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Research Article

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Frequency Distribution of ABO and Rh Blood Groups among Students of Maram Tribe of Don Bosco College, Maram, Manipur

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ABSTRACT

There are differences in the distribution of ABO and Rh (D) blood groups in different populations of the world. The ABO and Rh (Rhesus) blood group systems are important for blood transfusion purpose, paternity testing, modern medicine, anthropology and in population genetic study. Relatively, little information is available about the blood group distributions of the Maram ethnic community. This study sought to determine the current status of the blood group distribution and corresponding genetic composition of blood of the Maram population. Blood samples were collected from the students of Maram tribe by finger-prick method and blood groups were examined by slide-test method. Blood group O was the most predominant (35%) blood type. Majority (65%) of the subjects were Rh (D) positive and a surprisingly good number of the subjects (35%) were Rh negative. Blood type B had the highest number of Rh negative subjects (17.2 %). Blood group 'AB' was the rarest (17.7%) of all the blood types. This study confirmed that ABO and Rh antigenic structures differed among various populations and regions across the globe.

Key words *: Maram, ABO, Rh factor, multiple alleles.*

INTRODUCTION

Maram is an ethnic Naga tribe residing in the northern part of Manipur, NE India. The Marams speak the Tibeto-Burman language and possess a unique cultural heritage. They are primarily settled as agricultural community. According to the census of 2001, the total population of the Maram tribe is about 37,340[1]. Under the UNESCO classification of 'degree of endangerment' of languages, Maram has been put in the category of vulnerable. The people of Maram Khullen, the biggest Maram village, continue to follow the Lunar calendar for its customs and traditions[2].

There are at least 20 blood groups recognized in man, of which ABO system is an extensively known system. The ABO locus is located on chromosome 9, specifically, in the segment 9q34.1 – q34.2[3]. The ABO blood group system is widely credited to have been discovered by the Austrian scientist Karl Landsteiner, who found three different blood types in 1900[4]. He described A, B and O blood groups for which he was awarded the Nobel Prize in 1930. Alfred Von Decastello and Adriano Sturli discovered the fourth type AB, in 1932[5].

The discovery of the ABO blood groups by Landsteiner was an important achievement in the history of blood transfusion that was followed by the discovery of Rh (D) antigen [6,7]. 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*[8]. 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. The human blood group Rh polypeptide has been used to map the Rh locus, by *in situ hybridization*, to the region of p34.3 – p36.1 of chromosome 1[9]. The blood group substances are inherited according to simple Mendelian ratios through multiple alleles representing a single locus.

Blood groups are known to have some associations with diseases like duodenal ulcer, diabetes mellitus, urinary tract infection, Rh incompatibility and ABO incompatibility of new born[10]. Among individuals with stomach and peptic ulcers, there is an excess of type 'O' individuals, whereas among those with cancer of the stomach, there is an excess of type A individuals. Not all type O individuals have an increased risk for peptic or stomach ulcers, however[11]. Besides, persons of group A are affected more frequently with coronary heart disease, ischemic heart disease, venous thrombosis and atherosclerosis, while it is low in people with blood group O which is stated to have protective effect against these diseases[12]. O group individuals are known to have a 14 percent reduced risk of squamous cell carcinoma and 4% reduced risk of basal cell carcinoma when compared to non-O group[13]. It is also associated with reduced risk of pancreatic cancer[14]. The B antigen links with increased risk of ovarian cancer[15]. Gastric cancer has reported to be more common in blood group A and least in group O[16].

All human populations share the same blood group system, 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[17].

The knowledge of distribution of ABO and Rh blood groups at local and regional levels is helpful in the effective management of blood banks and safe blood transfusion services. Identification of Rh system is important to prevent the *erythroblastosis foetalis* or haemolytic disease of the new born, which commonly arises when an Rh negative mother carries an Rh positive foetus.

Knowledge of blood group distribution is also important for clinical studies, for reliable geographical information and it will help a lot in reducing the maternal mortality rate, as access to safe and sufficient supply of blood will help significantly in reducing the preventable deaths.

Apart from their importance in blood transfusion practice, the ABO and Rh groups are useful in population genetic studies, researching population migration patterns as well as resolving certain medico-legal issues, particularly of disputed paternity cases. In modern medicines, besides their importance in evolution, their relation to diseases and environment is being increasingly becoming important[18,19]. It is, therefore, imperative to have information on the distribution of these blood groups in any population group.

This study is intended to determine the frequency and distribution of ABO and Rh blood group patterns among Maram populations to give an insight into the current status of blood group distribution and the corresponding genetic composition of blood of the Marams and compare with other data from similar studies within the country and all over the world.

MATERIALS AND METHOD

Blood samples from 180 individuals (105 males and 75 females) were obtained with their consent upon request. Three drops of blood were obtained on clean glass slides from each individual by needle-bite on the tip of index finger with a sterile lancet after cleaning the finger-tip with 90% ethyl alcohol. For the ABO and the Rh tests, a drop of each of the antisera, anti A, anti B and anti D (J. Mitra and Co. Pvt. Ltd., New Delhi) was added and mixed with each blood sample. Blood groups were determined on the basis of agglutination (antigen-antibody reaction). The working assumption is that college students come from different localities and villages, and are thus distributed in a random fashion contributing to a mixed cosmopolitan population.

RESULTS

One hundred and eighty students (180) were randomly selected among the students of Don Bosco College, Maram and tested. This consisted of 105 males and 75 females between ages of 18 and 23. The frequency distribution of the blood groups O, A, B and AB is shown in table 1. The frequencies of blood groups O, B, A and AB were 35%, 27.3%, 20% and 17.7% respectively. There are significant differences in the distribution of blood groups between the male and female students, particularly the O and the AB types. The frequency of Rh system is shown in table 2. The Rh(D) and Rh (d) distribution varies among the four ABO blood groups. The frequencies of Rh +ve and Rh –ve blood groups were 65% and 35% respectively. Among students with Rh(d) negative, blood group B students have exceedingly high Rh

negative frequency (49.2%). On gender-wise examination, 68 out of 105 male students (64.76%) were Rh positive whereas remaining 37 male students (35.24%) were Rh negative. Regarding female students, the rates were 65.33% (49 females) and 34.67% (26 females) respectively. However, verification by allelic frequencies for the blood types cannot be carried out as it is not known whether blood types A and B are homozygous or heterozygous (ie., $I^A I^A/I^A I^O$ or $I^B I^B/I^B I^o$).

Table 1. ABO blood group distribution among the 180 Maram students of Don Bosco College, Maram

ABO SEX	O	A	B	AB	TOTAL
MALE	40 (22.3%)	20 (11.2%)	25 (13.8%)	20 (11.1%)	105 (58.33%)
FEMALE	23 (12.7%)	16 (8.8%)	24 (13.4%)	12 (6.6 %)	75 (41.67%)
TOTAL	63 (35%)	36 (20%)	49 (27.3%)	32 (17.7%)	180

Table 2. Distribution of Rh factors among the students of Don Bosco College, Maram

Phenotype	Number of individuals	Percentage (%)
Rh^{+ve}	117	65
Rh^{-ve}	63	35
Total	180	100

Table 3. Gender-wise distribution of Rh factors in Don Bosco College students of Maram

ABO type	Rh positive	M	F	Rh negative	M	F
O	57	36	21	6	4	2
A	28	14	14	8	6	2
B	18	10	8	31	15	16
AB	14	8	6	18	12	6
Total	117	68	49	63	37	26

Fig.1. Percentage distribution of ABO blood system in Maram population

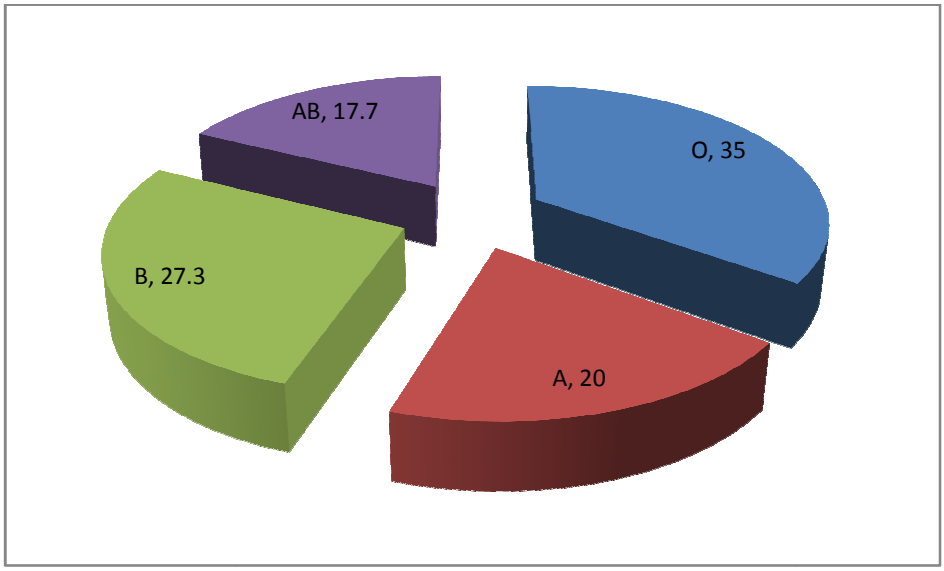
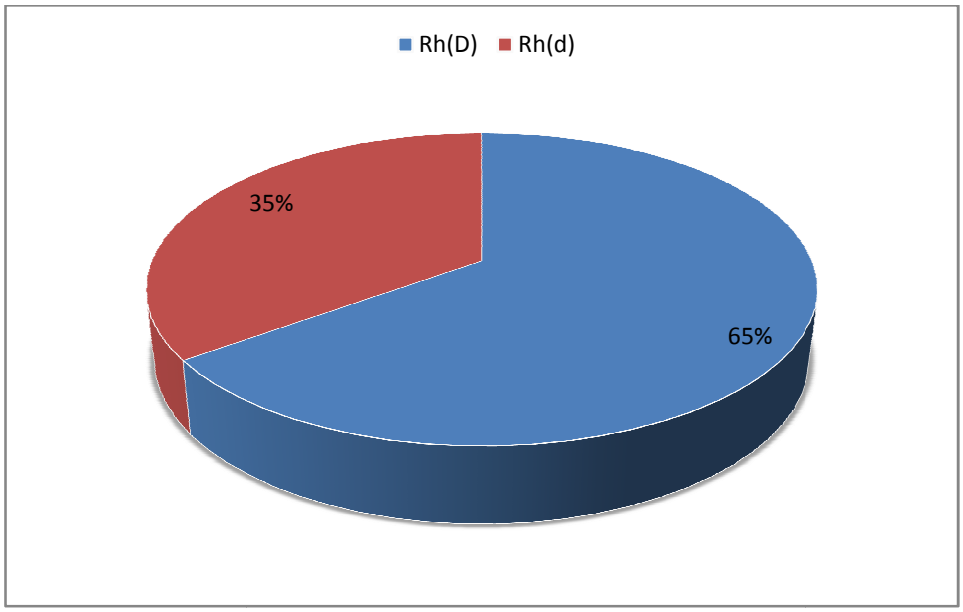


Fig.2. Percentage frequency distribution of Rh factors in Maram population



DISCUSSION

The Landsteiner's discovery opened the door to the birth of a wide spectrum of discoveries in the field of immuno-haematology, blood transfusion among humans irrespective of their natives, unmatched-pregnancy, legal medicine, anthropology and the discovery of other blood group systems, all are deemed as an application or as a result of Karl's discovery[20,21].

In the present study, the frequency of blood group 'O' was the highest (35%) and the least frequency was that of blood group 'AB' (17.7%). Usually, the distribution of ABO blood group varies from one population to another. In many other studies, blood group 'O' has been found to be the most common blood group. In the Caucasians in the United States, the distribution is type O, 47%; type A, 41%; type B, 9% and type AB, 3% and for the blacks in the U.S., the distribution is type O, 46%; type A, 27%; type B, 25% and type AB, 7% [22].

Among Western Europeans, 42% have group A; 9% have group B; 3% have group AB and the remaining 46% have group O. Similarly, in Pakistan, blood group O is the most common (35%), blood group A is 23.5%, blood group B is 33% and blood group AB is 8%. Thus, the segregation of the genes responsible for the ABO blood system has always taken a particular pattern for its distribution with exceptional cases. For instance, in Nepal, where type A is the most common (34%) and O is 1.5% [23]. In addition, it can be seen from the present study that blood group AB has the least frequency, though quite incredibly high; AB has the least percentage which is most of the time very rare and also the case in other previous studies.

As far as the distribution of blood group B is concerned, it has a frequency of 25% in Asians, 17% in Africans and only 8% in Caucasians[24]. Our study on Maram population also shows blood group B frequency at 27.7%, which is not so different from that of the Asians'.

While looking at the Rh grouping, 89-95% donors all over the world are detected with as Rh positive except in Africa and the U.S.A. where the frequency of Rh positivity is 83-85%. Our study found/showed unexpected high frequency of Rh negative (35%) indicating that occurrence of the recessive allele, Rh (d), for the D antigen is very high in the Maram population. This may be due to the fact that the group of people who had migrated to Maram area from Makhel might have had a high prevalence of Rh negative antigen contributing to Founder's effect. Many of the Naga tribes trace their origin or point of migration to Makhel of Mao and its surrounding areas[25].

In course of time, they became reproductively isolated due to geographical, cultural and traditional factors and occupation (agricultural), thereby leading to the high incidence of Rh negativity among the Marams. Besides, genetic drift tends to reduce the amount of genetic variation within the population mainly as a result of loss of those alleles which have a low frequency. Continual mating within a small population decreases the population of heterozygotes and increases the number of homozygotes.

The importance of the knowledge of the blood groups and genotypes in regards to the health of an individual is enormous. The different types of information are useful for medical diagnosis and treatment, genetic information, genetic counselling and also for the general well-being of individuals. So, it is imperative to do blood grouping studies in each region for overall, long-term human welfare and benefits of the nation.

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