweight are known to be harmful to health⁸, and many studies have demonstrated the association of increased BMI and risk of development of certain diseases. Excess body weight is believed to accentuate the risk of numerous diseases and clinical disorders, such as coronary heart disease, strokes, cancers, type 2 diabetes mellitus, HTN, asthma, liver disease, psychopathological conditions⁹ and allergic diseases.¹⁰

BMI is a modifiable risk factor that can be assessed in time. Moreover blood groups being non modifiable risk factor, should be identified as which of them is more prone to developing obesity, so that young adults can be accordingly counselled for the lifestyle modifications and thus be prevented from major diseases associated with increased BMI.

HTN is a condition of sustained increase in BP. In recent years, it is a major health problem in the world, without any early specific sign and symptoms, so most of the people have HTN without knowing it.¹¹

¹²According to Joint National Committee (JNC) 8, systolic blood pressure (SBP) 90-119 mmHg and diastolic blood pressure(DBP) 60-79 mmHg is normal BP. HTN is a condition where SBP is more than 120 mmHg and DBP is more than 80 mmHg.¹³ JNC 7 defined prehypertension as SBP ranging from 120-139 mmHg and DBP ranging from 80-89 mmHg. Whereas, stage-1 HTN is defined as SBP ranging from 140-159 and DBP ranging from 90-99mmHg.¹⁴

Although ABO blood group, HTN and BMI have individually been appraised as risk factors for certain illnesses, few studies have shown that a particular ABO blood antigen potentially predisposes to higher BMI or HTN, while others couldn't find a relationship between these factors.^{15, 16} Therefore, we conducted a study in medical students to find out frequency of different blood groups in the study population. Also to find out which blood group is more prone to high BMI or HTN so that the high risk population should be counselled about dietary and lifestyle modification at a younger age.

Methods

This is a prospective study carried out in 300 medical students in the department of Physiology, continental medical college, Lahore. Sampling was done by Non-Probability, Purposive technique. Written informed consent was taken from subjects, complete history and general physical examination was done. The BP was measured by mercury sphygmomanometer for two times and mean was calculated for accuracy. The Cases with HTN were excluded. Height in meters (m) and weight in kilograms (kg) were measured by weight scale and a measuring tape, respectively. The formula, weight in kg divided by height in meter square, was used to calculate the BMI of students and unit is kg/m². According to WHO "Asian Criteria" for BMI cut off point are; less than 18.5kg/m² is underweight, 18.5-22.9kg/m² is normal, 23-24.9 kg/m² is overweight, 25-29.9 kg/m² is pre-obese and ≥30kg/m² obese (30-40 kg/m² type-I obese, 40.1-50kg/m² type-II obese and more than 50 kg/m² is type 3 or super obese). ABO blood group was determined by antigen- antibody reaction in Physiology Lab. Collected data was compiled and analyzed by using Statistical Package of Social Science (SPSS) software version-20. Data was presented in the form of frequencies and percentages. Frequencies of both group was compared by Fischer's exact test and p-value of <0.05 was considered to be highly significant.

Results

Total 300 students were enrolled in the study. The overall mean age was 19±0.75 years (17-23 years). In total 164(55%) were females and 136(45%) were males as shown in (Fig-1). The distribution of phenotype frequencies and percentages for the A, B, AB, O, were 78(26%), 101(33.7%), 23(7.6%) and

98(32.7%), respectively. (Table-1)

Recording of BMI shows 180(60%) of total 300 students were with normal BMI whereas, 39(13%) were underweight, 43 (14.3%) were overweight and 38(12.7%) were obese. Most of the normal BMI students were belonging to Blood group A (n=59 or 19.7%), blood group O students were the most underweight (n=22or7.3%), most overweight and obese students were under the group B (n=18or6%) and (n=17or5.7%) respectively. Students of blood group AB shows least value for BMI.

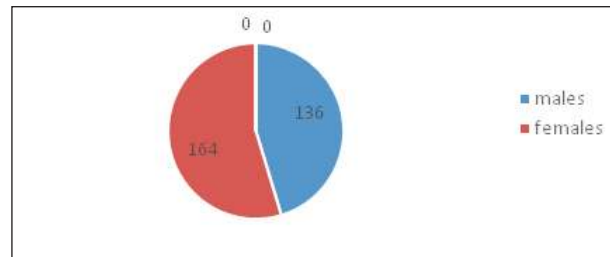
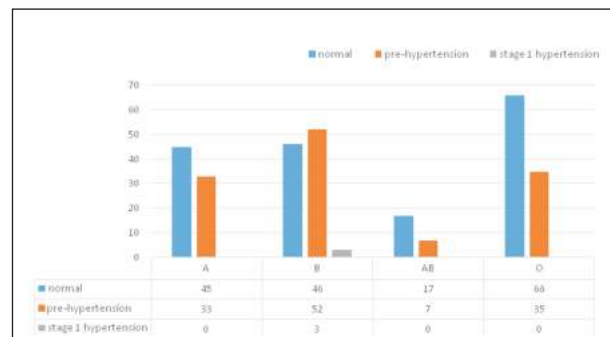


Fig-1: Distribution of gender among our study population.



p-value = 0.01 when compared by Fischer's exact test

Fig-2: Distribution of blood pressure among different blood groups.

Table-1: Distribution of different blood group phenotypes among our study population.

Blood Group	Male n (%)	Female n (%)	Total n (%)
A	35 (11.7%)	43 (14.3%)	78 (26%)
B	44 (14.7%)	57 (19%)	101 (33.7%)
AB	8 (2.6%)	15 (5%)	23 (7.6%)
O	49 (16.3%)	49 (16.3%)	98 (32.7%)
Total	136 (45%)	164 (55%)	300 (100%)

Table-2: Distribution of BMI (kg/m²) among different blood phenotypes.

Blood Group	Under Weight n (%)	Normal n (%)	Over Weight n (%)	Obese n (%)	Total n (%)
A	9 (3%)	59 (19.7%)	5 (1.7%)	5 (1.7%)	78 (26%)
B	8 (2.7%)	58 (19.3%)	18 (6%)	17 (5.7%)	101 (33.7%)
AB	0 (0%)	15 (5%)	4 (1.3%)	4 (1.3%)	23 (7.6%)
O	22 (7.3%)	48 (16%)	16 (5.3%)	12 (4%)	98 (32.7%)
Total	39 (13%)	180 (60%)	43 (14.3%)	38 (12.7%)	300 (100%)

p-value = 0.01 when compared by Fischer's exact test

So, tendency of obesity was maximum in B and minimum in AB blood group (**Table-2**). Blood group O has the maximum students with normal blood pressure, Blood group B has maximum prehypertensive 52(16.2%) and stage1 hypertensive students 3(16.2%) and students with blood group AB have minimum prehypertensive and no stage 1 hypertensive student (**Fig-2**).

Discussion

Common blood group among our participants was B (34%), followed by blood group O (33%), A (26%) and AB (8%). Similar findings were also reported by research studies done at Punjab and Sindh^{17,18} but Khyber Pakhtoonkhwa (KPK) shows more common blood group A followed by O, B and AB.¹⁹ Our research concluded that the blood group B has more tendency to develop HTN and obesity followed by blood group O, A and AB. Whereas AB blood group has least chance of getting HTN and obesity. Similar results were seen by a research conducted at Kathmandu showing that Maximum obesity (≥ 30) and prehypertension was found in students with blood group B about 4(1.17%) and 55(16.2%) respectively whereas no obese student found and minimum evidence of prehypertension was found in blood group AB.¹⁵ Other study done by Sadiq H and colleagues, at dental institution of

Greater Noida, India also showed similar result as our study showing Blood group B more susceptible to HTN.²⁰ Chuemere and his colleagues found that postmenopausal women with blood group O and B, were more susceptible to developing HTN, obesity and diabetes together with coexistence of prehypertension, pre-diabetes and obesity, this coexistence does exist in our study also.²¹

Contrary to our study, Kaur M, at India do find a prevalence of HTN in blood group B and O but was not significant statistically ($p > 0.05$) and hence they concluded that there is no correlation of developing HTN with a particular blood group.¹⁶ Similarly, Alwasaidi TA at Saudi Arabia came to know that men are more obese than women and blood group O participant were more obese than other groups but didn't find any statistically significant difference between the prevalence of obesity or high BMI and ABO blood groups.²²

Conclusion

We concluded from our research that Blood group B being the most prevalent group, is more prone to HTN and high BMI. The blood group AB has shown least tendency for high BMI and HTN.

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