RELATIONSHIP BETWEEN BLOOD GROUPS AND MALE INFERTILITY

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Background: Blood is man's complete and unchangeable identity. The ABO and Rh groups are recognised as major and clinically significant blood groups. Blood group antigens are not only important in relation to blood transfusion and organ transplantation, but also have been utilised in genetic research, anthropology and tracing ancestral relation of humans. The objective the present study is to examine the blood group antigens in infertile men for assessing the relationship to male infertility and to know the frequency of various blood groups among infertile males in our population. **Method:** A total of 1,521 patients along with 460 proven fathers as controls were recruited for the present study from both rural and urban areas of Pakistan and referred to Department of Reproductive Physiology/Health, Public Health Divisions, NIH, Islamabad, during 2002 to 2006. Blood grouping (ABO) and Rhesus factors (Rh) was done by the antigen antibody agglutination test. **Results:** Overall distribution of blood groups in the studied population of 1,521 subjects was 35.50%, 28.27%, 26.89% and 9.34% for blood groups O, B, A and AB respectively. The ratio of control to patient was 1:3.3. **Conclusions:** The present preliminary study revealed that in our population the prevalence of male infertility in blood group O is invariably higher than in all other ABO blood groups, showing a strong relationship between blood group O and male infertility.

Keywords: Blood groups, Male infertility, Pakistani population

INTRODUCTION

Blood is man's complete and unchangeable identity. Although almost 400 blood grouping antigens have been reported, the ABO and Rh are recognised as the major and clinically significant blood group antigens.[1] Rhesus blood group system was the 4th system discovered and yet it is 2nd most important blood group from the point of view of transfusion.[2]

Karl Landsteiner was the first person to put forward the ABO blood group system in 1900.[3,4] After 40 years, Landsteiner and Wiener discovered that blood group antigens could be recognised with specific anti-sera 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.[2,5,6] Human blood antigens may be erythrocytic related, leukocytic related and platelet related.[7]

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.[8–12] Blood group antigens are not only important in relation to blood transfusion and organ transplantation, but also have been utilised in genetic research, anthropology and training ancestral relation of humans.[12] Keeping this in view, the present study was designed to see frequency (%) of blood group antigens among infertile patients in our population attending Reproductive Physiology/Public Health Laboratories Division, and to asses the relationship, if any, with male infertility as no such data is available, in Pakistani community and South Asia.

SUBJECTS AND METHODS

A total of 1,521 subjects along with 460 proven fathers, were screened for their blood groups. The subjects belonged to both rural and urban areas of Pakistan and referred to Department of Reproductive Physiology/Health, Public Health Laboratory Division, National Institute of Health, Islamabad, Pakistan during 2002 to 2006.

Two mL sample of blood was drawn from the antecubital vein with aseptic measures 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 anti-sera used were procured from Plasmatec (Kent, UK). Plasmatec ABO monoclonal reagents are *in vitro* culture supernatants of hybridised immunoglobulins secreting mouse cell-line. For determination of Rh factor, plasmatec anti-D (1 gm) LO-Du and LO-Du2 monoclonal reagents prepared from different antibody producing human B lymphocyte cell lines were used.

The data collected were analysed using SPSS-14. Descriptive statistics were given for all qualitative variables and presented in the form of frequency and percentage.

RESULTS

The overall distribution of blood groups in the studied population of 1,521 patients along with 460 subjects as controls were 35.50%, 28.27%, 26.89% and 9.34% for blood groups O, B, A and AB respectively, and are presented in Table-1. The ratio of control to patient was 1:3.3. Blood group O was dominant in all patients, followed by B and A, while AB was less common. The Rh-positive and negative distribution in the studied population was 94.67% and 5.32%. The distribution of blood groups in control subjects showed that 14.35%, 42.60%, 7.82%, and 35.22% were groups A, B, AB, and O respectively. Although non-significant variations were recorded among groups A, O and AB, blood group B showed significant variations (p=0.04) among blood groups of patients when compared with control subjects.

Table-1: Prevalence of ABO and Rh blood groups in infertile patients and control subjects

Blood Groups	Patients (n=1521)			Control (n=460)			Statistical Test	
	Rh+	Rh-	Complete	Rh+	Rh-	Complete	χ^2	p
A	386 (26.80%)	23 (28.39%)	409 (26.89%)	62 (14.42%)	4 (13.33%)	66 (14.35%)	0.02	0.88
B	419 (29.09%)	11 (13.58%)	430 (28.27%)	184 (42.79%)	12 (40.00%)	196 (42.60%)	3.88	0.04*
AB	136 (09.44%)	6 (07.40%)	142 (09.34%)	34 (07.90%)	2 (06.67%)	36 (07.82%)	0.01	0.91
O	499 (34.65%)	41 (50.61%)	540 (35.50%)	150 (34.88%)	12 (40.00%)	162 (35.22%)	0.01	0.92
Total	**1440 (100%)**	**81 (100%)**	**1521 (100%)**	**430 (100%)**	**30 (100%)**	**460 (100%)**	**0.74**	**0.38**

*Statistically Significant

DISCUSSION

Associations of blood groups with several diseases including immunological disorders are considered to be a marker of impending health hazards. First well established claim for a relationship between blood groups and disease was that between group A and carcinoma of stomach.[13] It had been reported that the risk for blood group A subjects are more in the ratio of 1.2:1 as compared to subjects having blood group O or B to get carcinoma of stomach.[14] The most prevalent view is that A-phenotype has greater susceptibility for cardiovascular diseases, atherosclerotic peripheral vascular disease and several other types of cardiovascular diseases (CVD) than non A-phenotypes, particularly the O-phenotypes.[15] According to Jorgenson[16] group O is more susceptible to carcinoma of stomach. Similarly, pernicious anaemia too occurs more frequently in group A subjects than group O. Group A is more susceptible to duodenal ulceration as well.[13] Similarly blood groups A, B, and O are equally more susceptible to malaria infection, while blood group AB individuals are less susceptible.[17] The same findings have been observed as blood group O is coming invariably higher in infertile patients, followed by blood group B and A.

In multivariate logistic regression analysis for knowing the risk of otitis media with effusion (OME) between children with different blood groups, showed that blood group and OME were found to be statistically related. Considering children of blood group A as a reference, children with blood group O had a statistically significant lower risk of OME, when compared with children with blood group B. Thus it was concluded that blood group O (and possibly AB) plays a preventive role.[18]

Comparing Plasmodium falciperum and Plasmodium vivax, it was found that significantly lower frequency of plasmodium falciperum was observed among individuals with blood groups A and O, while, in groups B and AB, no difference in Plasmodium vivax and falciperum was observed.[17] Study from Australia showed a very high incidence of coronary heart disease in blood group A subjects, while in Britain and Pakistan relationship between ischemic heart disease and blood group A has also been established.[19–21]

In another study, a preliminary data showed an association between blood groups and serum markers 'triple screening'.[11] There were no significant differences in the distribution of hCG and AFP between these two cohorts. However the uE3 values in Rh negative women were significantly lowered (median: 0.85 MoM).[22] It had been concluded that certain different perinatal events are associated with an increased risk of type 1 diabetes.[23]

In the present study, group O was dominant in all infertile male patients, followed by B and A, while AB was less common. The Rh-positive and negative distribution in the studied population was 94.67% and 5.32%, showing that prevalence of male infertility in blood group O is invariably higher than in all other ABO blood groups, and there is a strong relationship between blood group O and male infertility.

We have, simply, made an attempt to generate preliminary data, to be useful for health planners, while making efforts to face the future health challenges for the region. Generation of this simple database of blood groups, will not only provides data about the frequency of blood groups among infertile males in case of regional calamities, but will also serves as a predictor of future burden of disease.

CONCLUSION

There was a strong relationship between blood group O and male infertility. Prevalence of male infertility in blood group O was invariably higher than in all other

ABO blood groups. This study may be an important addition to the field of andrology and for clinicians dealing with infertility to plan individual interventions for their patients.

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