

## **DISTRIBUTION OF ABO GROUPS AMONG THE TOTO TRIBE OF ALIPURDUAR DISTRICT, WEST BENGAL, INDIA**

**KAUSTUV DEBSARMA AND K.K.N. SHARMA**

### **ABSTRACT**

Toto is one of the particularly vulnerable tribal groups (PVTG) in West Bengal and in India, settled only in Totopara Village of Alipurduar District, West Bengal. They have very unique culture, language which differentiates them from the surrounding communities, viz., the Bengali, Nepali, Mech, etc., communities. The village is multi-ethnic, but the culture of Toto community is distinctively different from the others. The total number of individuals studied are 114 couples. Blood samples were collected and analysed by a trained practitioner. Among the studied people, 49.56% people have B blood group, 21.93% have AB group, 17.98% have A blood group and 10.53% have O blood group. Bernstein's method for frequency distribution is used, where, the expected frequency and number is different than the observed frequency and number [Blood group A: Observed frequency-0.180, Expected Frequency-0.180; blood group B: Observed frequency-0.496, Expected Frequency-0.482; blood group O: Observed frequency-0.105, Expected Frequency-0.085; blood group AB: Observed frequency- 0.219, Expected Frequency-0.206]. For the chi-square test, the value is  $0.20 > p > 0.975$  for the degree of freedom 1. In the whole population it is also found that no individual is carrying Rh negative blood group.

**Keywords:** Toto tribe, Blood groups, West Bengal, Frequency distribution

### **INTRODUCTION**

Blood is one of the very important connecting tissues of human body. It connects each of the organs in the human body as well as nourishes every cell with oxygen supply and nutrition. Its main components are blood cells and plasma fluid. Among the blood cells, red blood cells (RBCs) are responsible for the ABO and Rh blood grouping. There are antigens and antibodies on the cell wall of RBCs. In the year 1900, Karl Landsteiner first discovered the ABO blood system. Depending on the antigens and antibodies present in the blood, it is divided into four categories, namely A, B, AB and O groups. Later on, while researching on Rhesus monkeys, another type of antibody was found which is called as Rh

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factor, which represents as positive or negative with the ABO blood group (Mitra *et al.*, 2014; Kumar *et al.*, 2018; Shivaraman *et al.*, 1971). It is one of the important discoveries for blood transfusion.

Toto is one of the particularly vulnerable tribal groups of West Bengal and India. They live at Totopara Village of Ballalguri Gram Panchayat, Madarihat Block of Alipurduar District, West Bengal, India. It is a small isolated village under the Himalayan foothills in the Indo-Bhutan boarder. Though, Totopara is a multi-ethnic village, where, apart from people of Toto tribe, Nepali, Bengali, Bihari and Muslim people live harmoniously together. In the Totopara village, people of Toto tribe live in small six hamlets. Totopara is at approximately a distance of 3 km from Ballalguri Gram Panchayat and 22 km from Block and nearest Madarihat Town. People from Toto tribe have very unique culture and traditions, which are totally different from other communities around them and cannot be found anywhere in the whole world. The total number of the people of Toto tribe is 1646, which is very small. That is why State Government, NGOs and other independent researchers conduct researches here and also provide different programmes to increase the population of this tribe.

### **MATERIALS AND METHODS**

For the present research paper, the total number of 114 unrelated married couples (228 individuals) belonging to Toto tribe were selected from all the hamlets and from different families. For ABO and Rh blood testing, standard laboratory technique has been employed. One expert technician from the nearest town was employed for the collection of blood samples as well as to take those to the laboratory for the testing. Before starting blood sample collection, proper rapport was established by the researcher among the population. Permissions were also taken from panchayat office, block office and the district headquarters for conducting the research. All the individuals were explained about the target of the research and proper consent was taken individually before taking blood sample. The blood sample was taken from the inner side of elbow, by sterilizing the area first with ethyl alcohol, by puncturing the vein with 2ml syringe. After taking the blood out, it was poured inside a K2 EDTA (anticoagulant) based container and mixed properly for analysis. Then the blood was transported directly to the laboratory, as soon as possible, for analysis. Basic information of the subjects, such as their health, socio-economic status, educational status, etc., were also collected by the Interview method. Blood samples were analysed with the help of standard prescribed techniques.

### **RESULTS**

In the present study, blood samples of 114 unrelated couples (228 individuals) were analysed, which included an equal number of males and females. In Table-1, it can be observed that maximum number of people have B blood group (49.56%), with 23.68% males and 25.88% females. It is followed by AB blood

group (21.93%), with 12.28% males and 9.65% females. 17.98% people were found to have A blood group (8.77% male and 9.21% female). Lastly, 10.53% people have O blood group, where male and female subjects have an equal distributed of 5.26%. The ABO percentage frequency order among the studied population is B>AB>A>O. Among the total population studied, all the people have Rh positive blood group. No one was found carrying Rh negative blood group among the studied sample of the Toto tribe.

**Table-1: Percentage of people having different blood groups in the studied population**

Blood Groups	A		B		AB		O	
	M	F	M	F	M	F	M	F
No. (%)	20 (8.77%)	21 (9.21%)	54 (23.68%)	59 (25.88%)	28 (12.28%)	22 (9.65%)	12 (5.26%)	12 (5.26%)
Total No. (%)	41 (17.98%)		113 (49.56%)		50 (21.93%)		24 (10.53%)	
<b>Total</b>	<b>228 (100%)</b>							

In ABO blood group system, it is known that genetically and phenotypically the groups are totally different. Blood group A and B have dominant characteristics while the O blood group is genetically recessive in nature. Blood group A shows the characteristics of A phenotypically while genetically it may be either homozygous or heterozygous in nature, i.e., AA and AO genetically. Blood group B also shows the same characteristics like A, genetically it may be either BB (homozygous) or BO (heterozygous). Because blood group O has genetically recessive character it is always OO (homozygous) in nature. The blood group AB shows the character of co-dominance. In the present study, 41 individuals have blood group A, 113 individuals have blood group B, where they may be either homozygous or heterozygous. 50 individuals have AB group (co-dominance) and 24 individuals have O homozygous recessive character.

To see the allele frequency, Bernstein’s (1924) method is used when Anti-A and Anti-B is used for blood analysis (Bhasin and Chahal, 2013; Crow, 1993).

If *p* is assumed for A allele, *q* is used for B allele and *r* is used for O allele, then,

$$p = 1 - \sqrt{\bar{O} + \bar{B}}$$

$$q = 1 - \sqrt{\bar{O} + \bar{A}}$$

$$r = \sqrt{\bar{O}}$$

If *p* + *q* + *r* is not equal to 1, and if the deviation from 1 is called as D, then the improved (corrected) allele frequencies given by Bernstein is as follows,

$$p_c = (1 + 1/2 D) p$$

$$q_c = (1 + 1/2 D) q$$

$$r_c = (1 + \frac{1}{2}D)(r + \frac{1}{2}D)$$

In the present study, the observed phenotypes are: 41 people have A blood group, 113 people have B blood group, 24 people are of O blood group and 50 people have AB blood group. Thus, for the present study,

$$p = 1 - \sqrt{\bar{D} + \bar{B}} = 1 - \sqrt{0.105 + 0.496} = 1 - \sqrt{0.601} = 1 - 0.775 = 0.225$$

$$q = 1 - \sqrt{\bar{D} + \bar{A}} = 1 - \sqrt{0.105 + 0.180} = 1 - \sqrt{0.285} = 1 - 0.534 = 0.466$$

$$r = \sqrt{\bar{D}} = \sqrt{0.105} = 0.324$$

Then,  $p + q + r = 0.225 + 0.466 + 0.324 = 1.015$

The Deviation (D) from 1 is

$$D = 1 - (p + q + r) = 1 - 1.015 = -0.015$$

Then the improved (corrected) genotype frequency of p, q and r

$$p_c = (1 + \frac{1}{2}D)p = (1 - 0.008) \times 0.225 = 0.992 \times 0.225 = 0.223$$

$$q_c = (1 + \frac{1}{2}D)q = (1 - 0.008) \times 0.466 = 0.992 \times 0.466 = 0.462$$

$$r_c = (1 + \frac{1}{2}D)(r + \frac{1}{2}D) = (1 - 0.008)(0.324 + 0.008) = 0.992 \times 0.332 = 0.291$$

The total improved (corrected) genotype frequency will be,

$$p_c + q_c + r_c = 0.223 + 0.462 + 0.291 = 0.976$$

With the improved (corrected) genotype frequencies, the expected frequencies and the numbers have been given in the Table-2.

**Table-2: ABO blood group system among the studied population with observed and expected frequency and number**

Phenotype	Observed Number	Observed Frequency	Genotype	Expected Frequency	Expected Number	$\chi^2$
A	41	$\frac{41}{228} = 0.180$	AA = $p^2 = (0.223)^2$ AO = $2 \times 0.223 \times 0.291$	= 0.050 = 0.130 <b>= 0.180</b>	41.040	0.00004
B	113	$\frac{113}{228} = 0.496$	BB = $q^2 = (0.462)^2$ BO = $2 \times 0.462 \times 0.291$	= 0.213 = 0.269 <b>= 0.482</b>	109.896	0.08767
O	24	$\frac{24}{228} = 0.105$	OO = $r^2 = (0.291)^2$	<b>= 0.085</b>	19.380	1.10136
AB	50	$\frac{50}{228} = 0.219$	AB = $2pq = 2 \times 0.223 \times 0.462$	<b>= 0.206</b>	46.962	0.19653
<b>Total</b>	<b>228</b>	<b>1.00</b>		<b>0.953</b>	<b>217.284</b>	<b>0.52849*</b>

\*For the degree of freedom 1 the p value is  $0.20 > p > 0.975$

It can be seen in Table-2 that the observed frequencies and the numbers

are very different from the expected frequencies. In the total number of individuals the observed frequency and value is higher than the expected frequency and value (Observed= 228, Expected= 217.284). For the A blood group, the observed and expected frequencies are similar, while there is a minimum difference in the number. For Blood group B, O and AB, the observed frequency and number of individuals are higher than the expected frequency and numbers. In the present study, as per the Bernstein's (1924) equation of allele frequency distribution, expected number of individuals are lower than the observed number of individuals. The chi square value comes between 0.20 and 0.975 for the degree of freedom 1.

## DISCUSSION

ABO and Rh are important genetic markers to study among different populations. In the present study, out of a total Toto tribe population of 1646 individuals in the area, a sample of 228 individuals (constituting 114 couples) has been investigated. Among the total studied individuals 49.56% individuals have B blood group, which is the highest in number, followed by AB group (21.93%), A blood group (17.98%) and lastly O blood group (10.53%). A study by Tiwari and Kapoor (1982) showed similar results in the sense that the percentage of B was the highest (33.36%) while the blood group O was the lowest (19.24%). Nazil *et al.* (2015) also found that almost everywhere in Asia the frequency of B is higher than other blood groups. In another study in Chittagong City of Bangladesh Zaman *et al.* (2015) found that the highest number of people have B blood group (34.15%) followed by O group (29.67%), A group (26.57%) and AB blood group (9.61%). On the other hand, studies done by Agrawal *et al.* (2014) and Roman *et al.* (2018) show that the percentage of O blood group is the highest, followed by B, A and AB blood groups. Patidar and Dhiman (2020) collected information on ABO and Rh blood groups from many different sources of a huge number of populations and found that, generally, in the central and northern region of India the highest number of blood group found was B blood group, while in the eastern, western and southern regions the highest number of people have O blood group. As per the Bernstein formula of allele frequency distribution, several studies have reported difference between observed and expected frequency (Bhasin and Chahal, 2013; Crow, 1993; Nam, 1990). Among the total population, the observed and expected frequencies are 1.0 and 0.953 respectively, where there is a difference between numbers too (Observed number 228, expected number 217.284). According to the formula, only in A blood group the observed (0.180) and expected (0.180) frequency and number is same. For blood group B, the observed frequency is 0.496 and expected frequency is 0.482, for blood group O observed frequency is 0.105 and expected frequency is 0.085, for blood group AB observed frequency is 0.219 and expected frequency is 0.206. Among all the blood groups, except A blood group, the observed numbers and frequencies are higher than the expected numbers and frequencies. For the total individuals the expected frequency and number is also lower than the

observed frequency and number. Several other studies (Chakraborty *et al.*, 1986 and Mukherjee *et al.*, 1987) conducted among the Rarhi Brahmins, Vaidyas, Bagdis, Jalia Kaibartas, Garo and the Mech, the incidence of B blood group have been reported to be higher than the other blood groups; however, the difference between observed and expected numbers is minimum.

### CONCLUSIONS

The Toto community belong to particularly vulnerable tribal group (PVTG) in India, who have settled only in Totopara Village of Alipurduar District, West Bengal. They have very unique culture which differentiates them from the surrounding communities of Bengali, Nepali and Mech communities of the district. The village under investigation is multi-ethnic in nature, but people of Toto community have saved their own culture very nicely. In conclusion, it can be said that among the Toto individuals more people have B blood group than O group. As per the Bernstein formula, except A blood group, the expected frequencies and numbers are different than the observed frequencies and numbers for the blood group B, O, AB and for the total individuals. In the present sample of Toto individuals, no one was carrying Rh negative blood group.

### ACKNOWLEDGEMENT

The authors are thankful to all the subjects from the Toto community of Alipurduar District, West Bengal, India, who helped and provided blood samples.

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