



Study on the Incidence of Hypertension and Migraine in ABO Blood Groups

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Abstract

Present study was designed to assess the distribution patterns of blood groups in district Kangra of Himachal Pradesh and their relationship with hypertension and migraine. The data of age, sex, ABO blood type and pathological status of patients of different diseases i.e. hypertension and migraine (252 hypertension patients i.e. 165 males and 87 females, and 263 migraine patients i.e. 99 males and 164 females) were collected from various zonal hospitals at Kangra, Dharamshala, Palampur and Dr. R.P. Medical College, Tanda, Kangra, H.P (India) and from the individuals by scheduling, interviewing and questionnaire methods. The control sample was taken from the blood bank donors. The distribution pattern of ABO blood groups was B (35.269%) > O (26.409%) > A (24.121%) > AB (14.201%). The phenotypic distribution in blood groups A, B, AB and O was found to be 0.2412, 0.3527, 0.2641 and 0.1420, respectively. The incidence of hypertension was found to be highest in blood group O (43.25%) followed by group A (27.78%), group B (22.62%), group AB (6.35%). The frequency of migraine was highest in blood group O (30.03%) followed by group A (29.28%), then group B (28.52%) and group AB (12.17%). The relative risk for hypertension and migraine was found to be highest in group O and lowest in group AB. From the present study it was concluded that blood group B is the most prevalent in district Kangra of Himachal Pradesh and least prevalent is AB.

Key words: ABO blood group, hypertension, migraine.

Introduction

The ABO blood group system was the first human blood group system to be discovered¹. Most geneticists believe that genetic factors are involved in susceptibility and resistance to many “non-mendelizing” human diseases. It seems, therefore, reasonable to look for disease associations among genetic polymorphisms and a great deal of work has already been done with blood groups in this field. Since the discovery of the ABO blood groups by Landsteiner and his pupils comprehensive work have accumulated in the literature on the relation of ABO blood group to blood transfusion, on its anthropological and genetic applications, on its use in medico legal, identification on disputed paternity and, on its significant association with the relative susceptibility to various diseases.

The vast interest arising out of a blood group lies in the fact that the character of the ABO blood groups is exclusively and integrally heritable, genetically determined at conception and remain fixed for life, hence its frequency distribution follows a known pattern governed by gene transmission from generation to generation and varies with the race and geographical distribution of human being². The ABO blood type, an easily accessible factor in patient's genetic make-up has been associated with many diseases, though the explanation for the association between ABO blood groups and some diseases is still unclear. Blood cellular genes and gene aberrations may be associated with the diseases³.

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 normotension 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 damage⁴⁻¹⁴. 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. Migraine is a common subtype of headache. Migraine and hypertension are common conditions that frequently coexist.

Material and Methods

The present study was carried out in the Department of Biology and Environmental Sciences, College of Basic Sciences, CSK Himachal Pradesh Krishi Vishwavidyalaya, Palampur, H.P. Kangra is the most populated district of Himachal Pradesh, India with a total population of approximately 13, 38,536, an area of 5,739 sq km and sex ratio of 970:1000 (female: male). Data pertaining to the ABO and Rhesus blood groups of 4063 donors were collected from district Kangra. The donors of both the sexes were tested for their blood groups using Anti-A, Anti-B and Anti-D anti sera. Rhesus negative groups were confirmed by two potent monoclonal IgM Anti-D anti sera. Grouping was carried out at all hospital blood banks affiliated with the Dr. R. P. Medical College, Tanda, District Kangra, Himachal Pradesh and civil hospitals/ dispensaries located in the district.

The data of age, sex, ABO blood type and pathological status of patients of different diseases i.e. hypertension and migraine were collected from various zonal hospitals at Kangra, Dharamshala, Palampur and Dr. R.P. Medical College, Tanda, Kangra, H.P (India) and from the individuals by scheduling and interviewing methods.

ABO Methodology: The antisera used for blood grouping in this study were provided by monosera. Monosera immunoglobulins are produced from individual cell lines; hence they are identical in their chemical structure and biological activity.

Principle: Human red cells possessing A and/or B blood group antigen(s) were agglutinated by monosera directed towards respective antigen(s) indicating a positive test result. Absence of agglutination of red cells with monosera indicates a negative test result and therefore absence of corresponding antigen(s). Absence of both A and B blood group antigens are indicative of blood group O. The blood samples were tested immediately after collection, in case of delay in testing the sample was stored at 2°C to 8°C up to two days.

The blood group frequencies and incidence of various diseases in different blood groups were compared using Chi-square (χ^2) test for their independence. The data were tested for their significance using χ^2 test of significance.

Results and Discussion

For the assessment of distribution pattern of ABO blood groups a population of 4063 donors was taken. This population was taken as control. A population of 252 hypertension patients was taken to identify the relationship of ABO blood groups with hypertension. For migraine a population of 263 patients was taken. The results are shown in tables and figures. All comparisons between hypertension and migraine in ABO blood groups were statistically analyzed by χ^2 test.

The ABO blood group distribution varies in different geographical and ethnic groups, and socio-economic groups¹⁵. In India, the ABO blood group frequency is variable, the frequency for B ranges from 6 % in negritos of Andamans to 48 % in Birijas of Bihar while A group is 20-30 % in Western and Eastern Himalayas¹⁶. The blood group frequency in North India is B>O>A>AB¹⁷. The state of Punjab in North India is inhabited by a mixed population of Caucasian and Indoscythian racial stock, and the blood group frequency in Punjab is B (34-39 %) > O (30.0-31.5 %) > A (20 %) > AB (7.8 %)¹⁷.

It was found that blood group B was most prevalent in district Kangra (35.27 %), followed by blood group O (26.41 %), then group A (24.12 %) and least prevalent was group AB (14.20 %). Among all the Rhesus positive donors blood the trend for

prevalence was B (32.734 %) > O (24.588 %) > A (21.364 %) > AB (12.675 %). Among Rhesus negative donors it was A (2.757 %) > B (2.535 %) > O (1.821 %) > AB (1.526 %) as shown in table-1, figure-1.

Association of Blood groups with Hypertension: Figure-2 shows that in hypertensive patient's maximum incidence for the disease was found in blood group O and minimum in group AB. In Rh+ve individuals maximum incidence was found in blood group O and minimum in AB. In Rh-ve individuals maximum incidence was found in group O and minimum in group AB as shown in table-2. The disease was found to be statistically associated with blood groups.

Earlier studies observed that individuals of African descent with elevated BP had a significantly higher frequency of low-renin hypertension when compared with European hypertensives. Although the reason for the possible protective effect of the A antigen is not well understood, it may be speculated that since blood pressure is multifactorial, perhaps the ABO antigens play a role by influencing renin levels and affecting plasma angiotensin and aldosterone secretion, thus indirectly influencing arterial pressure^{18,21}.

Maxwell and Maxwell found that the chances of hypertension in Glasgow were highest in blood group O patients (53.04%), followed by A (33.62%), then B (11.02%) and lowest were in AB (2.32%)¹⁹. Alam *et al.* observed no significant difference in systolic and diastolic blood pressure among all blood groups²⁰. However, significant differences existed between the two sexes within blood group O for systolic blood pressure, A and O groups for diastolic blood pressure. Significant differences in systolic blood pressure were found between A+ve and O+ve phenotypes only. A-ve males had lower systolic blood pressure than O-ve males.

Previous investigators have reported higher diastolic pressures in subjects with blood group O than in their siblings with other ABO blood types from a study of 5777 members of 1068 Brazilian families. The importance of genetic factors in familial aggregation of blood pressure level has been shown repeatedly. Previous investigators have reported higher diastolic pressures in subjects with blood group O than in their siblings with other ABO blood types from a study of 5777 members of 1068 Brazilian families²¹.

Association of Blood Groups with Migraine: Migraine is a common subtype of headache. Epidemiological studies have revealed that migraine could be an independent risk factor for ischemic stroke even in elderly subjects. Arterial stiffness is one of the major pathophysiological bases of stroke.

Figure-3 shows that in migraine patient's maximum incidence was found in blood group O and minimum in blood group AB.

The incidence for the disease was highest in group B in case of Rh+ve individuals and lowest in group AB. In case of Rh-ve individuals maximum incidence for the disease was found in group A and minimum were in group AB as shown in table-3. The disease was found to be statistically not associated with ABO blood groups.

The absence of both the antigens and presence of both A and B antibodies may be responsible for higher incidence of migraine. When any of the two antigens or antibodies is absent the chances for the occurrence of the disease may decrease. As both the antigens are present or both the antibodies become absent the chances for the disease may decrease. Thus, both the antibodies i.e. A and B antibodies may have a cumulative effect on the occurrence of migraine.

Migraine and hypertension are common conditions that frequently coexist. The relationship between the two is usually coincidental, but some evidence suggests that poor control of blood pressure may exacerbate the frequency and severity of migraine²². Thus, the results of the present study may be explained on the basis of the above findings that migraine and hypertension co-exist and hence occurrence of the two in the same blood groups i.e. in blood group O.

Conclusion

This study shows that blood group B is the most prevalent blood group in the district Kangra of Himachal Pradesh. Frequency of occurrence of hypertension was found to be highest in blood group O. Similarly the frequency of occurrence of migraine was found to be highest in group O. Earlier studies show that migraine and hypertension coexist. Thus, from the present study we speculate that since blood pressure is multifactorial, perhaps the ABO antigens play an indirect role in influencing arterial pressure and migraine. However, further global epidemiological and genetic studies are needed to be carried out.

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Table-1
Frequency distribution of Rh and ABO blood groups

Blood groups	Number of male donors	Number of female donors	Total number of donors
A+	592 (14.571%)	276 (6.793%)	868 (21.364%)
A-	64 (1.575%)	48 (1.181%)	112 (2.757%)
B+	911 (22.422%)	419 (10.312%)	1,330 (32.734%)
B-	83 (2.043%)	20 (0.492%)	103 (2.535%)
AB+	364 (8.959%)	151 (3.716%)	515 (12.675%)
AB-	42 (1.034%)	20 (0.492%)	62 (1.526%)
O+	666 (16.392%)	333(8.196%)	999 (24.588%)
O-	55 (1.354%)	19(0.468%)	74 (1.821%)
Total	2777 (68.35%)	1286 (31.65%)	4063 (100%)

Table 2
Frequency of distribution of Rh and ABO blood groups in Hypertension patients

Blood groups	Number of male patients	Number of female patients	Total number of patients
A+	41 (16.26%)	17 (6.75%)	58 (23.02%)
A-	07 (2.78%)	05 (1.98%)	12 (4.76%)
B+	14 (5.56%)	19 (7.54%)	33 (13.1%)
B-	11 (4.37%)	13 (5.16%)	24 (9.52%)
AB+	04 (1.59%)	08 (3.17%)	12 (4.76%)
AB-	00	04 (1.59%)	04 (1.59%)
O+	45 (17.86%)	14 (5.55%)	59 (23.41%)
O-	43 (17.06%)	07 (2.78%)	50 (19.84%)
Total	165 (65.48%)	87 (34.52%)	252 (100%)

Table-3
Frequency distribution of Rh and ABO blood groups in Migraine

Blood groups	Number of male patients	Number of female patients	Total number of patients
A+	35 (13.31%)	26 (9.89%)	61(23.20%)
A-	04 (1.53%)	12 (4.56%)	16 (6.09%)
B+	23 (8.75%)	50 (19.01%)	73 (27.76%)
B-	00	02 (0.76%)	02 (0.76%)
AB+	14 (5.32%)	17 (6.46%)	31 (11.79%)
AB-	01 (0.38%)	00	01 (0.38%)
O+	21 (7.98%)	50 (19.01%)	71 (26.99%)
O-	01 (0.38%)	07 (2.66%)	08 (3.04%)
Total	99 (37.64%)	164 (62.36%)	263 (100%)

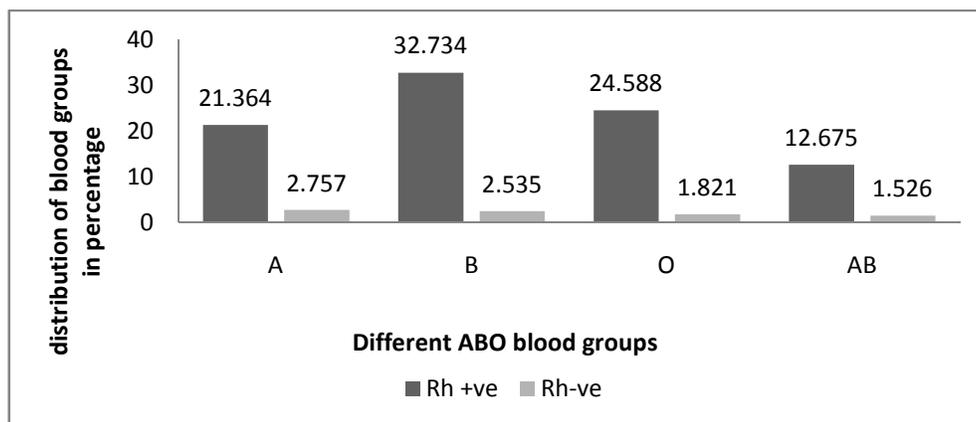


Figure 1
 Distribution of ABO and Rh blood groups

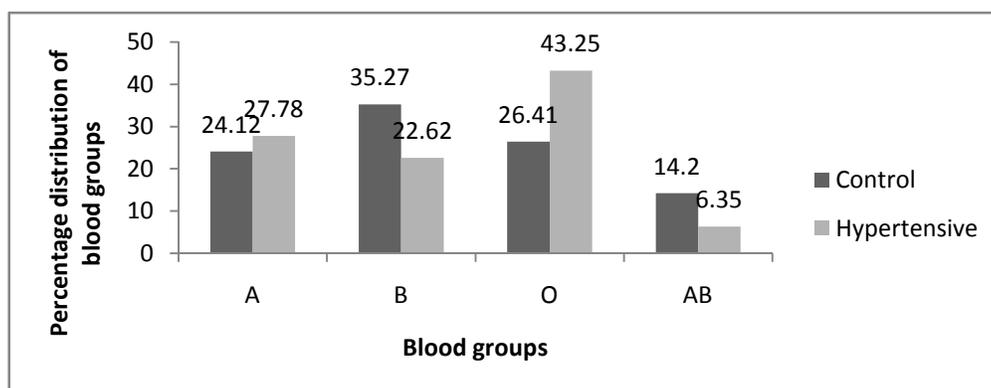


Figure 2
 Distribution of ABO blood groups in Control and Hypertensives
 DF=3, P> 0.01 Significant

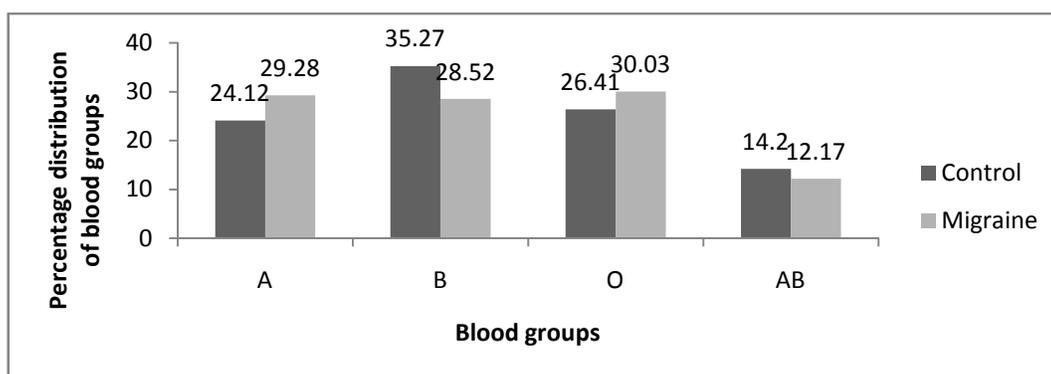


Figure-3
 Distribution of ABO blood groups in Control and Migraine
 DF= 3, P>0.01 Not Significant