

Comparative Study of Different Blood Groups and Gene Frequency in Tribes and Non-Tribes of Jharkhand

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ABSTRACT

Introduction: Various methodologies have been tried to differentiate the geographical distributions but the blood group is purely scientific having advantages over many other basis of classifications. Each person's blood group is determined by two genes, one inherited from each parent. The frequencies of blood group also vary from one group of population to another in the same region. This study compares the difference in frequencies of tribes and non-tribes blood groups. Aim of this study was to know the incidence of different blood groups in this area.

Material and methods: The study was done in the Department of Physiology, RIMS, Ranchi from January 2016 till February 2017, on 3132 individuals out of which 2068 were tribes of Jharkhand and 1064 were non tribes. The random selection was among medical and nursing students and indoor and outdoor patients in different departments at RIMS.

Results: In this study out of 3132 individuals out of which 2068 were tribes and 1064 were non tribes. In tribes the number of blood group B was maximum 34.72% and Rh +ve were 97.92% and Rh - ve were 2.08%. In non-tribal maximum incidence was of blood group O 40.03% and Rh+ve were 90.79% and Rh - ve were 9.21%.

Conclusion: In this study B blood group was the commonest blood group and the incidence of Rh negative was less in tribes.

Keywords: Blood group, Rhesus, Allele, Phenotype

INTRODUCTION

The physical characteristics and appearance of the individuals are the basis of their geographical distribution. Absolute divisions are not possible because in transitional zones the differences in features are not striking.

Various types of methodologies have been tried to differentiate the geographical distributions, like, language, food habits, cultural behaviours, diseases etc.

The study of blood group is purely scientific having advantages over many other bases of classifications.

There are three major blood group systems: 1. ABO, 2. Rh, 3. MN

In addition to these there are more than 29 additional blood groups present, e.g. P, Lutheran, Lewis etc., but the ABO and Rhesus are the most significant blood group systems.¹

The ABO blood group system was discovered by the Austrian scientist Karl Landsteiner, who found three different blood types in 1900.² He described A, B and O blood groups for which he was awarded the Nobel Prize in 1930.

It was Alfred Von Decastello and Adriano Sturli who discovered the fourth type AB, in 1932. Blood group

substances are antigens, chemically polysaccharides or glycolipids present on the surface of the RBC. The development of these antigens is genetically controlled; appearing in early fetal life and remaining unchanged throughout life.

On the basis of presence or absence of these antigens human beings are divided in different blood groups. In blood group A antigen A is present on red blood cell and agglutinin β is there in plasma, in blood group B antigen B is on the red blood cells and agglutinin α is in plasma and in blood group O no antigens are there on red blood cells but both agglutinins α and β are present in plasma.

Agglutinogens first appear in the 6th week of fetal life. The concentration at birth is 1/5th of adult level, and, it gradually increases through adolescence and puberty to reach adult levels.

Agglutinins are absent at birth. They are produced after 2–8 months, perhaps by entry of antigens in small doses via food and intestinal bacteria, reaching a maximum level in 8-10 yrs. These are IgG and IgM type of antibodies

The group specific substances also present in many organs and their secretion, e.g. saliva, tear, pancreas, liver, lungs, testes, semen, urine etc. and these are soluble antigens

Each person's blood group is determined by two genes, one inherited from each parent. Genes A and B are dominant whereas gene O is recessive.

The Rh factor was discovered in 1940 by K. Landsteiner and A.S. Weiner from rabbits immunized with the blood of the monkey *Macaca rhesus*. This blood group antigen is also found on the surface of human erythrocytes. About 85% of the population possesses Rh antigen on the surface of their erythrocytes and are called Rh positive persons. Rh antigens are of 3 sets (6 types) and these are D and d, C and c and E and e

The commonest and most potent is D antigen and the corresponding antibody is anti D. The gene for D antigen is Gene D and when gene D is absent its place is occupied by

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People	Number observed	A		B		AB		O	
		No.	%	No.	%	No.	%	No.	%
Tribes	2068	490	23.69	718	34.72	228	11.03	632	30.56
Allele			18.37		26.35				55.28
Phenotype			23.68		36.07		9.68		30.56
Non-tribes	1064	216	20.30		31.02	92	8.65	426	40.03
Allele			14.40	330	22.33				63.27
Phenotype			20.29		33.25		6.43		40.03
Total	3132	706	22.54	1048	33.46	320	10.22	1058	3.78

Table-1: Incidence of different blood groups, Allele and Phenotype frequency in tribes and non-tribes

People	Number Observed	Rh positive		Rh negative	
		No.	%	No.	%
Tribes	2068	2025	97.92	43	2.08
Non tribes	1064	966	90.79	98	9.21
Total	3132	2991	95.50	141	4.50

Table-2: Incidence of RH typing in tribes and non-tribes

allomorph d.

The blood group substances are inherited according to simple Mendelian ratios through multiple alleles representing a single gene. According to Hardy-Weinberg principle the allele and genotype frequencies in a population will remain constant from generation to generation in the absence of other evolutionary influences. The homozygous or heterozygous trait is determined by the presence of allele type. The alleles groups A, B and O are denoted by presence of single gene and Genotype of blood group are A (AA + AO), B (BB + BO), AB (AB), and O (OO). There were not much significant results according to the homo or heterozygous stratification. The allele frequencies within a population change randomly with no advantage to the population over existing allele frequencies. If allele frequencies of population over time differ from generation to generation, that means the population is not in Hardy-Weinberg equilibrium, there might be some evolutionary changes are taking place.

Percentages of people of these blood groups are different in different communities and races. The frequencies of blood group also vary from one group of population to another in the same region. The knowledge of distribution of ABO and Rhesus (Rh) blood groups at local and regional levels is helpful for the blood banks, blood transfusion services, disputed paternity and other medico legal issues.

MATERIAL AND METHODS

The study was done in Department of Physiology, Rajendra Institute of Medical Sciences, (RIMS), Ranchi from January 2016 till February 2017, on 3132 individuals who gave the consent out of which 2068 were tribes of Jharkhand and 1064 were non-tribes. The approval of institutional ethics committee was taken prior to the commencement of this study.

The random selection was among medical and nursing students and indoor and outdoor patients in different departments at RIMS. The significance or non-significance difference in two populations was seen by Null hypothesis. The allelic frequencies were calculated the standard of Hardy

Weinberg equilibrium. The allelic frequency of A, B and O were expressed as p, q and r respectively. Allele frequencies are expressed as percent. From the allele frequency genotype frequency calculated also.

The blood samples were collected on three clean glass slides by lancet prick from the tip of from left ring finger with aseptic precautions. The test for ABO and Rh typing is done by mixing a drop of each antiserum, of A, B and D. The blood group was decided on the basis of agglutination.

STATISTICAL ANALYSIS

Microsoft office 2007 was used for the statistical analysis. Descriptive statistics like mean and percentages were used to interpret the results.

RESULTS

The study was done on 3132 individuals out of which 2068 were tribes and 1064 were non tribes. In this study out of 3132 individuals maximum numbers were of blood group O 33.78% (1058), then B 33.46% (1048), A 22.54% (706) and least were of AB 10.22% (320).

In tribes the number of blood group B were maximum 34.72% (716) then the O 30.56% (632), A 23.69% (490) and least were of AB 11.03% (228). Allele frequency r 55.28% (O), p 18.37% (A) and q 26.35% (B).

In non- tribes maximum incidence was of blood group O 40.03% (426) > B 31.02% (330) > A 20.30% and least was AB 8.65% (92). The allele frequency r 63.27% (O), p 14.40% (A) and q 22.33% (B) (Table 1).

For Blood group A the Z-score is 2.1527, the p value is 0.03156. Blood group B the Z-score is 2.0809, the p value is 0.03752. AB group the Z-score is 2.0815, the p value is 0.03752 and O group the Z-score is -5.3109, the p value is 0. In all the groups the difference is significant as the result is significant at p < 0.05.

Out of 3132 with D antigen were 95.50% (2991) and without D antigen were 4.50% (141).

In tribes Rh +ve were 97.92% (2025) and Rh - ve were 2.08% (43). In non-tribes Rh+ve were 90.79% (966) and Rh - ve were 9.21% (98) (Table 2).

Table 2 shows that the incidence of Rh -ve is very low in tribes as compare to non tribes. It is 2.08% in tribes where as 9.21% in non tribes. Difference in both the values are significant as the Z score for Rh positive is 9.116 and P value 0 (significant at <0.01) and that for Rh negative Z score is - 9.116 and p value 0 (significant at <0.05).

DISCUSSION

The blood group study was done on total 3132 individuals. Out of these showed 706 people (22.54%) having A Blood group, 1048 people (33.46%) having B, 320 (10.22%) people having AB and 1058 (33.78%) having O. The findings were similar to the Asiatic trend maximum of O blood group > B > A > AB.³

In tribes the commonest blood group is the number of blood group B were maximum 34.72% (716) then the O 30.56% (632), A 23.69% (490) and least were of AB 11.03% (228). The results are similar in population of Gwalior and nearby regions B group is commonest (34.72%).⁴ In U.P and Punjab also B is (37.39%).⁵

In non-tribes maximum incidence was of blood group O= 40.03% (426) > B 31.02% (330) > A 20.30% and least was AB 8.65% (92). In this study the most common blood group is O, which is also reported from Bangalore (39.81%), Karnataka (39.81%)³ and South India (38.75%).⁶

A, B, AB and O groups frequencies are 37.1%, 12.2%, 4.1% and 46.7% in USA and in England 48.2%, 12%, 5.5% and 43.2% respectively.⁷ The incidence of blood group B is more common in Asian and blacks, almost twice that of whites.

The AB blood group is the most uncommon in this study which is similar to the results observed all over the world.

The allele frequencies in tribes were for O= 55.28%, B= 26.35% and A = 18.37% and phenotype frequencies were B= 36.07%, O= 30.56%, A =23.68% and AB= 9.68%. In non-tribes allele frequency were O= 63.27%, B= 22.33% and A= 14.40% and phenotype frequencies were O = 40.03%, B=33.25%, A = 20.29% and AB=6.43%. In both groups the allele frequency is maximum of O blood group and minimum for AB blood group but the phenotype frequency in tribes was maximum for B blood group and in non-tribes it was maximum for O blood group. Some other studies also the phenotype frequency is maximum of B as in tribes of East Pakistan the allele frequency was maximum of O blood group (A), (B) and (O) 0.14, 0.13 and 0.73, respectively.⁹ Amit aggarwal et al also concluded that in Indians allele frequency for O (r) is the highest followed by B (q) and A (p); O > B > A.⁴

Incidence of Rh-D negative in present study is 4.50%. The results are lower as the incidence is lower in tribes and the numbers of cases of tribes were also more. In tribes Rh +ve were 97.92% and Rh – ve were 2.08% the results are very near to the tribes of other places like the of Midnapore district of West Bengal 0.5%⁸ and in Assam less than 2%.¹⁰ In non-tribes Rh+ve were 90.79% and Rh – ve were 9.21% which is quite similar to the other parts of the country. In south India 5.42%³ and U.P and Punjab 8.7%.⁵ The incidence is higher in European population i.e. 15%.⁷

There are some discrepancies in findings of different areas and this study may be due to environmental and cultural differences.

CONCLUSION

We concluded that incidence of blood groups are different in different communities and races. Among the various

ABO blood groups, group B is the commonest; followed by O and A while AB is the least common type in tribes. The prevalence of Rh-D negative is higher than the other studies. These findings would be useful for health challenges relating blood transfusion, marriage counselling and medico legal purposes.

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