Original Research Article

Relationship between hypertension and ABO blood groups: A cross-sectional study

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Abstract

Background: Hypertension is a major health problem, especially because it has no clear symptoms. It is strongly correlated with modifiable risk factors such as adiposities, age, stress, high salt intake. Overweight and obesity is conveniently determined from BMI and visceral adiposity is determined by waist circumference. ABO blood group is one such factor which needs to be investigated. This study intends to find out any effect of different blood groups on development of hypertension. **Material and Methods:** The study was done in the Department of Physiology, Tertiary care Institute of India. A total of 200 subjects were studied from April 2019 to December 2019. Blood pressure of all the participants in the study was recorded using mercury sphygmomanometer. The formula, weight in kg was divided by height in meter square was used to calculate the BMI of patients and unit is kg/m2. The data collected was compiled and analysed using chi-square test. **Results:** Most common blood group in both sexes was B group. Out of 200 students, 186 students have Rh positive blood group and 14 have negative. Maximum 6 (3%) students had obesity (≥30) was found in students with blood group B. There were no obese students in blood group AB. blood group B has maximum prehypertension (systolic) n = 36(18%) and maximum prehypertension(diastolic) n = 37 (18.05%). It also shows that blood group B has maximum stage1 hypertension(systolic) 4 (2%) as well as maximum stage I Hypertension for diastolic blood pressure n = 4(2%). **Conclusion:** Blood group B has the highest tendency to be obese and developed both prehypertension and hypertension. Whereas blood group AB has least chance to develop hypertension and obesity.

Key Words: ABO Blood Group, hypertension, Physiology, Obesity

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Received Date: 04/09/2021 Revised Date: 14/10/2021 Accepted Date: 21/11/2021

Access this article online	
Quick Response Code:	Website: www.medpulse.in
	DOI: https://doi.org/10.26611/1032032

INTRODUCTION

In recent years, hypertension is a major health problem in the world. It has no early specific sign and symptoms, so most of the people have hypertension without knowing it.[1] Hypertension is a condition of sustained increase in blood pressure.[2] According to JNC, systolic 90-119 mm of Hg and diastolic 60-79 mm of Hg is normal blood pressure. Hypertension is a condition where systolic pressure is >120 mm of Hg and diastolic is >80 mm of Hg. Prehypertension (high normal), systolic blood pressure is 120-139 mm of Hg and diastolic is 80-89 mm of Hg. In stage 1 hypertension, systolic blood pressure is 140-159 mm of Hg and diastolic is 90-99 mm of Hg. In stage 2 hypertension, systolic blood pressure is 160-179 mm of Hg and diastolic is 100-109 mm of Hg. In stage 3 hypertension (hypertensive emergency), systolic pressure is ≥180 mm of Hg and diastolic is ≥110 mm of Hg. Isolated systolic hypertension ≥140 mm of Hg and diastolic.[3] Factors like obesity, high cholesterol level, sedentary life style, high fat and low fibers diet are major cause of hypertension.[4] The ABO blood group system was the first human blood group system discovered by Landsteiner in 1900. The ABO blood group system is the only system in which antibodies are consistently and predictably present in the serum of normal

How to cite this article: Hiteshkumar K Solanki, Omnath Yadav, Anita J Gojiya. Relationship between hypertension and ABO blood groups: A cross-sectional study. *MedPulse International Journal of Physiology.* December 2021; 20(3): 22-25. https://www.medpulse.in/Physiology/

individuals whose red cells lack the antigens.[5] The second type of blood group is the rhesus system. There are only two Rh phenotype such as Rh positive and Rh negative, depending on whether Rh antigen is present on the red cell or not. Determination of ABO blood groups is done by detecting A and B antigens. In addition, known red cells are used to detect anti-A and anti-B in the serum, by a process called 'reverse' grouping. The ABO blood group is entirely and inherently heritable, genetically detected at time of conception and became permanent for whole life. Therefore, frequency distribution of ABO blood group following to known pattern was regulated by transmission of gene from one generation to next generation and it differs geographically and racially among human beings.[6] This study intends to find out any effect of different blood groups on development of hypertension.

MATERIAL AND METHODS

The study was done in the Department of Physiology, Tertiary care Institute of India. A total of 200 subjects were studied from April 2019 to December 2019. Blood pressure of all the participants in the study was recorded using mercury sphygmomanometer. Blood pressure of individuals recorded in sitting position after the subject had been rested for at least 5 minutes. Two measurements of Blood pressure recording over the period of at least 3 minutes was obtain on left arm in sitting position by using mercury sphygmomanometer. The blood pressure at which the first Korotkoff sound heard would indicate systolic B.P and the pressure when the sound disappears would indicate diastolic B.P. The blood for blood grouping was obtain by finger prick in aseptic condition and ABO and Rhesus blood group was determine by using anti-sera by slide method. Height in meter and weight in kilogram (kg) of participants were measured to calculate BMI. The formula, weight in kg was divided by height in meter square was used to calculate the BMI of patients and unit is kg/m2. According to WHO (World Health Organization), "Asian Criteria" for BMI cut off point are less than 18.5 is underweight,18.5-22.9 is normal, 23-24.9 is overweight, 25-29.9 is pre-obese, ≥ 30 obese, 30-40 type 1 obese, 40.1-50 type 2 obese and more than 50 is type 3 or super obese.

Statistical analysis

The recorded data was compiled and entered in a spreadsheet computer program (Microsoft Excel 2007) and then exported to data editor page of SPSS version 15 (SPSS Inc., Chicago, Illinois, USA). For all tests, confidence level and level of significance were set at 95% and 5% respectively.

RESULTS

The data of 200 participants were collected and analyzed by chi-square test. The mean age of students is 22.50 years. In total, 104 (52%) were male and 96 (48%) were female. Maximum 70 (35%) had blood group B. Minimum students, 19 (9.9%) had AB blood group. Most common blood group in both sexes was B group. Out of 200 students, 186 students have Rh positive blood group and 14 have negative. Maximum 6 (3%) students had obesity (≥30) was found in students with blood group B. There were no obese students in blood group AB. Students with blood group O were maximum 11 (5.5%) underweight. Maximum overweight (23-24.9) was found in A blood group. And pre-obese were maximum (5.5%) in B blood group. So, tendency of obesity was maximum in B and minimum in AB blood group. Table 3 shows that blood group B has maximum prehypertension (systolic) n = 36(18%) and maximum prehypertension(diastolic) n = 37 (18.05%). It also shows that blood group B has maximum stage1 hypertension(systolic) 4 (2%) as well as maximum stage I Hypertension for diastolic blood pressure n = 4(2%). Students with blood group AB have minimum prehypertension and no stage 1 hypertension for both systolic and diastolic blood pressures.

Table 1: Gender distribution according to blood group of students

Blood Group	Male	Female	Total
A	26 (13)	28 (14)	54 (27)
B	35 (17.5)	35 (17.5)	70 (35)
AB	9 (4.5)	8 (4)	17 (8.5)
O	34 (17)	25 (12.5)	59 (29.5)
Total	104 (52)	96 (48)	200 (100)
Rh(+)	96	90	186
Rh(-)	8	6	14

Table 2: BMI distribution according to blood group

Blood Group	Under weight	Normal	Overweight	Pre-Obese	Obese	Total
A	8	26	11	9	2	54
B	7	36	10	11	6	70
AB	2	13	5	4	0	24
O	11	29	8	4	0	52
Total	**28**	**104**	**34**	**28**	**8**	**200**

Table 3: Systolic and Diastolic blood pressure stages in relation to different blood groups

Blood Group	Normal		Pre-hypertension		Stage I HTN	
	Systolic	Diastolic	Systolic	Diastolic	Systolic	Diastolic
A	28	24	22	23	0	3
B	27	28	36	37	4	4
AB	14	12	7	8	0	0
O	32	27	21	25	0	4

DISCUSSION

This current study showed that the B blood group has more tendency to develop hypertension and obesity followed by blood group O, A and AB. Whereas AB blood group has least chance of getting hypertension and obesity. Similar result were seen in study done in Iran by Abdollahi AA *et al.*[7] In this study, blood group O was the most common type, and AB is least common. A Saudi Arabian study also showed similar result.[8] A study done by Siva KGV had shown different result. That study showed blood group O was more susceptible for obesity. But in current study, blood group B had more prevalence of overweight, obesity and hypertension.[9] A study done by Siva KGV had shown different result. That study showed blood group O was more susceptible for obesity. But in current study, blood group B had more prevalence of overweight, obesity and hypertension.[10] Another study done by Behera Swikruiti showed O blood group was most common type in male and A was common in female. Whereas blood group AB had maximum Body Fat Percentage (BFP) >21% and Waist Hip Ratio (WHR)>0.9.[11] India is a country with a lot of diversity in of race, religion and creed. Hence diversity has been observed in the distribution of blood groups in population within the country. Study from South India showed that blood group O was commonest (38.75%) followed by group B (32.69%), group A (18.85%) and AB (5.27%).[12] Similarly studies in Jammu and Kashmir also showed O to be commonest among ABO group in their population.[13] These results were different from our study where B group was commonest. The ABO blood group system is not only important in blood transfusions, cardiovascular diseases, organ transplantation, erythroblastosis in neonates, but also one of the strongest predictors of national suicide rate and a genetic marker of obesity.[14,15] A significant deficit of group O has suggested that there may be susceptibility to develop osteoarthrosis in normal hip-joint and spinal osteochondrosis.[16,17] The genetic history of a person can be known by studying the blood groups.[18] A study done in Iran showed similar result blood group A was the most common type with high tendency of getting obese and overweight.[19] A study was carried out in medical students of Kasturba Medical College showed tendency of prehypertension was associated with increased BMI. And blood group O was more susceptible to develop hypertension.[20]

CONCLUSION

Blood group B has the highest tendency to be obese and developed both prehypertension and hypertension. Whereas blood group AB has least chance to develop hypertension and obesity.

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Source of Support: None Declared
Conflict of Interest: None Declared