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ABO Blood Group Distribution And Its Derived Gene Frequencies Among Native Tribal Blood Donors Of Tripura

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Abstract :
Background*: Tripura has a composite population of 36.74 lakhs out of which native tribes comprise 31.8% of the population. In the past, studies were done on ABO blood group distribution in the unsegregated population but ABO blood group data on native tribes are not available.*
Materials and methods: *A retrospective observational study was conducted in the department of blood bank from January 2014 to December 2015 after approval from our institute ethical committee. Tribal donors were segregated out from their surnames based on 2011 Tripura population census and ABO Rh blood grouping was noted from blood grouping register. Each donor was enrolled only once. Routine ABO typing in our blood bank was done by column agglutination technology using Bio-Rad gel cards. Calculations of gene frequency are based on standard assumption of Hardy Weinberg equilibrium model.*
Results*: A total of 3415 donors were registered during the 2 years study period out of which 509 donors were from native tribal population. The study revealed that blood group B was the commonest (34.77%, CI=±4.14) followed by A group at 28.68% (CI=±3.93), O group at 25.93% (CI=±3.81) and AB was the least prevalent group at 10.61% (CI±2.68). Our study also estimated the gene frequency of A, B & O which was found to be 0.2277, 0.2676 & 0.505 respectively.*
Conclusion: *Tripura tribes have ABO phenotypic trend of B > A > O > AB and gene frequency of O > B > A.*
Keywords : *ABO blood group, ABO gene frequency, Tripura tribes*

I. Introduction

Tripura is located in the north-eastern part of India bordering Bangladesh. It has a composite population of 36.74 lakhs out of which native tribes comprise 31.8% of the population and rest are migrated Bengali Hindus and Muslims.[1] In the past, studies were done on ABO blood group distribution in the unsegregated population but ABO blood group data on native tribes are not available. It is hoped that the findings of our study will be helpful in planning and management of blood resources as well as encourage future genetic studies on blood group of native tribes.

II. Aims

To find out ABO blood group distribution and derive its gene frequencies among native tribal blood donors of Tripura

III. Materials And Methods

A retrospective observational study was conducted in the department of blood bank from January 2014 to December 2015 after approval from our institute ethical committee. Tribal donors were segregated out from their surnames based on 2011 Tripura population census and ABO Rh blood grouping was retrieved from blood grouping register. Each donor was enrolled only once. Routine ABO typing in our blood bank was done by column agglutination technology using Bio-Rad gel cards.Calculations of gene frequency are based on standard assumption of Hardy Weinberg equilibrium model and Fischer's maximum likelihood calculation method. Allele frequencies of A1 & A2 are not calculated separately.[2,3]Calculations are as follows:

$$\boldsymbol{p}\ (\boldsymbol{A\ gene\ frequency}) = (\boldsymbol{t} - \boldsymbol{s})/\boldsymbol{v}$$
$$\boldsymbol{q}\ (\boldsymbol{B\ gene\ frequency}) = \boldsymbol{u} - \boldsymbol{s})/\boldsymbol{v}$$
$$\boldsymbol{r}(\boldsymbol{O\ gene\ frequency}) = \boldsymbol{s}/\boldsymbol{v}$$
$$\textbf{Where, } \boldsymbol{s} = \sqrt{\boldsymbol{O}}$$
$$\boldsymbol{t} = \sqrt{\boldsymbol{O} + \boldsymbol{A}}$$
$$\boldsymbol{u} = \sqrt{\boldsymbol{O} + \boldsymbol{B}}$$
$$\boldsymbol{v} = \boldsymbol{t} + \boldsymbol{u} - \boldsymbol{s}$$

Calculation for expected number of AB phenotype = $\boldsymbol{v^2 - (O + A + B)}$

In which O, A, B, D are the actual number of cases in the groups O, A and B antigens positive in the sample.

As the frequencies of the A and B genes are known, it was possible to calculate the expected number of AB phenotype in the sample. The significance of the deviation, i.e. the difference between the expected and the observed number of AB phenotype was determined by applying chi-square test. This would verify the goodness of fit for the calculated proportions ofABO gene frequencies.

IV. Results

A total of 3415 donors were registered during the 2 years study period out of which 509 donors were from native tribal population. The study revealed that blood group B was the commonest (34.77%, *CI=±4.14*) followed by A group at 28.68% (*CI=±3.93*), O group at 25.93% (*CI=±3.81*) and AB was the least prevalent group at 10.61% (*CI±2.68*). Calculated gene frequencies and significance of deviation between the observed and expected values of AB phenotype tested by using chi square test are shown in table 1.

Table 1: Gene frequencies and goodness of fit test

P	0.227725
q	0.267568
r	0.504707
Expected AB	63.19
Observed AB	54
Deviation	9.19
Variance	111.7133
$\chi 2$ (df-1) p-value	0.756008

V. Discussion

Distribution of ABO blood group varies regionally, ethnically and from one population to another. The finding of our study reveals ABO phenotypic trend of B > A > O > AB. This finding is similar to the previous study on Tripura tribes conducted by Choudhary P *et al* in which blood group B (30.65%) was the commonest but in his study it was followed by O (28.23%) > A (26.61%) > AB (14.51%).[4] Studies in neighboring states of Mizoram by Gosh AK *et al* reported prevalence of O = A (37.27%) > B (19.09) > AB (6.36%) and Mao tribes of Manipur reported by showed O (46.2%) > A (23.9%)> B (17.9%)> AB (12%).[5,6] Our study also estimated the gene frequency of A, B & O which was found to be 0.2277, 0.2676 & 0.505 respectively showing a pattern similar to a study done by Agarwal A *et al* in which the gene frequency of O > B > A.[7] Similar trends are found in previously mentioned study in Mizoram which showed gene frequency of 0.2524, 0.1400 & 0.6076 for A, B & O respectively and also the study among Mao tribes documented gene frequency of A, B & O as 0.22, 0.18 and 0.60 respectively.[5,6] Goodness of fit test for expected and observed AB phenotype in our study showed *p-value of > 0.05* as shown in table 1, which means that the deviation is insignificant. The allele frequency of AA, AO, BB, BO, AB and OO in the study population was also estimated as 0.0519, 0.1149, 0.0716, 0.1350, 0.0609 & 0.2547 respectively.

VI. Conclusion

Tripura tribes have ABO phenotypic trend of B>A>O>AB and gene frequency of gene frequency of O>B>A. The data revealed by our study is expected to help in the management of blood resources in the state and it will also aid in future ABO genetic researches however to determine ABO frequency distribution of Tripura tribes more precisely a larger sample size is required. Moreover there may be variation according to surnames and sub-communities among the tribes. Disease states, use of other technologies like molecular blood group typing and weaker groups of A and B typing may influence the outcome of ABO prevalence studies.

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