

# Relation of ABO Blood Group and Hypertension in Medical Students of Kathmandu Medical College, Duwakot Bhaktapur

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**Abstract:** ***Introduction:** Hypertension is one of the major health problem in the world. There are many factors like family history to life style are related with hypertension. This study was performed to find out the association of hypertension, ABO blood groups and obesity. **Aim and objective:** To find out the relation of hypertension with blood group in medical students of Kathmandu Medical College. **Methods:** This is a prospective study done in department of Physiology. Total participants were 340. ABO blood group was determined by antigen- antibody reaction. Blood pressure was measured two times by standard mercury sphygmomanometer and mean was calculated for accuracy. Height and weight of students were measured by weight scale and measuring tape to calculate BMI (Body Mass Index). **Results:** In total, 167(49.1%) were male and 173(50.9%) were female. Mean age of students were 20.13. Maximum 112(32.9%) had blood group O. In total, 333 students had Rh++ blood group and 7 had negative. Maximum obesity ( $\geq 30$ ) was found in students with blood group B about 4(1.17%). No obesity in students with blood group AB. Prehypertension is most common 77(22.64%) in students with normal BMI. But, stage 2 hypertension was common 7(2.1%) in pre-obese students. Blood group B was more susceptible with prehypertension and hypertension. **Conclusions:** Blood group B were more susceptible for both prehypertension and hypertension. Prehypertension was seen in maximum with normal BMI students. But stage 2 hypertension was most common in pre-obese. There was highly significant relation of obesity and hypertension ( $P=0.00$ )*

**Keywords:** ABO-blood group, BMI (Body Mass Index), Hypertension, Prehypertension, Rh-blood group

## 1. 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 8, 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  $\geq 180$  mm of

Hg and diastolic is  $\geq 110$  mm of Hg. Isolated systolic hypertension  $\geq 140$  mm of Hg and diastolic  $<90$  [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 discovered by the Austrian scientist Karl Landsteiner in 1900 [5]. Second type of blood group is the rhesus system. There are two Rh phenotypes, Rh positive and Rh negative. It depends on presence or absence of Rh antigen on the red cell membrane.

ABO blood groups are determined by detecting A and B antigens whereas Rh phenotype is by anti-A and anti-B in the serum [6].

Many studies found that the relationship of ABO blood group and various type of diseases are increasing [7]. The ABO system is important genetic make-up of individual which provide valuable information for early detection of diseases and treatment. Which are very useful for saving life of many people [8].

This current study tried to find out the relationship between ABO blood group and hypertension along with obesity.

## 2. Method

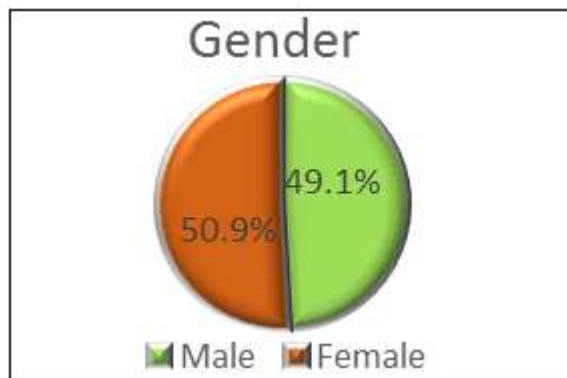
This is a prospective study carried out in 340 medical students in the department of Physiology, Kathmandu Medical College and Teaching Hospital, Duwakot, Bhaktapur, Nepal, during the period of February 2016 to June 2017.

The blood pressure was measured by mercury sphygmomanometer for two times and mean was calculated for accuracy. There was no cases of diagnosed hypertension. Height in meter and weight in kilogram (kg) of students 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  $\text{kg/m}^2$ . 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,  $\geq 30$

obese, 30-40 type 1 obese, 40.1-50 type 2 obese and more than 50 is type 3 or super obese. ABO blood group was determined by antigen- antibody reaction in Physiology Lab. Collected data were compiled and analyzed by using Statistical Package of Social Science (SPSS) software version 16. Chi-square test was used to find group association. P-value of  $< 0.005$  was considered to be highly significant.

### 3. Result

The data of 340 students were collected and analyzed by chi-square test. The mean age of students is 20.13 years.



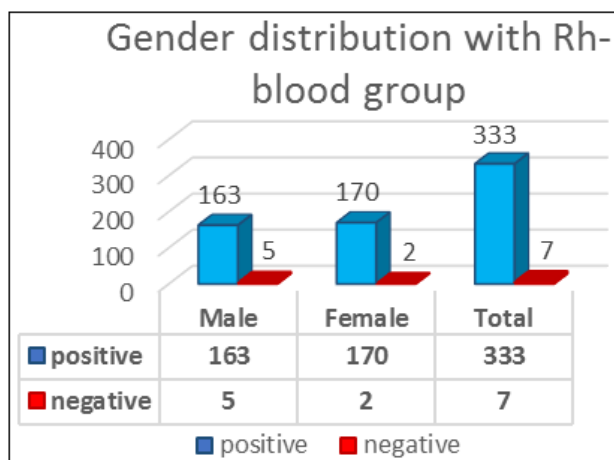
**Figure 1:** Distribution of gender

In total, 167(49.1%) were male and 173(50.9%) were female.

**Table 1:** Distribution of gender in different blood group

Blood Group	Male	Female	Total
A	43(12.6%)	46(13.5%)	89(26.2%)
B	56(16.5%)	51(15.0%)	107(31.5%)
AB	15(4.4%)	17(8.0%)	32(9.4%)
O	53(15.6%)	59(17.4%)	112(32.9%)
Total	167(49.1%)	173(50.9%)	340(100%)

**Table 1:** Maximum 112(32.9%) had blood group O. Minimum students, 32(9.4%) had AB blood group. Most common blood group in male was B and O in female.



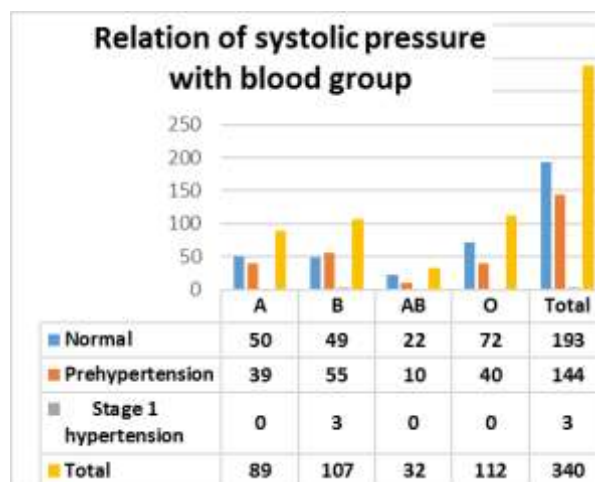
**Figure 2:** Distribution of gender in Rh-blood group type

Rh- blood group, 333 students have Rh-positive blood group and 7 have negative. Five male and 2 female had negative blood group.

**Table 2:** Distribution of blood groups in different BMI (Body Mass Index)

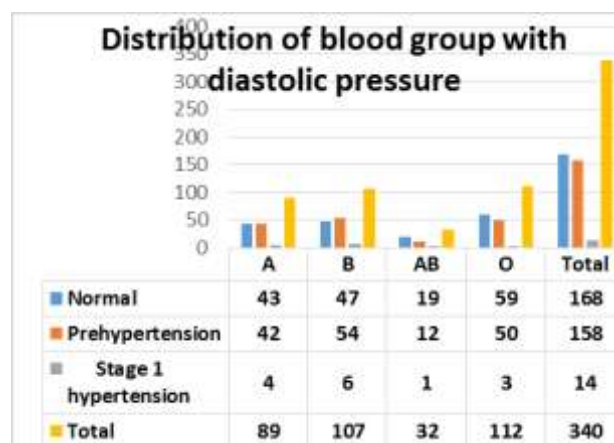
Blood group	Under Weight (<18.5)	Normal (18.5-22.9)	Over weight (23-24.9)	Pre-obese (25-29.9)	Obese ( $\geq 30$ )	Total
A	11	46	20	10	2	89
%	3.23	13.52	5.88	2.94	0.58	26.17
B	10	62	18	13	4	107
%	2.94	18.23	5.29	3.82	1.17	31.47
AB	3	19	6	4	0	32
%	0.88	5.58	1.76	1.17	0.00	9.41
O	20	63	16	12	1	112
%	5.88	18.52	4.70	3.52	0.29	32.94
Total	44	190	60	39	7	340
%	12.94	55.88	17.64	11.47	2.05	100

Maximum 4 (1.17%) obesity ( $\geq 30$ ) was found in students with blood group B. There was no obese students in blood group AB. Students with blood group O were maximum 20(5.88%) underweight. Maximum overweight (23-24.9) were found in A blood group. And pre-obese were maximum (3.82%) in B blood group. So, tendency of obesity was maximum in B and minimum in AB blood group.



**Figure 3:** Distribution of blood group with systolic pressure

**Figure 3:** Showed that blood group B has maximum prehypertension 55(16.2%) and stage1 hypertension 3(16.2%). Students with blood group AB has minimum prehypertension and no stage 1 hypertension.



**Figure 4:** Distribution of blood group with diastolic pressure

It showed that blood group B had maximum 54(15.9%) prehypertension and stage1 hypertension with blood group B, 6(15.9%). Students with blood group AB has minimum 12 (3.5%) prehypertension and 1(0.3%) stage 1 hypertension

**Table 2:** Distribution of BMI with systolic and diastolic pressure.

Systolic Pressure					
Body Mass Index	Normal 90-119/60-79	Pre-hyper tension 120-139/80-89	Stage1 Hyper tension 140-159/90-99	Total	Chi-square test
Under weight (<18.5)	37 (10.9%)	7 (2.1%)	0 (0.0%)	44 (12.9%)	
Normal (18.5- 22.9)	122 (35.9%)	76 (19.7%)	1 (0.29%)	190 (55.9%)	
Over weight (23- 24.9)	20 (5.9%)	40 (11.8%)	0 (0.0%)	60 (17.6%)	0.00
Pre-Obese (25-29.9)	13 (3.8%)	24 (7.1%)	2 (0.6%)	39 (11.5%)	
Obese (≥30)	1 (0.3%)	6 (1.8%)	0 (0.0%)	7 (2.1%)	
Total	193 (56.8%)	144 (42.4%)	3 (0.9%)	340 (100%)	

**Diastolic pressure**

Body Mass Index	Normal 90-119/60-79	Pre Hyper tension 120-139/80-89	Stage1 Hyper tension 140-159/90-99	Total	Chi-square test
Under weight (<18.5)	32 (9.4%)	12 (3.5%)	0 (0.0%)	44 (12.9%)	
Normal (18.5-22.9)	109 (32.1%)	77 (22.6%)	4 (1.2%)	190 (55.9%)	
Over weight (23-24.9)	14 (4.1%)	44 (12.9%)	2 (0.6%)	60 (17.6%)	0.00
Pre-Obese (25-29.9)	12 (3.5%)	20 (5.9%)	7 (2.1%)	39 (11.5%)	
Obese (≥30)	1 (0.3%)	5 (1.5%)	1 (0.3%)	7 (2.1%)	
Total	168 (49.4%)	158 (46.5%)	14 (4.1%)	340 (100%)	

Table 2: Showed prehypertension is maximum with SBP (Systolic Blood Pressure) 77(22.64%) and DBP (Diastolic Blood Pressure) in normal BMI students. Stage1 hypertension was maximum in Pre-Obese students with SBP and DBP 7(2.1%).

## 4. Discussions

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 [9].

In this study, blood group O was the most common type, maximum 112(32.9%) and AB is least common 32(9.4%). A Saudi Arabian study also showed similar result [10].

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 [11]. Another study done by Behera Swikruti 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 [12].

In similar study, showed blood group B had high incidence of obesity and high leptin level [13]. A study was done in Saudi Arabia by Aboel Fetoh, which showed no statistically significant association among overweight, obesity and blood group [14].

Similar study showed the most common type of blood group was A. which was associated with higher incidence of high serum cholesterol level, HTN and DM but no significant association [15]. A study done in Iran showed similar result blood group A was the most common type with high tendency of getting obese and overweight [16]. 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 [17].

## 5. Conclusions

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

## 6. Acknowledgement

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