Original Article

Trend of blood groups and Rh Factor in the twin cities of Rawalpindi and Islamabad

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Abstract

Objective: To determine the prevalence of different blood groups and Rh factors in a random population sample from urban and rural areas of Rawalpindi and Islamabad region of Pakistan.

Methods: Blood group and Rh factor determination was carried out by the antigen-antibody agglutination test from October 2003 to October 2004, and encompassed 2518 subjects.

Results: The percentages of various groups among male and female subjects, respectively, were recorded as 27.01% and 24.02% (for blood group A), 33.75% and 32.87% (for blood group B), 8.93% and 11.20% (for blood group AB) and 30.31% and 31.91% (for blood group O). The Rh positive and negative distribution in the studied population was 92.45% and 7.55% respectively.

Conclusion: The determination of the frequency of blood groups in the region would not only help in blood transfusion services, but also eliminate the risk of erythroblastosis foetalis in the neonates (JPMA 56:299;2006).

Introduction

Blood is the most important body fluid, which is responsible for circulation of important nutrients, enzymes, and hormones all across the body, besides the most critical substance, oxygen. The human red blood cell membrane contains different types of polysaccharide antigens, called agglutinogen.[1] The antigenic substances are capable of inducing a specific immune response[2] and that specific response results in the production of cells termed as antibodies.[3] Blood carries several antigens within it, which form the basis of its reactivity and hence it is not possible to mix the blood of all humans without initiating an immune reaction. Only the blood samples, which share the same antigenic identity, do not initiate an immune response, and hence are termed as compatible. The utility of these antigens is not only for blood transfusion or organ transplantation, but have also been utilized in genetic research, anthropology and tracing of ancestral relation to human beings.[4]

Blood is man's complete and unchangeable identity. Although almost 400 blood grouping antigens have been reported, the ABO and Rh is recognized as the major (clinically significant) blood group antigens. This system derives its importance from the fact that A and B are strongly antigenic and anti A and anti B occur naturally in the serum of persons lacking the corresponding antigen, these antibodies being capable of producing haemolysis in vivo.[5] ABO blood group system was the first human blood group system, while Rhesus blood group system was the fourth system, out of 15 most important systems discovered and yet it is the second most important blood group from the point of view of transfusion.[6]

Karl Landsteiner was the first person to put forward the ABO blood group system in 1900.[7,8] After 40 years (1940-1941), Landsteiner and Wiener discovered that blood group antigens could be recognized with specific antisera and a vast number of antigens have been detected on human blood cells, of which about 10-15% from well-defined systems and only 1-2% play a significant role in blood transfusion. These blood group antigens are divided into many blood group systems. Each of this system is inherited quite independently from all the other systems.[3,6,9] Human blood antigens may either be erythrocytic, leukocytic or platelet related.[10]

The need for blood group prevalence studies is multipurpose, as besides their importance in evolution; their relation to disease and environment is being increasingly sought in modern medicine.[4,11] Blood group antigens are not only important in relation to blood transfusion and organ transplantation, but also have been utilized in genetic research, anthropology and training ancestral relation of humans.[4]

Blood grouping has improved with the advent of monoclonal antibodies and the automation of tests. Although different advanced techniques, such as micro plate method, PCR based, FMC based typing, mini

sequencing analysis, fluorescent immuno microplate technique, sandwich ELISA method, etc., for ABO genotyping are available, but manual method has its own significance not only in blood typing but also measuring its genotypic frequency by Hardy-Weinberg Law, with no additional costs in the areas with limited access to advance/automated techniques.

No comparative study is reported in literature regarding the population of Rawalpindi/Islamabad with reference to distribution of ABO antigens in the region. The aim of the present study was to record the various blood groups among the population of Rawalpindi/Islamabad, Pakistan, and also to compare the data with the population of other areas of Pakistan, as well as some other countries of the world, with a view to generate data with multipurpose future utilities for the health planners and also see the common trend of the prevalence of various blood groups.

Materials and Methods

A total of 2518 consecutive subjects, comprising 1285 female and 1233 males, were screened for their blood groups. The subjects belonged to both rural and urban areas of the twin cities of Rawalpindi and Islamabad, Pakistan.

A 1.0-2.0 ml sample of blood was drawn from the antecubital vein of each subject in a disposable syringe, and transferred immediately to a tube containing ethylene diamine tetra acetic acid (EDTA).

Blood grouping (ABO) and Rhesus factors (Rh), was done by the antigen antibody agglutination test. The antisera used were obtained from Biolaboratory, USA. The ABO monoclonal reagents are in vitro culture supernatants of hybridized immunoglobulins secreting mouse cell-line. For determination of Rh factor, IgM + IgG monoclonal reagents were used.

Results

Table shows the prevalence of ABO blood groups in the studied population, of the twin cities of Rawalpindi and Islamabad, with gender distribution. The overall distribution of blood group in the total sample was 33.33%, 25.53%, 31.10% and 10.04% for groups B, A, O and AB, respectively. B group was dominant in both the genders, followed d by O and A. while AB was rare in both males as well as females.

Discussion

In the study under discussion, the relative frequency of the various blood groups (Figure 1), does not seem to deviate from those which have been recorded for studies on various segments of the Pakistani population.[4,11-14] However, comparison with the data from the British and African populations[10,11] reveals that there is an equal dominance of group B and O in the Indo-Pak sub-continent, in contrast to only O group for the British and African populations. The least reported group, in all the populations, has been AB.

It has been reported[15], that in the populations of the United States, Asian, Syrian Arabs and Palestinians, group O is dominant, with AB being the rarest, while in Saudi Arabia the prevalence of blood group A is higher as compared to the Pakistani population, where the blood group B is more prevalent. This sharp difference among the blood groups distribution may be due to geographical variations, external environment and genetic factors involved.[11,16] Racial (genetic) and environmental factors have been reported to influence the frequency of various blood groups in studies carried in various societies, including Bangladesh and Latin America.[15] The genetic and environmental factors responsible for varying frequency of the blood groups among the Pakistani populace needs to be probed further.

In terms of presence of Rh antibodies, the data from several studies on Pakistani as well as certain African populations is compared in Figure 2.[12,14,17-20] The present study has shown comparatively the lowest percentage of Rh-negative cases, and follows the global trend of being

Table . Trend of various blood groups (ABO and Rh) in the studied population.

Blood Group	Total Subjects % (n)			Male Subjects % (n)			Female Subjects % (n)		
	Complete	Rh^+	Rh^-	Complete	Rh^+	Rh^-	Complete	Rh^+	Rh^-
A	25.53 (643)	25.82 (601)	22.11 (42)	27.01 (345)	24.10 (276)	20.62 (20)	24.02 (298)	27.47 (325)	23.66 (22)
B	33.33 (839)	33.29 (775)	33.68 (64)	33.75 (431)	35.46 (406)	40.21 (39)	32.87 (408)	31.19 (369)	26.88 (25)
AB	10.04 (253)	10.05 (234)	34.21 (65)	08.93 (114)	09.26 (106)	08.25 (08)	11.20 (139)	10.82 (128)	11.83 (11)
O	31.10 (783)	30.84 (718)	19.85 (19)	30.31 (387)	31.18 (357)	30.92 (30)	31.91 (396)	30.52 (361)	37.63 (35)
Total	100.00 (2518)	100.00 (2328)	100.00 (190)	100.00 (1277)	100.00 (1145)	100.00 (97)	100.00 (1241)	100.00 (1183)	100.00 (93)

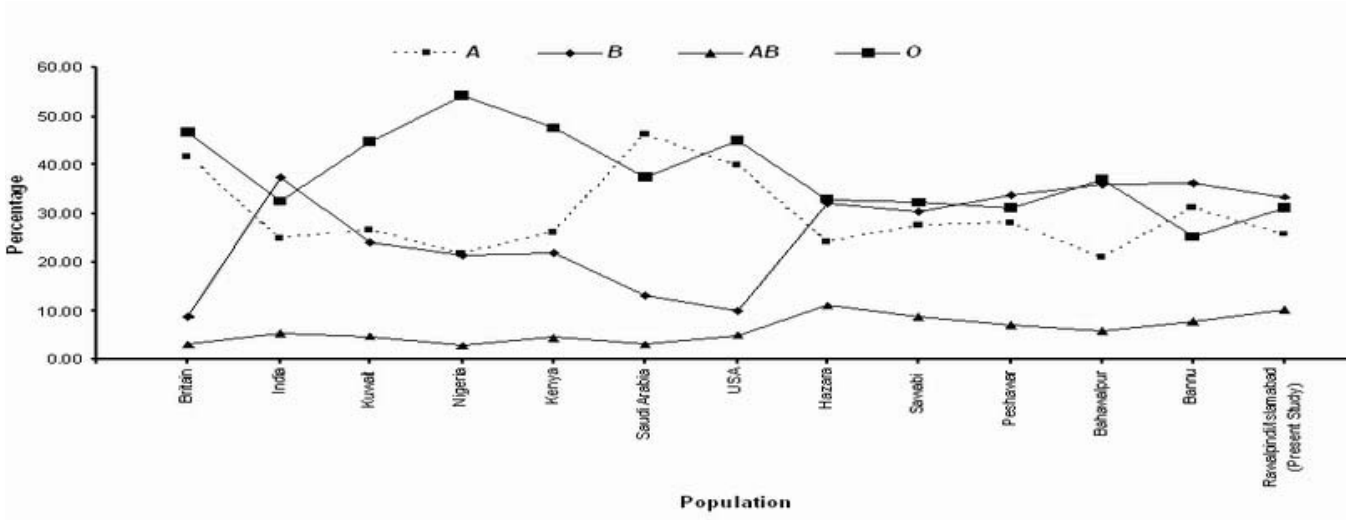

Figure 1. Comparison of the prevalence of various blood groups in Rawalpindi/Islamabad with various studies.

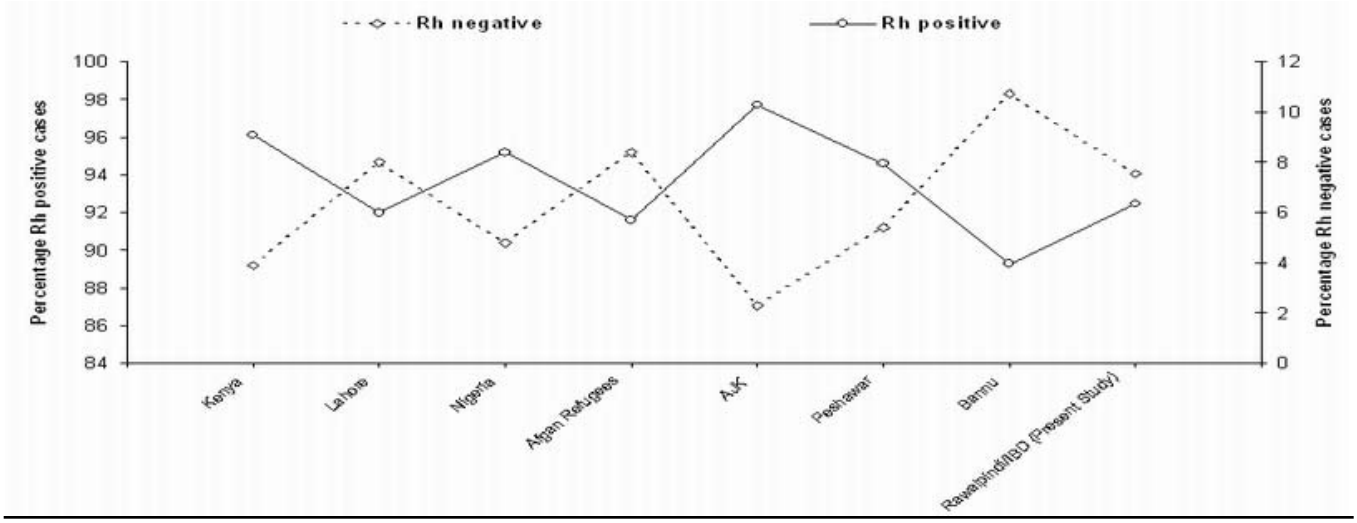

Figure 2. Comparison of Rh positive and Rh negative percentage in Rawalpindi/Islamabad with certain other populations.

significantly rarer than Rh-positive individuals.

In a five years study carried out in Nigeria, the groups identified were 21.4% blood group B, 21.6% blood group A, 54.2% blood group O and 2.8% blood group AB of the total blood samples. Overall gene frequencies for the O, A and B genes were 0.7398, 0.1305 and 0.1298 respectively. For the Rh (D) gene, 95.2% were Rh-positive while 4.8% were Rh-negative.[17] Similarly the phenotypic distribution of ABO blood groups in Kuwaiti population was 26.7% with A, 24.1% with B, 4.6% with AB, and 44.6% with O and the calculated gene frequencies were 0.6678 for O, 0.1768 for A, and 0.1554 for B.[21] As far as our study is concerned, the blood groups A, B, and AB were slightly higher while blood group O percentage was slightly lower than both Nigeria and Kuwaiti population. Similarly the Rh factor, Rh positive is lower while Rh negative is higher in our study. The results obtained in the present study are in agreement with the results obtained by Shah for a study carried out on the Afghan refugees in NWFP, in which the percentage of Rh +ve and Rh -ve was 91.6% and 8.4 % respectively.[18]

An association with the blood groups with several diseases, specially cardiovascular diseases, which has been reported over the years 15,[22-24] would make the data generated by the study, to be useful for health planners, while making efforts to face the future health challenges for the region.

In conclusion, generation of a simple database of blood groups, not only provides data about the availability of human blood in case of regional calamities, but also serves as a forewarner of future burden of disease. Such studies need to be carried out at regional levels, wherever humanity resides.

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