



Research Article

JMR 2017; 3(6): 273-276

November- December

ISSN: 2395-7565

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www.medicinarticle.com

Received: 14-11-2017

Accepted: 10-01-2018

A hospital based study to find the distribution of ABO and Rh blood group in the local population of Sikkim, North-Eastern India

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Abstract

Introduction: Blood group antigens are hereditarily determined and play a vital role in transfusion safety, understanding genetics and inheritance pattern and disease susceptibility. ABO and Rh system is the most common and widely used world-wide. The objective of the present study was to determine the distribution of blood groups (ABO and Rh) subtypes A1, A2, A1B & A2B and Bombay blood group in the local population of Sikkim. **Methods:** A total of 262 blood samples were collected over a period of two months from voluntary blood donors, which included hospital staff, visitors and patients and local inhabitants of Sikkim. Determination of various blood groups namely [ABO, Rh, A1, A2, A1B, A2B and Bombay blood group were performed. **Results:** Out of the total sample the most common blood group was O blood group comprising 34.73% followed by B group (28.24%), A (22.91%) and AB (14.12%). 98.4% of the total samples were Rh positive. When blood group A and AB were further sub-typed the distribution of A1 antigen was 98.3% and A₂B was 89.7% respectively among A and AB blood groups. Among the 91 blood group O samples only 1 was reactive to H antigen. **Conclusion:** The distribution of Blood group O was highest in these region closely followed by B, A and AB. Almost all the samples showed positivity for Rh. The distribution of A₂ and A₂B were very low and Bombay blood group was very rare in this part of the country, however further study is required on a larger scale as this study was done in a hospital set up for a very short period of time

Keywords: Anti A lectin, ABO, Rh, Bombay Blood group.

INTRODUCTION

Blood groups antigens are hereditarily determined and play a vital role in transfusion safety, understanding genetics and inheritance pattern and disease susceptibility. It plays a vital role in pattern, and disease susceptibility^[1].

The study depicts the distribution of ABO blood groups, their subtypes and Bombay blood group among the local population of Sikkim. This study was chosen as previously no such research has been done in this population and thus the data about the prevalence of blood groups and their subtypes is not sufficient. Though done on a small scale, hopefully this study will prove to be a great contribution in the field of blood transfusion techniques.

Nearly 700 erythrocyte antigens are described and organised into 30 major blood grouping systems by the International Society of Blood Transfusion, of which ABO and Rh are the most common ones. This system was discovered by Karl Landsteiner in 1900 based on the presence of agglutinins in the blood and the agglutino-gen present on the RBC membrane^[2]. The varieties of glycoprotein coating on red blood cells divides ABO blood group into four groups namely A(A oligosaccharide present),B(B oligosaccharide present),AB(both A and B Oligosaccharide present) and O(neither A nor B oligosaccharide present).

Based on the presence or absence of Rhesus (Rh) factor the above mentioned blood groups may be positive or negative respectively. This Rh system is the second most significant blood group system in the human blood transfusion and was identified by Karl Landsteiner and Alexander S. Wiener in 1940^[3].

The frequencies of ABO and Rh blood groups vary from one population to another and time to time in the same region. Knowledge of the distribution of ABO and Rh blood group is essential for effective management of blood banks and safe blood transfusion services, be it a facility of a smaller local

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transfusion service or a regional or national transfusion service. It is, therefore, imperative to have information on the distribution of these blood groups in any population. In modern medicine besides their importance in evolution, their relation to disease and environment is being increasingly important [4, 5]. It is, therefore imperative to have information on the distribution of these blood groups in any population. Sub typing in addition gives us a better precision in blood grouping so as to be more precise in cross-matching and thus reducing any chances of a miss-match.

On a worldwide basis, O is the most prevalent blood group followed by B, A and AB. The most common blood group in India is O positive (47.3%) [6]. Blood group B has its highest frequency in Northern India and neighbouring Central Asia [7].

Blood group A contains about twenty subgroups out of which A₁ and A₂ is the most common(over 99%). A₁ makes about 80% of all A-type blood, with A₂ making up the rest [8]. These two subgroups are interchangeable as far as transfusion is concerned, but complications can sometimes arise in rare cases. So apart from the ABO and the Rh subtypes we have made an effort to subtype blood group A and AB into A₁,A₂,A₁B and A₂B depending upon their reaction with anti A₁lectin(anti A₁lectin agglutinates A₁ and A₁B but not A₂ and A₂B).

The next blood group that has been taken into account is Bombay blood group. This is an extremely rare ABO group, called so because it was first discovered among some people in Bombay (now Mumbai) [9]. Although the group is more likely to occur in East Indians, it is a very rare group even here. It is not restricted to East Indians but found in Caucasians, Japanese, etc. Their red cells lack ABH antigens. As a result, these individuals produce anti-H, anti-A, and anti-B and can therefore be transfused only with RBCs that also lacks the H, A, and B antigens i.e., they can only receive blood from another person with the Bombay phenotype. Because of the rarity of this blood type, this normally means using blood donations from a suitable relative [10]. The anti-H would not be detected in the ABO group but would be detectable in pretransfusion tests.

MATERIALS AND METHODS

[This study was conducted at Blood Bank, Department of Pathology, Sikkim Manipal Institute of Medical Sciences, Gangtok for a period of 2 months (from 20th May to 20th July,2013).

Recruitment methods

The subjects included in the study were the local inhabitants of Sikkim. The blood samples were collected from volunteers which included staff, donors, patients and visitors. An informed consent was taken from each of the volunteer.

The blood samples were screened for the blood groups ABO and Rh. The A and AB blood groups were further screened and sub grouped into A₁,A₂, A₁B and A₂B while O blood group was screened for the presence of H antigen.

Blood grouping (forward and reverse) was performed by tube method as per the departmental standard operating procedures(SOPs).The screening for ABO blood group was done with the help of commercially prepared anti-sera (anti-A and anti-B) Rh antigen was detected using anti-Rh(Dtype)sera. Identification of sub groups A₁, A₂, A₁B and A₂B were done by using anti A₁lectin. Samples with O blood group were further screened for the presence or absence of H antigen by using anti H lectin.

Technique followed for blood grouping:

1. Slide method

Three clean glass slide were taken on which a drop of known anti-sera (anti-A, anti-B and anti-D) were put. A drop of blood sample was added to each one of it. Using the edge of separate slides the blood was properly mixed with the anti-sera. The slides were kept undisturbed for 1-2 minutes at about 37 degrees. The presence of agglutination indicated the presence of that respective blood group and the Rh factor.

For subtyping blood groups A and AB into A₁, A₂, A₁B and A₂B, separate clean glass slides were taken on which a drop of anti-A₁lectin and a drop of the blood sample to be tested was taken and mixed properly with the edge of a separate clean glass slide. Presence of any agglutination was observed and the result noted.

For all blood group O samples, presence of H antigen were identified by taking a clean glass slide in which a drop of anti-H lectin and a drop of the blood sample was mixed. Presence of agglutination indicated the presence of H antigen in that blood group.

All the samples which were grouped by the slide method were confirmed by the tube method.

2. Tube method

Forward grouping-Subject's RBCs taken along with a known anti- sera such that the positive result depended on the presence of agglutination in the respective tube or slide.

- 1) A 2-5% suspension of washed RBCs was prepared from the samples to be tested using 0.9% saline as diluents.
- 2) Two test tubes were labelled with the sample number as 'i' and 'ii'
- 3) One drop of each anti-sera A and anti-sera B were place in test tubes i and ii respectively.
- 4) One drop of the RBC suspension was added to both the test tubes.
- 5) After a gentle shake, the test tubes were subjected to centrifugation for 15-20 minutes on a high speed of about 3500 rpm. The RBCs settle down in the test tube in the form of a button or pellet indicating the presence of agglutination.

Reverse grouping-Subject's serum taken and RBCs of known blood group antigens were added so that a positive result in the tube excluded the presence of that antigen.

- 1) Two test tubes labelled with the sample number were taken and marked as 'i' and 'ii'.
- 2) Two drops of the serum sample were put in each of the test tubes.
- 3) One drop of 'A' RBC reagent and 'B' RBC reagent were added to test tube i and ii respectively.
- 4) After a gentle shake, both the test tubes were subjected to centrifugation for 15-20 seconds at a high speed of about 3500 rpm.
- 5) Agglutination was indicated by formation of RBC button at the bottom of the test tube.

RESULTS

The study depicts the distribution of ABO blood groups, their subtypes and Bombay blood group among the local population of Sikkim. The study included 262 samples collected from voluntary donors over a period of two months. Out of the total sample the most prevalent blood group was O blood group comprising 34.73% followed by B group(28.24%), A(22.91%) and AB(14.12%) as shown in table I.

Table 1: Distribution of ABO and Rh blood group in the study population (n=262).

BLOOD GROUP	Rh Positive (%)	Rh Negative(%)	TOTAL (%)
O (%)	90 (34.35%)	01 (0.38%)	91 (34.73%)
B (%)	73 (27.86%)	01 (0.38%)	74 (28.24%)
A (%)	58 (22.13%)	02 (0.78%)	60 (22.91%)
AB (%)	37 (14.12%)	00 (00%)	37 (14.12%)
Total (%)	258 (98.46%)	04 (1.54%)	262 (100%)

Out of the total 262 samples 258 were Rh positive (98.4%) while only 1.6% were Rh negative as depicted in the figure 1.

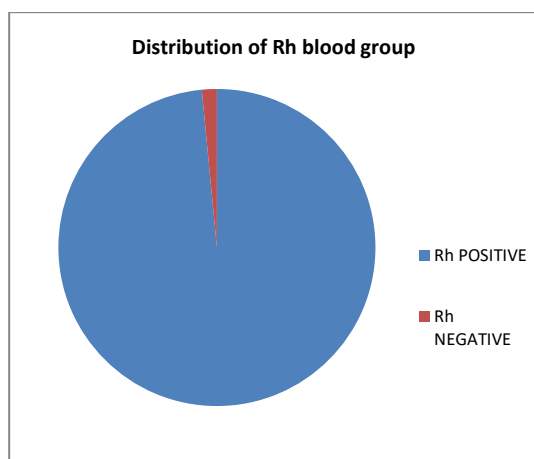


Figure 1

97 samples (60 A group and 37 AB group) were further subtyped by using anti A1 lectin. 94 samples(98.3% A group and 89.7% AB group)showed agglutination which is shown in figure 2.

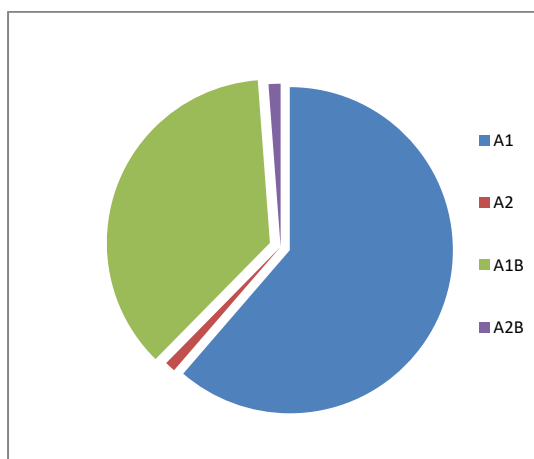


Figure 2

Among the 91 blood group O samples 90(98.9%) reacted with anti H lectin.

DISCUSSION

This data obtained closely resembles the one which was given by Sunder Periyavan [11]. As per the study conducted by Sunder Periyavan *et al*, the most common blood group was O (39.81%) followed by B (29.95%), A(23.85%) and AB (6.37%). Also studies conducted by Chapagain RH *et al* (2005) [12], AnjuVerma *et al* (2011) [13], and Das PK *et al*(2001) [14] concluded that the most common blood group in India as

well as most of Asia was O followed by B which can also be seen in our study. However a study conducted in Uttarakhand by Garg P *et al* (2014) [15] showed that Blood group B was more common than O followed by A and AB.

Out of the total 262 samples, it was seen that 258 were Rh positive which comes out to be 98.4% while only 1.6% were Rh negative as depicted in figure 1. This observation also correlates with the data collected by Sunder Periyavan *et al* and Das PK *et al* [11].

which showed the high number of Rh positive subjects. On a worldwide basis also the prevalence of Rh negative blood group was found to be low as seen in studies by by Chapagain RH *et al* [12] and Mohammed A.Saharan *et al* [16]. The prevalence of Rh positive and negative subjects is quite similar to that found in India as well as the rest of the world.

The blood group A contains about twenty subgroups out of which A₁ and A₂ are the most common (over 99%). A₁ makes up about 80% of all A-type blood, with A₂ making up the rest [4].

Out of total 262 samples 60 were A group and 37 were AB. So when a total of these (97 samples) were further subtyped 94 showed positive reaction with anti A1lectin.The prevalence of A₁ antigen in A blood group was 59 out of 60(98.3%) and A₂B in AB group was 35 out of 39(89.7%) which is shown in figure 2. Our findings were similar to the study by Shastry Bhatt *et al* [17], Bangera *et al*, Chaitanya Kumar *et al* [18] and Giriyan SS *et al*(2017) [19].

Bombay blood group is an extremely rare ABO group, called so because it was first discovered among some people in Bombay (now Mumbai). Although the group is more likely to occur in East Indians, it is a very rare group even here. It is not restricted to East Indians but found in Caucasians, Japanese, etc. as their red cells lack ABH antigens. Among the 91 blood group O samples 90(98.9%) reacted with anti H lectin.

Sunder Periyavan *et al* (2010) [11] found the prevalence of Bombay blood group to be just 0.005% while Das PK *et al*(2001) [14] found the prevalence of Bombay blood group to be just 0.004% in their studies.

CONCLUSION

The present study concludes that the distribution of Blood group O is highest in these region closely followed by B,A and AB. Almost all the samples showed positivity for Rh. The distribution of A₂ and A₂B is very low in this part of the country, however further study is required on a larger scale as this study was done in a hospital set up for a very short period of time.

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