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# ABO AND RH (D) BLOOD GROUP DISTRIBUTION AMONG THE CHAKMA OF TRIPURA, INDIA

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***Abstract:*** *Background:* Globally, the distribution of ABO and Rh (D) blood types as well as their allele frequencies differ among populations. The study's goal is to ascertain the allele frequencies and distribution of ABO and Rh (D) blood groups among the Chakma of Tripura, India.

*Methods:* This was an observational study carried out among 272 individuals, both males and females, among the Chakma of Nabinchhara village, district Unacoti in Tripura in the month of September 2019. The tube agglutination method was used to categorize all of the blood samples according to ABO and Rh (D). The Hardy-Weinberg equilibrium was used to compute the allele frequency of the blood group genes.

*Results:* The commonest frequency of B blood groups (37.13%) and the lowest frequency of O blood groups (13.60%) found among the Chakma. The blood groups phenotype frequency is observed as B> A >AB>O. The goodness of fit test for observed and expected phenotype ABO phenotype showed p-value of >0.05, which is insignificant ($\chi^2$ value is 0.069: df =1). The allelic frequencies of ABO blood group p, q, and r were found as 0.2931, 0.3118 and 0.3951 respectively. No Rh negative blood was found among the Chakma of Tripura.

*Conclusion:* Distribution of two major blood group systems namely ABO and Rh (D) systems show considerable heterogeneity among the study population. Outcome of the present study indicates recessive allele for the D antigen is absent among the studied Chakma.

***Keywords:*** Blood Group Frequency. Chakma. Tripura

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## Introduction

The ABO blood group is a multi-allelic character represents co- dominance. The gene responsible for antigenic differentiation is present on chromosome 9 (9p34.1-q34.2) and synthesized ABO glycosyltransferase. Human blood group is a unique genetic marker. Among the various blood group systems, the ABO and Rh systems are routinely analyzed in humans for medico-legal purposes. Both ABO and Rh systems are genetically controlled. The blood group of a person reflects the genetic make-up of the person for the particular blood group gene. Blood typing of a large number of individuals for ABO and Rh systems generates data to determine the distribution of ABO and Rh blood groups in a population. These data are genetically analyzed to estimate the frequencies of different alleles for the blood group systems in the population. The proportions of different alleles of a gene in a Mendelian population are known as gene (allele) frequencies (Singh, 1990). The gene frequency determines the genotype frequencies of a particular gene in a population.

In routine Rh blood group typing, human beings are classified as Rh positive and Rh negative groups depending on the presence or absence of Rh antigen or D antigen. About 100 Rh antigens have been discovered so far (Saran, 2003). Out of these, The D antigen (Rh) is clinically the most important antigen in the Rh system as it is highly antigenic. In addition, the knowledge on the distribution of ABO blood groups and Rhesus blood type is of great importance in blood transfusion, organ transplantation, migration pattern, paternity disputes, and even association of blood group specific diseases (Nanda *et al*., 2021; Suresh, *et al*., 2015). All human populations share the same known blood group systems. Yet, the frequency distribution of genetic traits varies in different races and ethnic groups.

In India, the distribution of the A, B, O and AB blood groups is 23.16%, 34.10%, 34.56%, and 8.18%, respectively, while Rh (D) positive and Rh (D) negative populations are 94.13% and 5.87%, respectively (Patidar and Dhiman, 2020). Over the years, numerous works on primary ABO blood group, genetic markers have been documented in the North Eastern region of India. Recent studies on ABO and Rhesus blood groups in this region of the country were conducted by Nanda *et al*. (2021) among tribal students of Arunachal Pradesh; by Kotal *et al*. (2003) among the Digaru Mishmi of Arunachal Pradesh; by Rai and Singh (2017) among the Bhutia, Lepcha, and Nepali of Sikkim; and by

Meitei *et al*., (2010) among the Meitei, Brahmin, Muslim and Kabui populations of Manipur.

No doubt, there is a fair amount of data on basic genetic information in this region, however, under the circumstances of evolutionary forces, inheritable variation. But different reproductive abilities, the genetic composition of a population can never remain constant (Volpe, 1985). Hence, it is essential to report and utilize the latest data to broaden our spectrum of understanding human diversity and micro evolutionary forces acting in a population. With these details, the present study was undertaken to describe and report the genetic composition of the Chakma of Tripura with the help of genetic markers viz., ABO blood groups, Rh (D) blood type. We further attempted to compare our results with other similar studies reported among the neighboring populations of North East India.

## Materials and Methods

The present study was taken up in the Nabinchhara village of Pecharthal C D Block of Unakoti district, Tripura among the Chakma. The Chakma are one of the major tribes of Tripura. They have first migrated to Arakan Hills of Burma and then Chittagong Hill Tracts to Tripura. According to Census Report of 2001 Chakma population in Tripura was 61,793. Among the Chakma there are 3 (three) major groups like (i) Anokia, (ii) Tandugia, and (iii) Mangla. Linguistically Chakma language is mixed with loan words of Indu-Aryan language, Tibeto-Chinese and mainly Arakan language. Their language is also described as mixture of broken Bengali and Assamese language. Chakma have their own script in Burmese Alphabets, though not in use rather Bengali script is being used and easy to learn. Economic activities of the Chakma are centralized with jhum cultivation, plain land cultivation and economic supporting works of vegetable growing, fishing and wage earning, who are also expert in trapping animals. They are well known for trapping wild elephants.

A total of 272 individuals belonging to the people of the Chakma tribe inhabiting in Nabinchhara village of Pencharthal block of Unakoti district of Tripura, were randomly selected for study. They included 134 males and 138 females between 14 years to 60 years of age after obtaining consent from person or his/her guardian. ABO and Rh (D) groupings were performed simultaneously for which slide agglutination method was followed. On a labelled slide a drop of each of finger prick blood was placed. Onto which a drop of anti –A, anti-B

and anti-D (manufactured by J. Mitra and Co. Pvt. Ltd, New Delhi) were added and was mixed. Results of agglutination were recorded immediately. Agglutination with anti-A showed group A, with Anti-B showed group B, with both anti-A and anti-B showed AB and with neither of these showed O group (Race and Sanger 1968). The blood samples were also classified as Rh positive or Rh negative according to the presence or absence of the anti-D. Screening for Rh type was also conducted by slide method. Agglutination of red blood cells in the slide constituted a positive test result of the Rh (D) antigen by using combined ABO monoclonal antibodies for blood typing. The ABO and Rh (D) allele frequencies were calculated according to Mourant *et al*. (1976).

## Results

Altogether 272 Chakma individuals (134 males and 138 females) were tested for this study of Nabinchhara village, Unakoti district, Tripura. The highest frequency of B blood groups (37.13%) and the lowest frequency of O blood groups (13.60%) found among them. The blood groups frequency is distributed as B>A>AB>O. The observed and expected phenotype frequency patterns were found some variation and the $\chi^2$ value is 0.069 (df=1). The allelic frequencies of ABO blood group p, q, and r were found as 0.2931, 0.3118 and 0.3951 respectively. For Rh (D) ABO blood groups we did not find any Rh negative blood among the study individuals (Table 1).

**Table 1: Observed and expected phenotype frequency of ABO and Rh blood group among the Chakma**

| Blood group system | Phenotype | Observed frequency | Genotype | Expected frequency | Allelic frequencies |
|---|---|---|---|---|---|
| ABO | A (94) | 34.56 | AA<br>AO | 31.75 | 0.2931 |
| | B (101) | 37.13 | BB<br>BO | 34.36 | 0.3118 |
| | O (37) | 13.60 | OO | 15.61 | 0.3951 |
| | AB (40) | 14.71 | AB | 18.28 | |
| Rh | D+ (272) | 272 | DD<br>Dd | 272 | 1.0000 |
| | D− (00) | 00 | dd | 00 | 0.0000 |

$\chi^2$= 0.069; (df=1)

Gender-wise frequency of ABO and Rh blood group shows though B blood group frequency is highest among males (41.79%) A blood group

frequency is highest (38.41%) among females. Among males ABO blood group phenotype frequency trend is B>A>O>AB, whereas among females it is different: A>B>AB>O. Rh (D) phenotype frequency shows that all the studied individuals are Rh (D) positive (Table 2).

**Table 2: Distribution of ABO and Rh blood group systems with respect to gender**

| *Blood group* | *Male* | *Female* | *Total* | *Prevalence rate* |
|---|---|---|---|---|
| A | 41(30.60) | 53(38.41) | 94 | 34.56 |
| B | 56(41.79) | 45(32.61) | 101 | 37.13 |
| AB | 16(11.94) | 21(15.22) | 37 | 13.60 |
| O | 21(15.67) | 19(13.77) | 40 | 14.71 |
| Total | 134(49.26) | 138(50.74) | 272 | 100.00 |
| Rhesus(D) blood group | | | | |
| Rh positive | 134(49.26) | 138(50.74) | 272 | (100.00) |
| Rh negative | 00 | 00 | 00 | (0.00) |

## Discussion

Distribution of ABO blood group varies regionally, ethnically and from one population to another. The finding of our present study reveals ABO phenotype frequency trend of B>A>AB>O. This finding is similar to the previous study on Tripura tribes (Chaudhary *et al*. 2014) 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%). Ghosh *et al*. (1996) reported the phenotype frequency of O (37.28%)>A (37.27%)>B (19.09%)>AB (6.36%) among the Mizo in Mizoram and Mao in Manipur showed the frequency of O (46.2%)> A (23.9%)>B (17.9%)>AB (12%). Similar findings have also been reported among the Purum (Chothe) tribe of Manipur: O (47.75%)>A (24.7%)>B (19.75%)>AB (7.75%) (Singh and Singh 2007), as well as Kotal *et al*. (2003) reported the same trend among the Digaru Mishmi of Arunachal Pradesh: O (48.25%)>A (30.77%)>B (16.78%)>AB (4.20%). Gene frequency of A, B and O was found- p (0.2931), q (0.3118) and r (0.3951) respectively among the Chamka, whereas among the Karbong of Tripura (Ghosh *et al*. 2023) ABO allelic frequency was found- A (0.1894), B (0.3338) and O (0.4768) respectively. Various research works conducted by many workers gave an indication of higher allele 'O' frequencies over A and B alleles of ABO blood groups system in North East India, such as Digaru Mishmi (O=69.39, A=19.42, B=11.19) by Kotal *et al*. (2003); Tangkhul tribe (O=0.624, A=0.210, B=0.148) by Kapaiwo (1995), in Chiru tribe (O=0.73, A=0.12, B=0.15) by Singh

and Shah (1997), in Koireng tribe (O=0.72, A=0.18, B=0.01 by Shah (2001). In comparison with other populations of Tripura the studied population, the Chakma shows a more or less similar trend (Table 3). The goodness of fit test for observed and expected phenotype ABO phenotype in our study showed p-value of >0.05 as shown in the Table 1, which is insignificant.

**Table 3: Allele frequencies of ABO locus among the populations of Tripura**

| *Tribe* | *Number* | *p* | *q* | *r* | *Reference* |
|---|---|---|---|---|---|
| Rangkhal | 100 | 21.8 | 11.2 | 67.0 | Gupta (1958) |
| Riang | 150 | 23.0 | 29.8 | 47.2 | Gupta (1958) |
| Tippra | 150 | 31.9 | 21.0 | 47.1 | Gupta (1958) |
| Chakma | 272 | 29.31 | 31.18 | 39.51 | Present study |

The majority of the people in the world have Rh+ blood type and as such in the present study the allele frequency of Rh (D) as well as is 100%, this may be because of natural selection of the dominant Rh (D) allele over the recessive Rh (d) allele or Rh (D) positive blood group over those who are Rh (d) negative. It is quite evident that the population in this study being small in size at the same time being preferentially endogamous might have resulted the homozygosity of allele 'd' or blood group to be Rh negative, but with a deleterious effect. Thus, the gene or the individuals possessing homozygous condition might have also been eliminated from the population through erythroblastosis fetalis or hemolytic disease of the new born (Dennis *et al*. 1998). When there is occurrence of Rh incompatibility between mother and fetus, the very phenomenon arises leading to the premature killing of either fetus or the new born. Thus, the outcome of the present study indicates that the recessive allele for the D antigen is very much rare or absent among the Chakma and of Tripura. However, it would be wrong to draw any conclusion from this small sample size of the studied population. For a better understanding of the population, an elaborate and more precise study is much needed in future.

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