

## To Assess the Association between ABO Blood Group with Prehypertensive among Medical and Students

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### Abstract

**Background:** To Assess the Association between ABO Blood Group with Prehypertensive among Medical and Students. **Material and Methods:** The research was carried out in the Department of Physiology at the Maharishi Markandeshwar Institute of Medical Sciences and Research in Mullana, as well as the MM Institute of Dental Sciences (Ambala). Five hundred medical students between the ages of 18 and 25 were picked at random. The 500 students were split into two groups and Students in Group A were normotensive. Students in Group B were prehypertensive. Students having a history of hypertension were also included in the study. **Results:** In group A majority of cases belonged to blood group B i.e. 131 (43.09%) and only 42 (13.81%) in blood group AB. Similarly in group B cases also majority of cases were in B blood group i.e. 91 (46.42%). It clearly shows that blood group B was most common in both the groups. We observed that mean SBP/DBP was higher in B blood group in group B i.e. 130.41±5.21 and 82.02±3.17 and in group A; blood group O was higher i.e. 113.98±2.34 and 74.85±7.69. Blood group A was less in both the groups i.e. 108.56±0.96 and 73.33±3.12 in group A and 122.91±1.01 and 72.75±3.32 in group B as compared to other blood groups. When we compared all these blood groups with each other; it was found to be statistically significant. The mean SBP/DBP was 132.47±3.84 and 83.30±3.22 in male cases in group B & mean SBP/DBP was 123.14±0.99 and 80.30±3.04 in female cases. A total of 142 male and 54 female were found in prehypertensive group. **Conclusion:** We concluded that the Blood group B is the most common blood group in our study. There was no statistically significant association between ABO Blood groups and Hypertension.

**Keywords:** ABO Blood Group, Hypertension, Medical and dental Students.

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### Introduction

Hypertension is a chronic medical illness that is one of the most frequent life-threatening noncommunicable diseases. It is responsible for 7.6 million premature deaths, 54% of strokes, 47% of ischemic heart disease, and 13% of all fatalities globally.<sup>[1]</sup> The incidence of hypertension is likely to be on the increase in emerging nations, owing to the adoption of Western lifestyles and urbanisation.<sup>[2]</sup> Because hypertension is asymptomatic, most patients become aware of their hypertension only after issues arise. Hypertension diagnosis is important since it may be readily avoided by understanding its likely risk factors.<sup>[3]</sup> Modifiable and non-modifiable variables influence hypertension. Obesity, high cholesterol, sedentary lifestyle, excessive fat and poor dietary fibre consumption are the leading causes of hypertension.<sup>[4]</sup> Familial patterns of hypertension point to genetic factors as another key non-modifiable predisposing factor, and ABO blood type is one such component that needs to be investigated further. In the year 1900, scientist Karl Landsteiner discovered the ABO system

of blood groups, which marked the beginning of blood banking and transfusion therapy.<sup>[5]</sup> ABO blood grouping is based on the antigenic properties of red blood cells. Type A people have antigen A, type B people have antigen B, and type AB people have both; type O people do not have any of these antigens. These A and B antigens are complex oligosaccharides found on the surface of red blood cells that vary in their terminal sugar. ABO antigens, in addition to being expressed on red blood cells, are also extensively expressed on the surface of a range of human cells and tissues, including the epithelium, sensory neurons, platelets, and the vascular endothelium.<sup>[6]</sup> The clinical importance of the ABO blood group system goes beyond transfusion therapy, with multiple studies indicating a significant role for ABO blood types in the development of cardiovascular, oncological, and other disorders linked with hypercoagulability.<sup>[7]</sup> Blood groups are genetically determined, and hypertension is also a hereditary condition. A genetic component is an essential non-modifiable predisposing factor for the development of hypertension. As a result, the current research was conducted to investigate the relationship between ABO blood type and hypertension.

There is strong evidence in the literature to suggest there is an association between ABO blood group and certain diseases.<sup>[8]</sup> The AB antigen appears to have evolutionary significance because the frequencies of different ABO blood group types vary across different populations, suggesting that a particular blood type confers a selection advantage.<sup>[9]</sup> Numerous associations have been reported between particular ABO phenotypes and an increased susceptibility to disease.<sup>[10]</sup> For example, the ABO phenotype has been linked with stomach ulcers, which are more common in group O individuals and gastric cancer, which is more common in group A individuals.<sup>[11,12]</sup> A clear correlation has been established between ABO phenotype and the level of 2 proteins involved in blood clotting, von Willebrand factor and factor VIII. However, the literature shows conflicting evidence regarding the role of blood group in diabetes mellitus.<sup>[13]</sup>

### Material and Methods

The research was carried out in the Department of Physiology at the Maharishi Markandeshwar Institute of Medical Sciences and Research in Mullana, as well as the MM Institute of Dental Sciences (Ambala). Five hundred medical students between the ages of 18 and 25 were picked at random. The study's goal and protocol were described to them, and informed permission was obtained.

According to the 7<sup>th</sup> report of the Joint National Committee on criteria for grading normotensive and prehypertensive patients, the pupils studied were split into the following categories.

The 500 students were split into two groups.

- Students in Group A were normotensive.
- Students in Group B were prehypertensive (Systolic 120-139 or diastolic 80-89mm of Hg).

The research comprised apparently healthy students aged 18 to 25 who had no clinical complaint/sign/symptom suggesting morbidity. Students having a history of hypertension were also included in the study. This research excluded hypertensive students who were taking any medication for hypertension or any other endocrinological or cardiorespiratory diseases.

### Methodology

The finger was poked with a lancet under aseptic circumstances to identify the blood group. The blood group was identified using agglutination procedures using anti-A, anti-B, and anti-D sera. A mercury sphygmomanometer was used to measure blood pressure. Smoking and caffeine use were not permitted within the previous 30 minutes. After a 10-minute break, the measurements were retake. The non-dominant arm was fitted with a cuff bladder that

encircled at least 80% of the arm circumference. The systolic and diastolic readings were determined by the emergence of phase I Korotkoff sounds and the disappearance of phase V Korotkoff sounds. The average of three values taken two minutes apart was calculated. If these readings diverged by greater than 5 mmHg, three further measurements were obtained at 2 minute intervals, and the mean of all five values was calculated. Over a one-minute interval, the radial pulse rate was manually measured.<sup>[14]</sup>

## Results

**Table 1: Distribution of cases according to their blood groups**

Blood group	Group A (Normotensive)n=304	Group B (Prehypertensive)n=196	Statistical significance
A	71 (23.35%)	24 (12.24%)	$\chi^2 = 10.08$ ; $p < 0.05$ Significant
AB	42 (13.81%)	35 (17.85%)	
B	131 (43.09%)	91 (46.42%)	
O	60 (19.73%)	46 (23.46%)	

Above [Table 1] shows distribution of cases according to their blood groups. In group A majority of cases belonged to blood group B i.e. 131 (43.09%) and only 42 (13.81%) in blood group AB. Similarly in group B cases also majority of cases were in B blood group i.e. 91 (46.42%). It clearly shows that blood group B was most common in both the groups.

**Table 2: Comparison of blood pressure (SBP/DBP) according to blood groups**

Blood group	Group A (Normotensive) n=304		Group B (Prehypertensive) n=196		Statistical significance	
	SBP	DBP	SBP	DBP	SBP	DBP
A	108.56±0.96	73.33±3.12	122.91±1.01	72.75±3.32	Z=158.12; p<0.01 Significant	Z=1.96; p <0.05 Significant
AB	112.90±2.46	75.19±2.95	129.2±4.28	83.54±3.60	Z=19.95; p<0.01 Significant	Z=10.99; p<0.01 Significant
B	113.98±2.34	74.85±7.69	130.41±5.21	82.02±3.17	Z=28.17; p<0.01 Significant	Z=9.57; p<0.01 Significant
O	114.73±3.10	75.8±2.74	129.04±6.19	81.91±2.76	Z=14.36; p<0.01 Significant	Z=11.33; p<0.01 Significant

In the present study, we correlated the blood pressure of subjects of both the groups according to their blood groups. We observed that mean SBP/DBP was higher in B blood group in group B i.e. 130.41±5.21 and 82.02±3.17 and in group A; blood group O was higher i.e. 113.98±2.34 and 74.85±7.69. Blood group A was less in both the groups i.e. 108.56±0.96 and 73.33±3.12 in group A and 122.91±1.01 and 72.75±3.32 in group B as compared to other blood groups. When we compared all these blood groups with each other; it was found to be statistically significant.

**Table 3: Distribution of cases according to their sex and residential status.**

Resi. Status	Group A (Normotensive)n=304Male/Female n(%)	Group B (Prehypertensive)n=196Male/Female n(%)
Haryana resident	104 (34.21%) / 83 (27.30%)	83 (42.34%) / 33 (16.38%)
Outside Haryana	63 (20.72%) / 54 (17.76%)	59 (30.10%) / 21 (10.71%)

In the present study; we divided our cases according to their residential status i.e. whether they belonged to Haryana state (study area) or outside Haryana. We found that both male / female were belonged to Haryana state (being a study area) as compared to cases belonged to outside Haryana. A total of 104 (34.21%) male cases belonged to Haryana state in group A as compared to 83 (42.34%) in group B. Similarly 83 (27.30%) female cases belonged to Haryana in group A as compared to 33 (16.38%).

**Table 4: Comparison of blood pressure according to gender wise**

Sex	Group A (Normotensive)n=304	Sex	Group B (Prehypertensive)n=196
Male (n=137)		Male (n=142)	
SBP	115.74±2.04	SBP	132.47±3.84
DBP	75.13±8.74	DBP	83.30±3.22
Female (n=167)		Female (n=54)	
SBP	111.63±1.51	SBP	123.14±0.99
DBP	74.82±4.73	DBP	80.40±3.04

We further divided blood pressure according to gender and we found that male cases belonged to increased mean BP as compared to female in group B. The mean SBP/DBP was 132.47±3.84 and 83.30±3.22 in male cases in group B & mean SBP/DBP was 123.14±0.99 and 80.30±3.04 in female cases. A total of 142 male and 54 female were found in prehypertensive group.

**Table 5: Blood group according to Gender wise**

Blood group	Group A (Normotensive) n=304	Blood group	Group B (Prehypertensive) n=196
MaleA	38 (12.5%)	MaleA	16 (8.16%)
AB	29 (9.53%)	AB	26 (13.26%)
B	72 (23.68%)	B	70 (35.71%)
O	28 (9.21%)	O	30 (15.30%)
FemaleA	33 (10.85%)	FemaleA	8 (4.08%)
AB	13 (4.27%)	AB	9 (4.59%)
B	59 (19.40%)	B	21 (10.71%)
O	32 (10.52%)	O	16 (8.16%)

We correlated our cases according to their blood group and gender. We found that male cases in both the groups were higher as compared to other blood groups. B blood group plays a major role because maximum number of cases i.e. 72 (23.68%) in group A and 70 (35.71%)

in group B were found. Similarly, female cases in both the groups were higher as compared to other blood groups. Here also B blood group plays a major role because maximum number of cases i.e. 59 (19.40%) in group A and 21 (10.71%) in group B were found.

**Table 6: Blood group according to residential status**

Residential status	Group A (Normotensive) n=304	Group B (Prehypertensive) n=196
Resident of Haryana		
SBP	112.26±1.66	126.18±3.38
DBP	74.36±8.16	82.03±3.63
Outside Haryana		
SBP	116.49±2.03	135.3±1.93
DBP	76±5.21	83.2±2.97

In the present study; we also correlated blood group of cases according to their residential status and found that cases who belonged to outside Haryana had more SBP/DBP as compared to cases to resident of Haryana. In our study mean SBP/DBP of cases belonged to outside Haryana was 116.49±2.03 and 76±5.21 in group A as compared to 112.26±1.66 and 74.36±8.16. Similarly in group B it was 135.3±1.93 and 83.2±2.97 as compared to 126.18±3.38 and 82.03±3.63.

## Discussion

Hypertension is a chronic medical condition and one of the most common life threatening non-communicable disease. According to the survey done by Indian Council of Medical Research in 2007-8 to identify the risk factors for non communicable diseases under state based Integrated Disease Surveillance Project Phase 1, the prevalence of hypertension was varying from 17 to 21% in all the states of India with marginal rural-urban differences.<sup>[15]</sup> Hypertension is divided into Primary (essential) and Secondary. Essential, or primary hypertension is a persistent elevation of blood pressure which is not caused by underlying cardiac, endocrine, or renal disease.<sup>[16]</sup> Essential hypertension is the most prevalent form of hypertension accounting for 90% of all cases of hypertension. Hypertension is classified as "Secondary" when some other disease process or abnormality is involved in its causation like disease of kidney, (chronic glomerulo-nephritis and chronic pyelonephritis), tumours of adrenal glands, congenital narrowing of aorta and toxemias of pregnancy. These are estimated to account for about 10% or less of the cases of hypertension.<sup>[17]</sup> Many other study findings have suggested the genetic basis of essential hypertension in population of different ethnicity.<sup>[18]</sup> ABO blood group is one the non modifiable risk factor for the development of hypertension, so in the present study we tried to find out the association between ABO blood group and hypertension.

Present study shows distribution of cases according to their blood groups. In group A majority of cases belonged to blood group B i.e. 131 (43.09%) and only 42 (13.81%) in blood group AB. Similarly in group B cases also majority of cases were in B blood group i.e. 91 (46.42%). Similar study was carried out by Nemesure et al,<sup>[19]</sup> who evaluated the possible relationship of hypertension and diabetes with the ABO, Rhesus, and Duffy blood groups, which are known markers of African ancestry. They reported that diastolic blood pressure was positively associated with years of age, the Rhesus D+ antigen and body mass index, but negatively associated with the ABO blood group A allele. They also indicated that diabetes, hypertension, body mass index and waist-hip ratio increased with years of age but decreased with presence of the Rhesus C+ antigen. They concluded in their study that the associations

of diabetes and hypertension to these blood groups support possible genetic influences on both conditions in this and similar African-origin population.

In the present study, we correlated the blood pressure of subjects of both the groups according to their blood groups. We observed that mean SBP/DBP was higher in B blood group in group B i.e.  $130.41 \pm 5.21$  and  $82.02 \pm 3.17$  and in group A; blood group O was higher i.e.  $113.98 \pm 2.34$  and  $74.85 \pm 7.69$ . Blood group A was less in both the groups i.e.  $108.56 \pm 0.96$  and  $73.33 \pm 3.12$  in group A and  $122.91 \pm 1.01$  and  $72.75 \pm 3.32$  in group B as compared to other blood groups. Similar results were also reported by Nemesure et al.<sup>[19]</sup>

In our study we divided blood pressure of cases according to gender and we found that male cases belonged to increased mean BP as compared to female in group B. The mean SBP/DBP was  $132.47 \pm 3.84$  and  $83.30 \pm 3.22$  in male cases in group B & mean SBP/DBP was  $123.14 \pm 0.99$  and  $80.30 \pm 3.04$  in female cases. A total of 142 male and 54 female were found in prehypertensive group.

Similar results were reported by Gan SKE et al,<sup>[20]</sup> in 2003 and reported the prevalence of hypertension and "white coat hypertension" in young adult Asian males, and identify the associated risk factors. In their population-based; they studied descriptive analysis of 3,352 Singapore military conscripts presented consecutively for medical screening, followed by case-control study of subjects with elevated blood pressure. A standard protocol for assessing elevated blood pressure, 24-hour ambulatory monitoring and detailed interviews were performed. Main study outcomes were prevalence rate of hypertension and "white coat hypertension", mean blood pressure readings. They reported that prevalence of hypertension and "white coat hypertension" was 1.6% and 2.0% respectively. Twenty-four-hour ambulatory monitoring was required to differentiate the two conditions, with a fall of 22.5 mmHg observed between first visit and day-time ambulatory mean systolic blood pressures. There was strong association between hypertension and obesity. Other important variables included parental history of hypertension, Malay ethnicity and low socio-economic status, although there was no significant correlation. There is a clear role for ambulatory blood pressure monitoring for differentiating true hypertension from "white coat hypertension". There may be a role for targeted screening of high-risk groups, particularly the obese.

We correlated our cases according to their blood group and gender. We found that male cases in both the groups were higher as compared to other blood groups. B blood group plays a major role because maximum number of cases i.e. 72 (23.68%) in group A and 70 (35.71%) in group B were found. Similarly, female cases in both the groups were higher as compared to other blood groups. Here also B blood group plays a major role because maximum number of cases i.e. 59 (19.40%) in group A and 21 (10.71%) in group B were found.<sup>[20]</sup>

### Conclusion

We concluded that the Blood group B is the most common blood group in our study. There was no statistically significant association between ABO Blood groups and Hypertension.

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