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## *Full Length Research Article*

# DISTRIBUTION OF ABO AND Rh(D) BLOOD GROUPS AMONG THE PEOPLE OF MAO NAGA TRIBE OF MAO, SENAPATI DISTRICT OF MANIPUR, NORTH EAST INDIA

**[1*]Jiten Singh Soram, [1]Katingpou Panmei and [2]Biswas, S. P.**

[1]Department of Zoology, Asufii Christian Institute, Mao, Senapati, Manipur-795150
[2]Department of Life Sciences, Dibrugarh University, Assam-786004, India

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**ABSTRACT**

The Genetic studies relating to blood group on populations in north-east India particularly in Manipur have been performed less frequently than in the other parts of India, though there are diverse communities residing the region. The people of Mao Naga tribe of Mao think themselves to have been migrated from China and first settled in Makhel of Mao (latitude $23.83^0$ N to $25.68^0$N and longitude $93.03^0$E and $94.78^0$E) and many of the Naga tribes trace their place of origin from there. In the present study, an attempt was made to study the distribution of ABO and Rh (D) blood groups among Mao Naga tribe of Mao, Manipur, India. This is a preliminary study in which the blood groupings were done after collection from 775 individuals (359 males and 431 females). 354 individuals (46.2%) were found to possess blood group O and shows the highest allele frequency of 0.60 followed by followed by 185 individuals possessing blood group 'A' (23.9%) with a corresponding allele frequency value of 0.22 and 139 individuals with blood group 'B' (17.9%) with a corresponding value of 0.18 while the remaining 93 individuals were found to be possessing blood group 'AB' (12%) and was the least preponderant. In case of alleles Rh(D) and Rh(d), the frequency of allele 'D' was far higher than that of allele 'd' with the recoded values of 0.93 and 0.07 respectively. The result also showed a total of 771 individuals (99.5%) of the studied population to be Rh+ (positive) while the rest four (0.5%) individuals were Rh- (negative).



## INTRODUCTION

Manipur is one of the small hilly states situated at the north eastern extreme corner of India that connects the Indian sub continent to East Asia as a unique passageway (Cordaux *et al*., 2004). The state lies between 23.80°N and 25.68°N latitudes and 93.03°E and 94.78°E longitudes. It is bounded on the east by the Somra tract and the upper Chindwin areas of Myanmar, on the west by the Cachar hills of Assam, on the north by the Naga Hills of Nagaland, and on the south by the Chin Hills of Myanmar. This state has a total area of 22,327 sq. km. where in around 92% of the land is hilly area which surrounds the central bowl-shaped valley formed by the deposits of alluvial soil valley area of about remaining 8% (Rustam Singh *et al*., 2010). Numerous ethnic groups inhabit both the hill and valley areas, thereby forming diverse cultural and ethnic backgrounds (Yaiphaba Meitei *et al.*, 2010). The Mao Naga tribe inhabits the northern hills of Senapati District of Manipur state which state which lies between latitude $23.83^0$ N to $25.68^0$ and longitude $93.03^0$E and $94.78^0$E. They are settled as agricultural community. The total population of the Mao is about 70,000 (seventy thousands), inhabiting in over forty villages. Modern Naga historians brought out the migration theory of the tribe through story telling that one of the Naga groups moved out during the reign of emperor of China, Qin Chin Haunghi, who built the Great Walls of China about 215 B.C. to keep out Mongols. The emperor demanded forced labour, heavy taxation from his subjects and this led to discontentment among the population. Many people died of starvation, exhaustion and more over the political unrest forced the people to depart from this area. There was mass exodus during this period, some slowly moved into the vast plains of Assam. The oral tradition says, Ikhro river is one of the tributaries feeding Barak river on which the forefathers en-routed to Makhel Village and settled down there. Many of the Naga tribes trace their place of origin or point of their migration to this Makhel of Mao and its surrounding areas (Athikho Kaisii and Francis Ariina, 2012). Start a fresh para from here Ever since Karl Landsteiner described the original ABO blood group types

***Corresponding author: Jiten Singh Soram,***
*Department of Zoology, Asufii Christian Institute, Mao, Senapati, Manipur-795150*

(Landsteiner, 1900) many people know what their blood type is and understand that blood group types must be matched in a medical emergency. The ABO blood groups are the most significant blood factors in clinical applications involving blood transfusions. Understanding the importance of blood group is not limited to clinical applications alone. However, with our recent ability to rapidly sequence genes, the ABO blood group is also providing to be a valuable asset for determining migration patterns and origin. The ABO blood group is determined by the presence of A and B antigens on the surface of the Red Blood Cells (RBCs). In addition these, RBC antigens are widely expressed on the membranes of a wide variety of cells including platelets, vascular, epithelial, and endothelial as well as saliva and body fluids (Hosoi, 2008). All human populations share the same blood group systems, differing only in the frequencies of specific types which mean the incidence of ABO and Rh blood groups varies in different races, ethnic groups and socio economic groups in different parts of the world (Khattak *et al*., 2008). Thus, assessing blood group frequency distribution is multipurpose and is not only crucial in the medical field, but can also be utilized in genetic research, anthropology and ancestral relation of human (Khan *et al*., 2004).

As far as the genetic studies on populations in north east India in general and Manipur in particular is concerned, there has been less works carried out compared to the other parts of the country in spite of diversity among these populations. Yaiphaba Meitei *et al.*, 2010 have made an attempt to study the distribution of ABO and Rh(D) blood group among Meitei, Brahmin, Muslim and Kabui tribes of Manipur. A higher occurrence of 'O' blood group which is recessive to 'A' and 'B' blood group types has also been found out amongst the Purum (Chothe) tribes of Manipur (S. Jibonkumar Singh and H. Vokendro Singh, 2007). However, there has not been any previous report on the distribution of ABO and Rh(D) blood group among the prople of Mao tribe. Hence, in the light of the growing need for new strategies this paper is intended to measure the distribution of ABO and Rh(D) blood group among Mao tribe inhabited in the Mao area of Senapati district, Manipur to give an insight into the current status of population in terms of ABO and Rh blood group distribution and corresponding genetic composition of the tribe. It is also wished that, the extrapolation of this data might be of help to the future researchers in their pursuit of further in-depth study in the area.

## MATERIALS AND METHODS

Blood samples from 775 individuals (359 males and 431 females) were collected by finger prick method. ABO and Rh(D) groupings were performed simultaneously for which slide agglutination method was followed. On a labelled slide a drop of each of figure prick blood was placed onto which a drop of anti-A, anti-B and anti-D (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 & anti-B showed group AB and with neither of these showed O group (Race R.R. and Sanger R, 1968). The blood samples were also classified as Rh positive or Rh negative according 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

A total of 775 individuals belonging to the people of Mao Naga tribe inhabiting in Mao were randomly selected for the study. They included 359 males and 431 female between 16 and 25 years of age. The percentage distribution and frequency of ABO and Rh(D) blood groups are given in Table-1, Table-2, Table-3, Fig. 1 and Fig. 2 respectively.

**Table 1. Distribution of the ABO blood groups and allele frequencies in the Mao tribes of Mao, Senapati District, Manipur**

| Phenotype | Number observed | Percentage | Allele frequency |
|---|---|---|---|
| 'O" | 354 | 46.2% | 0.60 |
| 'A' | 185 | 23.9% | 0.22 |
| 'B' | 139 | 17.9% | 0.18 |
| 'AB' | 93 | 12% | ---------- |
| Total | 775 | 100 | 1.00 |

**Table 2. Distribution of the Rh(D) blood groups and allele frequencies in the Mao tribes of Mao, Senapati District, Manipur**

| Phenotype | Number observed | Percentage | Allele frequency |
|---|---|---|---|
| RhD(+) positive | 771 | 99.5% | 0.93 |
| RhD(-) negative | 4 | 0.5% | 0.07 |
| Total | 775 | 100 | 1.00 |

**Table 3. Distribution of the ABO blood groups among males and females in the Mao tribes of Mao, Senapati District, Manipur**

| phenotype | Number observed (males) | % | Number observed (females) | % |
|---|---|---|---|---|
| 'O' | 163 | 45.4 | 195 | 45.2 |
| 'A' | 93 | 25.9 | 92 | 21.3 |
| 'B' | 46 | 12.8 | 108 | 25.06 |
| 'AB' | 57 | 15.9 | 36 | 8.4 |
| Total | 359 | 100 | 431 | 100 |

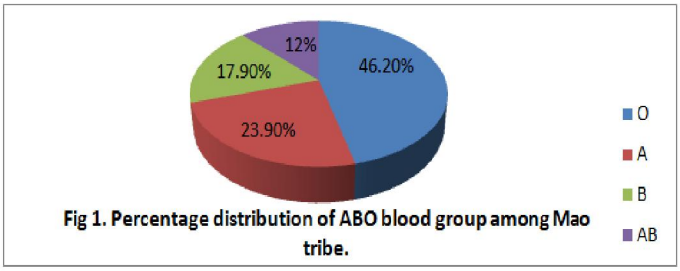

Fig 1. Percentage distribution of ABO blood group among Mao tribe.

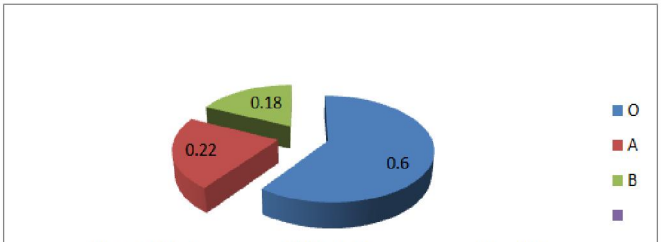

Fig 2. Allele frequency of ABO blod group among Mao tribe.

In overall, the maximum number of individuals (354) in the present study were recorded of possessing blood group 'O' with a percentage value of 46.2% followed by 185 individuals possessing blood group 'A' (23.9%) and 139 individuals with

blood group 'B' (17.9%) while the remaining 93 individuals were found to be possessing blood group 'AB' (12%) was the least preponderant. On the other hand, amongst 359 males and 431 females, the blood group 'O' possessing individuals still outnumbered the other blood groups with 160 and 194 individuals each, so is most preponderant giving percentages of 45.4% and 45.2% respectively. However, in female sex, blood group B is the second most preponderant with 108 recorded individuals giving a percentage of 25.6% followed by blood group A with 92 individuals (21.3%) and the least was 36 individuals with blood group AB (8.4%). In case of males, the blood group A possessing 93 individuals formed the second most important group with a percentage of 25.9% followed by 57 individuals possessing blood group AB giving a percentage of 15.9% and the least was with 46 individuals having blood group B giving rise to a percentage of 12.8%. As the Rh(D) antigen is concerned, a very low percentage of individuals were found to be Rh(D) negative in the present study. The result also showed a total of 771 individuals (99.5%) of the studied population were Rh+ (positive) while the rest four (0.5%) individuals were Rh- (negative). Most interestingly all the four (4) individuals who are Rh negative possess blood group 'O' and are represented by three (3) males with a percentage of 0.4% and one (1) female with a percentage of 0.13%. As far as allele frequencies are concerned, allele 'A' showed a frequency of 0.22 while allele 'B' showed a frequency of 0.18 while the highest was of allele 'O' with a recorded frequency of 0.60. In case of allele Rh(D) and Rh(d), the frequency of allele 'D' was far higher than allele 'd' with the recoded values of 0.93 and 0.07 respectively.

## DISCUSSION

The 'O' blood group is very common around the world. About 63% of humans share it. Blood group 'O' is particularly high in frequency among the indigenous populations (Mourant *et al*., 1976). In the present study, it has been found that the occurrence of blood group 'O' possessing individuals is the highest amongst the ABO blood groups. It has on the other side too been found out that the frequency of allele 'O' is the highest among all the other remaining ABO blood groups. The reason for the very fact may be attributed to the performance of preferential endogamous marriage amongst the Mao tribes as well as smaller population size of the tribe leading to founder's effect. The allele of blood group 'O' is recessive either to 'A' or 'B'. Thus, the incidence of well maintained, clan based practice of endogamous marriage might have resulted in the homogygosity of allele 'O'. Such an occurrence of higher blood group 'O' frequency in the present study is also supported the research works conducted by many scholars among the Manipuri Muslims ('O'=49.5%, 'A'=22.44%, 'B'=24.10% and 'AB'=3.96%) who are strictly endogamous (Shah and Singh, 1986). Similar findings have also been reported among Purum (Chothe) tribes ('O'=47.75%, 'A'=24.7%, 'B'=19.75%, and 'AB'=7.75%) of Manipur (Singh and Singh, 2007). Various other research works conducted by many workers too gave an indication of higher allele 'O' frequencies over others alleles of ABO blood group system; e.g. in Tangkhul tribe ('O'=0.624, 'A'=0.210, 'B'=0.148) reported by Kapaiwo,1995; in Chiru tribe ('O'=0.73, 'A'=0.12, 'B'=0.15) as reported by Singh and Shah, 1997; in Koireng tribe (('O'=0.72, 'A'=0.18, 'B'=0.01) reported by Shah, 2001.

Singh in 1986 also came up with a similar report among Kabui tribe with a recorded allele frequencies of 'O'= 0.609. 'A'= 0.228 and 'B'= 0.163. Apart from this the population is also reproductively isolated due to geographic, religious, linguistic and occupation of the ethnic people because of which there could also be the higher rate of homogygosity of allele 'O' (Banshad *et al*, 2001). Another explanation to the preponderance of the blood group 'O' amongst the population could also be the occurrence of *Plasmodium falciparum* affected malaria in the region (Dev *et al*, 2003; Lal *et al*, 2000). In such a region there is the selection of blood group 'O' over the other blood group types through the process of reduced resetting (Cserti and Dzik, 2007; Rowe *et al*, 2007). The present study also has shown an increase in frequency of group 'O' and decrease in group 'B' which again can be caused by migration of people groups that had a higher or lower frequency for one of the alleles at the time of migration. It could also result from random genetic drift and is likely one more cause for the increase in the frequency of the 'O' allele (Criswell, 2008).

The majority of the people in the world have the Rh+ blood type and as such in the present study the allele frequency of the Rh(D) as well as the individuals who are recorded to be possessing Rh(D) positive blood group exceedingly outnumbered the Rh(d) allele frequency and Rh(D) negative individuals. This may be because of the natural selection of either 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 study besides being small in size at the same time being preferentially endogamous might have resulted the homogygosity 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 the occurrence of Rh incompatibility between mother and foetus, the very phenomenon arises leading to the premature killing of either foetus or the new born.

Thus, the outcome of the present study indicates that the recessive allele for the D antigen is very rare in the Mao population and when the recorded values are compared to global data presented by Mourant *et al.* (1976) and Khattak (2008), the Rh factor data from this study follows the same pattern found in all the populations till surveyed and has always been reported with a minor Rh- type representation which ranges from 0% to 17%. These populations include American Indians, Arabs, Bengalis, Africans, Chinese, Eskimos, Mexicans, and Americans. Such a similar finding have also been reported by Singh and Singh, 2007 among Purum (Chothe) tribes in which out of the 400 individuals tested, only 3 (0.75%) were found to be Rh negative thereby giving frequency of 0.0866 for the allele 'd' where as the remaining 397 (99.25%) individuals were found to be Rh positive giving frequency of 0.9134 for the allele '*D'*. Generally in different populations of the world, there is a general increase in the frequency of the blood group 'O' allele, and in many populations a drop in the type 'B' allele

(Criswell, D. 2008). In this regard, though there are no prior data or information pertaining to the population in study i.e. Mao which can be compared or analysed with the present record to say anything about either increase or decrease in overall frequency of blood group alleles, but still the present study has shown a higher frequency of blood group 'O' and lower in type 'B'. As Criswell, D. 2008, has already mentioned, this higher frequency of blood group 'O' and lower in type 'B' could be caused by migration of population that had a higher and lower frequency for the aforementioned alleles respectively at the time of migration. It could also result from random genetic drift and thus gives a brim of indication that the population had been migrated from a large group of population. However, it would be wrong to draw any conclusion and say about the origin and migration of the population in study from this small research work. Thus, for a better understanding of the population, an elaborate and more precise study is much needed.

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