

## Original Research Article

**Occurrence of blood group pattern in Nepalese population of mixed origin in Tarai Region .**

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**Abstract**

Role of different blood groups is very important in the management of transfusion of blood to the needy patient. This is why since the discovery of ABO blood group by Landsteiner in 1900, several attempts were made by different researchers to study on the frequency distribution of ABO blood groups, but similar data among Nepali population specially in one of the main topographical region of Nepal i.e Tarai Region is still lacking. So the aim of this study is to observe the distribution of normal ABO group and Rh factors among the Nepalese population of Tarai region.

A total of 1082 Nepali domiciles from Tarai regions are randomly selected from the Nepali Medical and Dental students, staffs and local domiciled population. Aseptically collected venous blood was used to determine ABO and Rhesus factor by Tile or Slide testing as reported by Egesie et al. 2008. It is observed in our study that prevalence of blood group in Tarai region of Nepal is in the following order : O>A>B>AB. However the occurrence of Rhesus positive individual is comparatively higher in Nepal than other countries. This study reveals that unlike other Asian countries A blood group is 2nd largest blood group in studied population of Nepal. This can be explained as racial variation.

**Keywords:** Blood group, Nepal, Racial, Rh grouping

**Introduction:**

Since Landsteiner<sup>1</sup> published his report regarding the distribution of the ABO blood group in 1900 and Landsteiner and Wiener<sup>2</sup> collectively published their report on the discovery of the Rh factors in 1940, it has been observed that the occurrence of ABO and Rh factors vary worldwide as well as among different races. A study by Chan et al<sup>3</sup> in 1962 from Singapur the O blood group has the highest frequency among Malays, Indians, Eurosiens and also Chinese people in Singapur whereas B group is the 2nd highest and AB is least. On the contrary the blood group A is most common in Russian Federation<sup>4</sup>. In the USA<sup>5</sup> it is 46% of O group, 41% of A, 9% of B and 4% of AB group. The commonest group among Australians are group O and A whereas in African B group is much common<sup>6</sup>. In Pakistan,<sup>7</sup> the occurrence of blood group B was maximum followed by A blood group.

It has also been reported that the occurrence of ABO group is different in different geographical, ethnic and socioeconomic groups<sup>8</sup>. For example in India, the incidence of ABO group is variable- the frequency for B ranges from 6% in Negritos of Andamans to 48% in Birijas of Bihar, while group A has a percentage of 20-30% in Western and Eastern Himalayas<sup>9</sup>. Frequency of blood group in North India is B >O>A>AB<sup>10,11,12,13</sup>, whereas in south India the blood group O was maximum followed by B<sup>14</sup>. This indicates that the occurrence of ABO blood group is not similar in all provinces of a country and depends on different geographical or ethnic groups. In Nepal such type of study is limited only in

**Editor's comments**

1. The distribution of blood groups varies according to geographical and ethnic groups.
2. The high prevalence of B group is similar to the West in contrast to the Asian population.
3. This knowledge may help in research of anthropology and disease associations.

restricted population i.e. either people from hilly region or from medical students community with small sample number<sup>15,16</sup>. Therefore the present study related to the occurrence of ABO blood group and Rh factor is essential in different geographical and ethnic groups (Natives staying in Tarai region of Nepal) so that this data can be used for:

1. The management of blood bank related services in this area.
2. Establishing possible associations of various diseases like cardiovascular disorders, cancers, peptic ulcers etc. to blood group in the said population living there<sup>17,18,19</sup>.
3. In anthropological study of racial classification of said population and also in solution of problems of identity, percentage and etc.

**Material and Method:**

Total of 1082 Nepali domiciles from Tarai regions (Flat river plain of Nepal that extends along the southern border with India, which is one of the major three topographical regions of Nepal) are randomly identified from the Nepalese MBBS and BDS students, staffs of the Medical colleges and local domiciled population. The ethnic group chosen for this study are the largely populated locally domiciled ethnic groups from this belt (Tarai region) who are of heterogeneous origin from Nepalese and Indians as the other studies were dealt in either multi ethnic<sup>20,21</sup> or population from purely Nepali

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| Blood Group | Male (N=648)   |       | Female(N=434)  |       | Total (N=1082) |       |
|-------------|----------------|-------|----------------|-------|----------------|-------|
|             | Absolute value | % age | Absolute value | % age | Absolute value | % age |
| O           | 286            | 44    | 176            | 41    | 462            | 43    |
| A           | 194            | 30    | 143            | 33    | 337            | 31    |
| B           | 136            | 21    | 82             | 19    | 218            | 20    |
| AB          | 32             | 5     | 33             | 8     | 65             | 6     |
| Rh+         | 602            | 93    | 391            | 90    | 993            | 92    |
| Rh-         | 46             | 7     | 43             | 10    | 89             | 8     |

Table-II: Comparative table of ABO blood group & Rh factor in percentage

| Country                                | A  | B  | O  | AB | Rh+     | Rh-   |
|--|----|----|----|----|---------|-------|
| Great Britain                          | 42 | 9  | 47 | 3  | 83      | 17    |
| USA & Western Europe                   | 41 | 9  | 46 | 4  | 85      | 15    |
| Central & Eastern Europe               | 45 | 11 | 40 | 4  | 89      | 11    |
| Australia                              | 44 | 9  | 46 | 4  | 85      | 15    |
| India (Mixed)                          | 18 | 33 | 39 | 10 | 95      | 5     |
| Pakistan                               | 28 | 32 | 30 | 10 | 90      | 10    |
| Nepal (Mixed) <sup>9,10</sup>          | 28 | 27 | 35 | 10 | 98.5-99 | 1-1.5 |
| Nepal (Tribes of Jirels) <sup>11</sup> | 34 | 14 | 25 | 9  | 99      | <1    |

tribes<sup>22</sup>. The above mentioned ethnic group was selected through a questionnaire containing questions regarding their paternal, maternal and ancestral origin. Any doubtful case of ancestral relationship and individuals from purely Nepali origin are excluded from this study. The work was approved by the Institutional review board.

The venous blood was collected aseptically by puncturing the antecubital vein. The ABO and Rh factor are determined immediately after blood collection using the Tile or Slide testing method<sup>7, 23</sup> using antisera-A, antisera-B and antisera-D (Span Diagnostics Ltd. Surat, India). The blood groups were determined on the basis of agglutination (under light microscope as and when required). As per the standard protocol the result was expressed as percentage which is considered as occurrence of each ABO blood group and Rh factor. The significance of difference between the observed frequency and the expected (Reference frequency) is done by Chi Square test<sup>24</sup>.

**Observations:**

The sex wise distribution of ABO and Rh system in the above mentioned population is displayed in Table-I. It is found that amongst the studied group the O group is most prevalent followed by A group, then group B and then group AB. There is also no sex wise significant variations of blood group distribution. Statistical analysis by Chi Square test reflects that the observed frequency distribution does fit to the expected i.e. reference frequency distribution of Nepali (Mixed) population or in otherwise there is no significant difference between the observed frequency distribution and reference frequency distribution. But the observed frequency distribution significantly (P< 0.001) differs with the expected frequency distribution of Indian population. It is also found that the frequency distribution of Rh positive individuals is comparatively more in both genders among the population than the Rh negative individuals and the Rh negative population is significantly lower than that of other countries but matches with the reference distribution of other Asian countries. It is also observed that the percentage of Rh negative population in

Tarai region is not too lower as reported by other workers.

**Discussion:**

The occurrence of four ABO group varies in different population throughout the world though the type O is the most common. The frequency of A blood group is 2nd largest among Americans<sup>25</sup>, Western Europeans<sup>26</sup>, Central and South Americans, Australians and Central and Eastern Europeans<sup>27</sup>, whereas the frequency of B type of blood group is 2nd largest in Asian countries like China<sup>3</sup>, India<sup>9,10,11,12</sup>, Pakistan<sup>7</sup>, Singapore<sup>3</sup> etc. This study reveals that unlike other Asian countries like India A blood group is 2nd largest blood group in studied population of Nepal which defies the findings of some study in Nepal<sup>20,21,28</sup> but similar to some other findings<sup>22</sup>. This can be explained as racial variation as Nepalese are the conglomerate of diverse ethnic communities and mostly a mixture of Indo-Aryan, Tibeto-Burman and other ethnic groups though the people of Tarai region are mostly Indian in origin from northern Gangetic plain<sup>12,13</sup>. Similar difference is even seen in some provinces of India and Pakistan. For example in district Swat NWFP Pakistan<sup>7</sup> it was observed that the group B is most prevalent followed by O, A and AB, whereas in Baluchistan and Sindh provinces of Pakistan the O group is most prevalent<sup>29,30</sup>. Similarly in South India<sup>14</sup> O group was reported as the most common followed by B and A whereas in Northern part of India like Himachal Pradesh & Delhi<sup>9-12</sup> the blood group B group is 2nd most common.

The present findings also reveals that the percentage of Rh negative population is comparatively less irrespective of sex than that of other countries but is similar with the incidence of other Asian countries like India.

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**Karl Landsteiner - Father of Discovery of the Major Blood Groups**

## Blood Grouping for Clinical Practice

Dr. Rajib De\*

Blood group antigens are molecules present on the surface of red blood cells. There are 30 types of blood groups, each group consisting of several antigens. ABO group is most immunogenic and most important from transfusion point of view. ABO blood group consists of A & B Antigen on RBC surface and corresponding opposite naturally occurring antibody (Anti-B, Anti-A respectively) in plasma.

To confirm ABO grouping both forward (for Ag on RBC) and reverse (for corresponding opposite Ab in plasma) grouping as well as detection of H Ag must be done.

For RBC Transfusion, group must be same or compatible and should be properly crossmatched. Crossmatch involves testing donor RBC with patient's plasma (Major crossmatch: Most important for transfusion) and patient's RBC with donor plasma (Minor crossmatch: not important for transfusion).

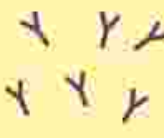


Bombay blood group means absence of H antigen with presence of corresponding anti H Ab in the plasma. Bombay blood group patients can be given only Bombay group RBC as anti H in plasma can destroy all other group RBC including group O.

After A & B Ag, Rh D Ag is most immunogenic and should be matched before transfusion as Rh+(D Ag present), Rh- (D Ag absent).

RBC transfusion should be ABO & Rh(D) compatible. ABO blood group is not necessary for Random Donor Platelet(RDP) and Cryoprecipitate transfusion. Rh(D) grouping is not applicable for FFP, RDP, Cryoprecipitate transfusion.

Blood group O are sometimes known as universal donors due to absence of A or B Ags. However, their plasma does contain anti-A and anti-B that, if present in high titre, has the potential to haemolyse the RBCs of non-group O recipients. Blood group antigen expression is suboptimal upto 6 month of age, reach adult level at 5-10 years of age and again decline in older age > 65 years.

ABO and Rh(D) grouping is sufficient for occasional transfusion. For multi-transfused patients extended grouping like Rh(C,c,E,e) and Kell are necessary to prevent alloantibody formation. Grouping is best done by Tube method, Gel card or automated platforms. Slide method is not recommended for grouping. Certain diseases like Leukemia, Multiple Myeloma, Autoimmune Haemolytic Anaemia etc can cause group discrepancy (discrepancy in forward & reverse grouping).

| <b>ABO Blood Groups</b> |  |  |  |  |
|-------------------------|--|--|--|--|
| Antigen<br>(on RBC)     | Antigen A  | Antigen B  | Antigens A + B   | Neither A or B   |
| Antibody<br>(in plasma) | Anti-B Antibody<br> | Anti-A Antibody<br> | Neither Antibody   | Both Antibodies<br> |
| Blood Type              | <b>Type A</b><br>Cannot have B or AB blood<br>Can have A or O blood                                    | <b>Type B</b><br>Cannot have A or AB blood<br>Can have B or O blood                                    | <b>Type AB</b><br>Can have any type of blood<br>Is the universal recipient | <b>Type O</b><br>Can only have O blood<br>Is the universal donor   |

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