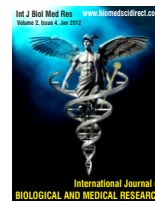




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### Original Article

## A study of incidence of hypertension in ABO and rhesus blood group system

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#### ABSTRACT

Hypertension may be defined as the sustained elevation of systemic arterial pressure to a level that places the patients at increased risk for target organ damage. According to most accepted in place of opinion classification the sustained systemic arterial pressure. More than 140/90 mm Hg should be considered hypertensive and should get treatment. Individuals are grouped as either RH 'positive' or RH 'negative' based upon the presence or absence of the major D antigen on the surface of their red blood cells, and more than 46 other antigens, including the CcEe series, have been identified. Using Southern blot analysis, it has been determined that the RH locus is composed of two homologous structural genes, one encoding the RH D polypeptide and the other encoding both the Cc and the Ee polypeptides. These findings provide support for linkage and association of the hypertension gene locus to hypertension in that descent and suggest some similarities in the genetic basis of essential hypertension in populations of different ethnicity. The four groups are determined by presence or absence of antigen A ( $\beta$ ) and/or antigen B ( $\gamma$ ) on the red blood cells, and therefore, an individual is either group A, B, AB or O (O denoting the absence of antigen A and antigen B). In addition it has been shown that, corresponding to the antigens 'A' and 'B', there are antibodies anti-A ( $\alpha$ ) and anti-B ( $\beta$ ) which occur as agglutinins in the sera of individuals whose red cells lack the corresponding antigen. This study was taken up as there was no clear data on relation between hypertension and ABO and Rhesus blood group system.

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### 1. Introduction

Definition of hypertension is difficult and by necessity it is arbitrary. Sir George Pickering first formulated a concept that blood pressure in a population is distributed continuously as a bell-shaped curve with no real separation between normo tension and hypertension. Again hypertension may be defined as the sustained elevation of systemic arterial to a level that places the patients at increased risk for target organ damage [1-20]. According to most accepted opinion the sustained systemic arterial pressure. More than 140/90 mm Hg should be considered hypertensive and should get treatment. In other words, hypertension is defined as sustained increase in blood pressure exceeding 140 over 90 mm Hg. Landsteiner discovered the phenomenon of allow-agglutination in 1900 [16-33]. In 1901, he published the results of experiments which made it possible to divide the population into 3 groups, which he called A, B and O. A year later the existence of a fourth, less common group AB was established. This marked the beginning of the whole subject of blood transfusion practicable and for this reason; Landsteiner was awarded Nobel Prize in 1930. The four

groups are determined by presence or absence of antigen A( $\alpha$ ) and/or antigen B( $\gamma$ ) on the red blood cells, and therefore, an individual is either group A, B, AB or O (O denoting the absence of antigen A and antigen B) [30-45]. In addition it has been shown that, corresponding to the antigens 'A' and 'B', there are antibodies anti-A ( $\alpha$ ) and anti-B ( $\beta$ ) which occur as agglutinins in the sera of individuals whose red cells lack the corresponding antigen.

### 2. Materials and Methods

This study was carried out in two groups of subjects to determine the association between blood groups and hypertension.

**Control group:** - This group consisted of normal healthy subjects in specific age group of 20-70 years. Both males and females were included in this group Normal healthy subjects attending general medicine outpatient department, Meenakshi General Hospital, Enathur who were selected for the control group. The controls were age and sex matched.

**Study group:** - These groups consist of specific group of patients suffering with essential hypertension and attending general medicine, Outpatient department, Meenakshi general hospital, Enathur. The patients were in the age group of 20-70 years with essential hypertension. Study group included both male and female subjects.

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**Size of sample:** - Both the control and study group consisted of 800 subjects of this 418 subjects, were males and 382 subjects were females. In control group, 141 subjects were males, 159 were females. In the study group, 277 subjects were males and 223 subjects were females.

**Inclusion criteria:** - The subjects whose blood pressure was more than 140/90 mm Hg were included in the study group. Only normal healthy subjects whose systolic blood pressure in the range of 110-139 mm of Hg, and diastolic blood pressure in the range of 60-89 were included in the control group.

**Exclusion criteria:-** Subjects with Diabetes mellitus type-1 and type-2 were not included and subjects suffering from renal hypertension whose serum creatinine levels above 1.5 g/dl were not included in the study in the study.

**2.1. Subjects from both the groups were tested for following tests:**

*1) Determination of ABO and Rh blood group:*

**Procedure:** Blood group is determined by slide haemagglutination technique. 2-5% suspension of red blood cells was prepared in normal saline (0.85g/dl sodium chloride in distilled water) Preparation method given below. Mix 1 drop of blood with 1 ml of normal saline. This provided the red cell suspension. On one half of glass slide, one drop of Anti-A (Blue color)-human poly clonal or murine monoclonal blood grouping serum was placed. On the other half of a glass slide one drop of Anti-B (yellow color)-human poly clonal or murine monoclonal blood grouping serum was placed. Using a Pasteur pipette one drop of red blood cell suspension was added to each half of the slide. With separate applicator, the serum was well mixed back and forth and observe for agglutination.

**Interpretation of Result:**

Reagents		Interpretation
Anti-A	Anti-B	
+	-	AB
-	+	B
+	+	AB
-	-	O

**Key: + = Agglutination, = No agglutination**

*ii) Determination of Rh group :-* Rh factor determined using same procedure on a clean glass slide by placing one drop of Anti-D serum is placed by using Pasteur pipette and then one drop of whole blood is added to Anti-D sera and with the help of applicator stick cell serum mixture was finally mixed well. Then the slide was tilted back and forth and observed for agglutination. Then the tests that showed no agglutination within two minutes were considered negative.

**Determination of blood pressure:** - Blood pressure was recorded in the hypertensive's and normal individuals by the Plapatory & Auscultator methods introduced by Riva Rocci.

**3. Results**

This study to identify the association between blood groups and hypertensive was carried out on 800 subjects, out of which 500 are hypertensive and the remaining 300 were controls, who were

randomly selected and examined for their ABO and Rh status. The results are shown in tables, all comparisons between hypertensive in ABO blood groups and Rh system were statistically analyzed by X<sup>2</sup> test.

**4. Discussion**

Please refer vide Table- I and fig- I. It appeared that the incidence of hypertensive was increased by 3% in blood group 'B' and it showed a decrease in the people having in blood group 'A'. On statistical analysis it is not significant (p>0.05). Therefore it can be concluded that there is no association between ABO blood groups and essential hypertension, in other words it is not genetically related. Please refer vide Table-II and fig-II. That shows in controls and hypertensives. It is observed in control group that, the percentage of females in blood group 'O', 'B' and 'AB' has increased. But however, this is statistically not significant p is>0.05. Therefore it that incidence of various blood groups in the two genders does not vary significantly, in other words inheritance of ABO blood group is not related to gender. So in hypertensive group it is observed that the incidence of O, A and B blood group is reduced. But it was not statistically significant. (P>0.05). It has been observed that in different regions of the world, there was specific ABO blood group distribution. Blood group O was the most common group on India as evident from various studies. More than 60% of the population in India has blood group A and O. The least common group is AB blood group. Similar pattern was also seen in IHD patients. In USA, England, Africa, Australia and Saudi Arabia majority of the people have blood A and O. Mean age was found to be almost similar in different ABO blood group in our study. Similar results were seen other studies. Sex distribution had no significant association with the blood group. The recent studies have also shown similar results. Although numerous studies have revealed genetic influences on blood pressures, only recently have genetic influences on physiological mediators been defined and genetic markers have not been identified.

Our results are in consistent with the recent studies. Therefore this study shows that there was no correlation between tendencies for developing hypertension with a particular blood group. Further investigations in other settings with much larger study population are necessary to more fully elucidate these findings. Our study also suggests that hypertension is not related to blood group or any gender. It was also observed that the percentage of Rhesus negative (Rh -ve) individuals in the hypertensive's was increased by 6% and it was found to be statistically significant. This interesting correlation has to be explored further.

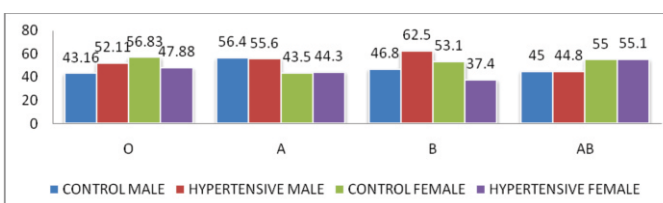
**TABLE - I : Distribution of ABO blood groups in Controls and in Hypertensives**

Blood Group	Control	Hypertensive	Total
O	139(46.3%)	236(47.2%)	375
A	62(20.6%)	88(17.6%)	150
B	79(26.3%)	147(29.4%)	226
AB	20(6.66%)	29(5.8%)	49
TOTAL	300	500	800

DF = 3, X<sup>2</sup> = 1.8252

0.95 > p > 0.05, NONSIGNIFICANT

**Fig-1. Distribution of ABO blood groups in controls and hypertensive**



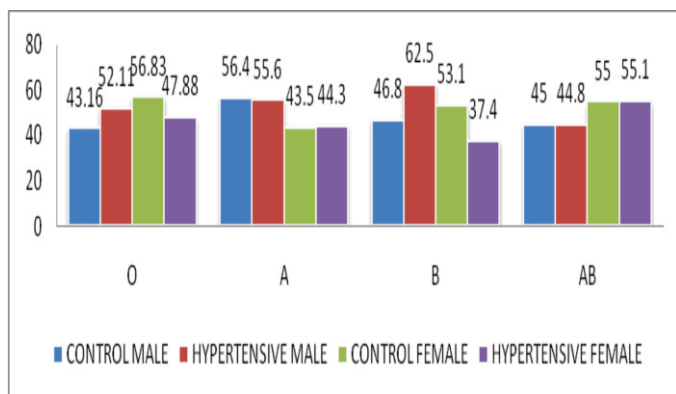
**TABLE - II. Distribution of ABO blood groups in Control and in Hypertensive's in the both gender**

Blood Group	Control			Hypertensive		
	Male	Female	Total	Male	Female	Total
O	60 (43.16%)	79 (56.83%)	139 (46.30%)	123 (52.11%)	113 (47.88%)	236 (47.20%)
A	35 (56.40%)	27 (43.50%)	62 (20.60%)	49 (55.60%)	39 (44.30%)	88 (17.60%)
B	37 (46.80%)	42 (53.10%)	79 (26.30%)	92 (62.50%)	55 (37.40%)	147 (29.40%)
AB	9 (45%)	11 (55%)	20 (6.66%)	13 (44.80%)	16 (55.10%)	29 (5.80%)
TOTAL	141 (47%)	159 (53%)	300	277 (55%)	223 (45%)	500

DF=3  
 $X^2 = 3.0766$   
 $P > 0.05$   
 NONSIGNIFICANT

DF=3  
 $X^2 = 5.4139$   
 $P > 0.05$   
 NONSIGNIFICANT

**Fig - II : Distribution of ABO blood groups in Control and Hypertensives in both the gender**

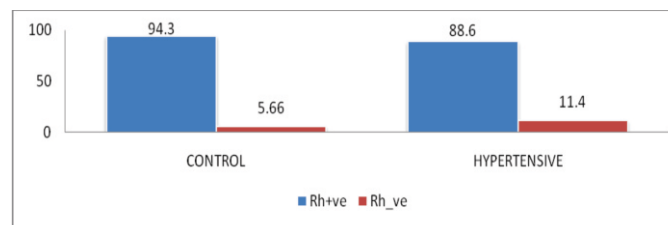


**TABLE - III: Distribution of Rh factor in Normal Controls and in Hypertensives**

Rh Factor	Control	Hypertensive	Total
Rh+ ve	283(94.3%)	443(88.6%)	726
Rh- ve	17(5.66%)	57(11.4%)	74
TOTAL	300	500	800

DF = 1,  $X^2 = 7.34211$   
 $0.01 > p > 0.005$   
 SIGNIFICANT

**Fig - III (Please vide table-3) Distribution of Rh factor in Controls and Hypertensives**

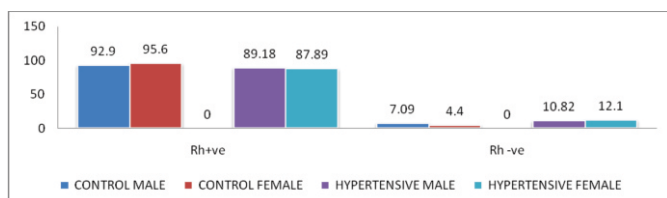


**TABLE - IV. Distribution of Rh factor in both sex, in Controls and in Hypertensives**

Blood Group	Normal Control			Hypertensive		
	Male	Female	Total	Male	Female	Total
Rh+ ve	131 (92.90%)	152 (95.60%)	283 (94.30%)	247 (89.18%)	196 (87.89%)	443 (88.60%)
Rh -ve	10 (7.09%)	7 (4.40%)	17 (5.66%)	30 (10.82%)	27 (12.10%)	57 (11.40%)
Total	141 (47%)	159 (53%)	300	277 (55%)	223 (45%)	500

DF=1  
 $X^2 = 0.000045$   
 $0.995 > p > 0.99$   
 NON SIGNIFICANT

DF=1  
 $X^2 = 0.19955$   
 $0.95 > P > 0.05$   
 NON SIGNIFICANT

**Fig - IV. Distribution of Rh factor in both sex, in Controls and in Hypertensives**

## 6. References

- [1] Aird I, Bentall H, Mehigan JA, et al. Blood groups in relation to peptic ulceration and carcinomas of colon, rectum, breast and bronchus. *BMJ* 1954; 2: 315-321.
- [2] Aird Ian, Bentall HH, Bingham J. An association between blood group A and pernicious anaemia. *BMJ* 1956; 2: 723-724.
- [3] Aird J, Bentall HH, Roberts JA. A relationship between cancer stomach and ABO blood groups. *BMJ* 1953; 1: 1953.
- [4] Aird, I, Bentall, H.H Mehigan JA. And Fraser Roberts et al, the blood groups in relation to peptic ulceration and carcinoma of colon, rectum, breast and bronchus. *Brit.Med.J.* 1954; 2:315.[5] Aird, I, Fraser Roberts J.A. A relationship between cancer of stomach and the ABO blood group *Brit.Med.J.*, 1953, 1:799.
- [6] Ball PAJ. Influence of secretor and Lewis genes on susceptibility to duodenal ulcer. *Brit. Med. J.* 1962; 2: 948-950.
- [7] Beg M, Singh M, Mehmood O, et al. A study of ABO blood groups and Ischaemic heart disease in men. *Ind J. Physiol & Allied Sci.* 2001; 55: 39.
- [8] Borecki IB, Eiston RC, Rosenbaum PA, Srinivasan SR, Berenson GS. ABO associations with blood pressure, serum lipids and lipoproteins, and anthropometric measures, *Hum Hered*, 1985; 35: 161-170.
- [9] Braunwald, Fausi, Kasper, Hauser, Longo, Jameson, Harrison's principles of internal medicine 14th edition volume 2, MC Graw Hill publication 1998. Page no: 2074-2075 and page no: 2142-2143.
- [10] Buchanan JA and Higley ET. Relationship of blood groups to disease. *Brit. J. Exper path* 1921; 2: 247-255.
- [11] Buckwalter JA, Wohlwend EB, Colter DC, et al. ABO blood groups and disease. *JAMA* 1956; 162 (13): 1210-1215.
- [12] Callender ST, Denborough MA, Sneath J. Association between blood group A and pernicious anaemia. *Brit. J. Haemat* 1957; 3: 107.
- [13] Clarke CA et al. Relationship of ABO groups to Duodenal and Gastric ulceration. *BMJ* 1955; 2: 643-646.
- [14] Clarke CA, Edwards JW, Haddock DR, et al. ABO blood groups and secretor character in duodenal ulcer population and sibship studies. *BMJ* 1956; 11(2): 725-731.
- [15] Clarke CA, Evans DAP, MC Connel RB, et al. Secretion of blood group antigens and peptic ulcer. *BMJ* 1959; 1: 603-607.
- [16] Dickey W, Collins JS, Watson RG, et al. Secretor status and Helicobacter pylori infection are independent risk factors for gastro-duodenal disease. *Gut* 1993; 34: 351 - 353.
- [17] Edelman L, Bach JF, Reviron J. Monoclonal antibodies against blood group antigens. *Dev. Biol. Stand* 1984; 57: 43-47.
- [18] Fox MH, Webber LS, Thurmon TF, Berenson GS. ABO blood group associations with cardiovascular risk factor variables, 11; blood pressure, obesity, and their anthropometric co variables. The Bugalusa heart study *Hum Biol.* 1986; 58: 549-584.
- [19] Ganong, William F: "Review of medical physiology", twenty first edition.
- [20] Glynn LE, Holborow. Distribution of blood group substance in human tissues. *Brit. Med. Bull* 1959; 15: 150-157.
- [21] Gupta YN, Gupta S, Sanyal B. Blood group specific substances in saliva of patients with cervical carcinoma. *Int J Gynaecol obstet* 1981; 19: 83-84.
- [22] Guyton and Hall text book of medical physiology, 10th edition, Saunders Harcourt India 2000, page no; 789.
- [23] Guyton, A.C., et al., Arterial pressure and Hypertension, Saunders, Philadelphia, 1980.
- [24] Hubbell, R.C., ed., Advances in Blood Transfusion, Am. Blood Comm., Arlington, Va., 1979.
- [25] Hurkat PC, Mittal SR, Gupta SN. ABO blood groups and susceptibility to diseases. *J Indian Med. Ass.* 1971; 57(12): 445-447.
- [26] James, D.G., ed., Circulation of the blood, Univ. Park press, Baltimore.
- [27] Keele CA, Neil E, Joel's N, Samson Wright's applied physiology, 13th edition, oxford, New York, Auckland; CX ford medical publications; 2000:47.
- [28] Kingbury KJ relation of ABO blood groups to atherosclerosis. *The Lancet* 1971; 1:1 99-203.
- [29] Koster KH, Sindrup E, Seele V. ABO blood groups and Gastric acidity. *Lancet* 1955; 11(2): 52-55.
- [30] Landsteiner K, Weiner AS. An agglutinable factor on human blood recognized by immune sera for rhesus blood. *Proceedings of the society for Experimental Biology* 1940; 43: 223.
- [31] Mc Neil, Crichton, Trentelman EF, et al. Aberrant secretion of salivary A, B and H group substance in human beings. *Am.J. Clin. Path* 1957; 28: 145-151.
- [32] Medalie JH Papier BA, Goldbourt U, Leven C, Bregfuss F, Oron D, et al: Blood groups and hypertension. *Isr J Med sci.* 1973; 9:989-994.
- [33] Miller JZ, Grim CE, Connally PM, Weinberger MH. Association of blood groups with essential and secondary hypertension. A possible association of the MNS system. *Hypertension*, 1971; 1: 493-497.
- [34] Mohn, J.F., et al., ed., Human Blood Groups, Karger, New York, 1960.
- [35] Mollison PL, Engelfriet CP and Contreras M. "Blood Transfusion in clinical Medicine." 1007, 10th edition. Blackwell Science, oxford, UK.
- [36] Morgan WTJ. Some aspects of the biochemistry of human blood group substances. *Brit. Med. Bull* 1959; 15: 109-113.
- [37] Nance WE, Kreger H, Azeveda E, MIMP. Human blood pressure and the ABO blood group system an apparent association. *Hum BIO/.* 1965; 37:238-244.
- [38] Oliver MF, Geizerova H, Cumming RA, Heady Journal. Serum cholesterol and ABO and Rhesus blood groups. *Lancet.* 1969; 2: 605-606.
- [39] Pike LA, Dickens AM, Richardson JR, et al. Further observations on ABO blood group frequencies and Toxaemia of pregnancy. *BMJ* 1956; 1: 776-777.
- [40] Race, RR & Sanger, R., Blood groups in man, 5th ed., Blackwell, Oxford, 1977.
- [41] Roberts JAF. Some associations between blood groups and disease. *Brit. Med Bull.* 1959; 15: 129-133.
- [42] Roy D H Max well, Katharine N Max well. ABO blood groups and hypertension. *British medical journal*, 1955; 179-180.
- [43] Shepherd, J.T & Vanhoutte. P.M., the Human Cardiovascular System, Raven, New York, 1979.
- [44] Srivastava DK, Thakur CP and Das M. ABO blood groups in relation to ischaemic heart disease *Indian heart journal.* 1966; 18:140-149.
- [45] Tyagi SP, Hameed Sami. Secretion of blood group specific substances in body fluids. *Indian J. Med. Res* 1970; 58: 1226-1233.