Study of ABO and Rh-D blood group among the common people of Chittagong city corporation area of Bangladesh

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This study was aimed to identify the distribution patterns of ABO and Rh-D blood group among the population of Chittagong city corporation area in Chittagong city of Bangladesh in order to promote social awareness, and safe blood transfusion among the population. A cross sectional, analytical study was carried out on a total of 937 people in three different area of Chittagong City Corporation (that is, Central railway building area, District commissioner hill area and Patenga sea beach area). The ABO blood group system in the total sample showed the same trend of prevalence with that of the general Indian subcontinent (B > O > A > AB). The same trend was found among males, but among females the order of prevalence was different (O > A > B > AB). Rh-D positive were 90.72% and Rh-D negative were 9.28%. Study of blood grouping is not only generating a simple database but also create a great social awareness about self-blood grouping and safe blood transfusion among the population of a country.

Key words: ABO, Rh-D, social awareness, agglutination method, Bangladesh.

INTRODUCTION

ABO blood groups were discovered by Landsteiner in 1901 (Landsteiner and Wiener, 1940). Later on in 1939, Rhesus blood groups were discovered by Landsteiner and Wiener in 1940. Since 1901, more than 20 distinct blood group systems have been identified but the ABO and Rhesus blood groups remain clinically the most important. Furthermore, they are also well defined genetic markers employed in population genetics (Amin-ud-Din et al., 2004; Sigmon, 1992). Blood group or blood type is based on the presence or absence of inherited antigenic substance on the surface of red blood cells that can be determined by specific antibodies (Garg et al., 2014). The importance of blood group discovery lies in the transfusion of blood amongst different populations irrespective of their ethnic origin, in organ transplantation and in the development of legal medicine, genetic research and anthropology (Storry, 2003).

The major ABO blood group system is divided into four blood types on the basis of presence or absence of A and B surface antigens. The blood groups are A, B, O and AB. The frequency of four main ABO blood groups varies in the population throughout the world. ABO blood group system derives its importance from the fact that A and B are strongly antigenic and anti A and anti B naturally
occurring antibodies present in the serum of persons lacking the corresponding antigen, and these antibodies are capable of producing intravascular hemolysis in case of incompatible transfusion (Harmening and Firestone, 2005). Blood group investigations in this subcontinent started during 1st World War with Hirschfeld in 1919 who determined blood groups in large number of soldiers including Indians, and found high frequency of blood group B. Though records were not maintained separately for endogamous population groups, the studies revealed large regional and ethnic differences in blood group frequencies (Nydegger et al., 2007). The distribution of ABO and Rhesus blood group systems in Bangladeshis was studied in South East zone of the country during 1984 to 1988; the predominant blood group was O followed by B group (Majumder and Roy, 1982). In Eastern part of Bangladesh, O group was predominant and distribution of O and B was almost same in Western part (Nandy, 1986).

The present study was conducted among the common population of Chittagong city corporation area with the objective to observe the distribution pattern of ABO and Rhesus blood group system among them. This study will document a blood group data base as well as create social awareness among them, allow safe blood transfusion and prevent hemolytic disease of new born and fetus by knowing ABO and Rh typing.

**MATERIALS AND METHODS**

This cross sectional study was conducted in three different places and those were at District commissioner hill area on 21st February, at Chittagong railway building area on 1st April and at Patenga sea beach on 16th December. The duration of the study was 8 months from February, 2013 to December, 2013. A total sample of 937 participants irrespective of age and sex were included in the study. Samples were determined using random sampling technique.

**Collection of specimens**

After aseptic washing with 70% ethyl alcohol, blood samples were collected on grease free clean slide from left ring finger tip with the help of a sterile lancet. Blood groups were determined in a single slide to minimize any errors.

**Laboratory investigations**

The determination of ABO blood group and Rh (D) blood group was done according to the principle of slide method (Sultana et al., 2013). A drop of blood from each volunteer was placed on a glass slide in three places. A drop of each of the antisera A, B and D was added and mixed with each blood sample, with the aid of glass rods. Then, the mixture was rocked gently for 60 seconds to observe for agglutination. The results of agglutination were recorded immediately after mixing. The agglutination in blood drop A was considered as group A, and agglutination in blood drop B as group B. The agglutination in both drops was considered as group AB, and if both blood drops were not agglutinated, it was considered as group O. The agglutination in rhesus blood drop was considered as rhesus positive and non-agglutination as rhesus negative.

**Data collection**

All the participants were told about the aims and objectives of the study, and the blood grouping procedures were briefed to them. Written consent was taken from the participants aged more than 18 years, and parents' consent was taken for those who were less than 18 years old. Particulars of the each participant were taken in a data collection sheet.

**Statistical analysis**

All statistical analyses were done by Microsoft Office Excel 2007. The result was calculated as frequency of each blood group expressed as percentage.

### RESULTS

Out of 937 participants, 90.82% were male and 9.18% were female. Table 1 shows the distribution of ABO blood group among the male and female volunteers. ABO blood grouping data revealed that group ‘B’ was predominant with 34.15%, followed by group O with 29.67%, group A with 26.57% and group AB with 9.61%. Figure 1 shows the distribution of ABO blood groups among the total participants (for both male and female). The frequency distribution of Rhesus blood group among the participants is shown in Figures 2 and 3. The Rhesus-negative blood group distribution is 2.45% for group A, 2.99% for both group B and O, 0.85% for group AB. In the rhesus-positive blood group distribution, blood group A has percentage frequency of 24.12%; blood group B 31.16%; blood group AB 8.75% and blood group O 26.68%. Blood group B had the highest frequency followed by blood groups O and then A. Blood group AB had the least. The Rhesus-positive and Rhesus-negative
Figure 1. ABO blood group distribution among the population of Chittagong city corporation area.

Figure 2. Rhesus-negative blood group distribution among the total volunteers.

Figure 3. Rhesus-positive blood group distribution among the total volunteers.

vary among the ABO blood group. Rhesus positive has the highest frequency (90.72%) while Rhesus negative has the lowest frequency (9.28%). Table 2 shows the distribution of Rhesus blood groups by sex among the participants. The frequency distributions of ABO blood group based on Rhesus blood group is also shown in Figure 4. The percentages of the ABO blood group and Rhesus blood group varies significantly.

DISCUSSION

The present study has been carried out to determine the distribution pattern of ABO and Rh-D blood groups in common people of Chittagong City Corporation. The knowledge of the blood groups and Rhesus factor is important in evolution, related to diseases and environment, essential in blood transfusion, organ transplantation, forensic pathology, anthropology and training ancestral relation of human (Khurshid et al., 1992), and also helps to prevent complications due to Rhesus incompatibility (Bamidele et al., 2013).

This study showed that among the common people of Chittagong city corporation area, blood group B was the commonest followed by O. The distribution pattern of A, B, O, and AB were 26.57, 34.15, 29.67 and 9.61% respectively. The study regarding the distribution of ABO and Rhesus Blood Group systems among the people of central part of Bangladesh was first done in 1975 by Rahman (1975) where blood group B was found most predominant among the population. Another study (Pathan et al., 2008) conducted in the rural and urban areas of Bangladesh showed the similar results of predominant blood group B (35.54%) followed by blood group O (32.57%). These findings are almost similar to that of common people in the current study. However, study in South East and Western part of Bangladesh demonstrated the most frequent blood group was O (Majumder and Roy, 1982; Hussain et al., 1990).

There are several factors such as genetic and environmental factors on variation of blood group frequency in different parts of the world. Comparative study on data among the different studies in the Indo-Pak sub-continent revealed that there was an equal dominance of group B and O (Khan et al., 2004). Studies in Pakistan explored that B blood group predominated in many regions of Punjab and Multan, Swat, Gilgit, and Rawalpindi/Islamabad, while in Sindh and in Baluchistan, group O was predominated (Sultana et al., 2013; Khattak et al., 2008). Study in India showed group O is the predominant followed by B, A and AB (Das et al., 2001; Reddy and Sudha, 2009; Periyavan et al., 2010). However, in contrast, other studies showed group B is the most prevalent followed by group O, A, and AB (Chandra and Gupta, 2012; Nanu and Thapliyal, 1997).
Data from neighboring country Nepal, revealed different structure of higher frequency of group A (Pramanik and Pramnic, 2000). In Australia (Australian Red Cross Blood service, 2013), Britain (Frances, 2002), and USA (Mourant et al., 1976), group ’O’ and ‘A’ were the commonest followed by B and ‘AB’. In African subcontinent phenotypic frequency order is as follows; O>A>B>AB. The phenotypic frequency order is quite similar in Europe and Africa (Table 3).

This study suggests blood group order similar to the reports of other Indian subcontinent countries. But it differs from the reports of the middle-east countries (Table 3). The present investigation demonstrated similarities with the findings of previous research done in Bangladesh. The implication of this study finding is that Blood group B and O are readily available among the population of Bangladesh, and it is advantageous for the population in the event of blood transfusion. The higher proportion of blood group B and O is also advantageous from the point of pancreatic cancer. Previous studies have shown that the frequency of blood group A was significantly higher among people suffering from pancreatic cancer (Greer et al., 2010). It also indicates that one out of five of the studied population is probably at elevated risk of pancreatic and other types of cancer. For instance, early independent studies showed association of rectal, cervical, leukemia, pancreatic, breast, ovarian, gastric cancers among individuals with blood groups A, AB, or B more likely to have elevated risk of pancreatic cancer than individual belonging to blood group O (Wolpin et al., 2009; Greer et al., 2010; Amundadottir et al., 2009).

This study also found that, Rh (+ve) blood group is dominant in Chittagong which is consistent with the available data from previous reports of other population in Bangladesh. Moreover, Rh (+ve) group remains higher than Rh (-ve) group throughout the world (Table 4).

**Conclusion**

This study showed higher frequency of group B followed by group O, A and AB which reflects the same blood group pattern with the previous studies conducted in Bangladesh. Rh blood group system is also similar to other previous studies. Study of blood grouping not only generates a simple database but also create a great social awareness about self-blood grouping and safe
### Table 3. Order of blood groups (ABO) studied in different populations across the world.

<table>
<thead>
<tr>
<th>Population</th>
<th>Blood group order</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Asia</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Swat (Pakistan)</td>
<td>B&gt;O&gt;A&gt;AB</td>
<td>Khattak et al. (2008)</td>
</tr>
<tr>
<td>India</td>
<td>O&gt;B&gt;A&gt;AB</td>
<td>Khattak et al. (2008)</td>
</tr>
<tr>
<td>Gujrat (Pakistan)</td>
<td>O&gt;B&gt;A&gt;AB</td>
<td>Anees and Shabir (2005)</td>
</tr>
<tr>
<td>Bangladesh</td>
<td>B&gt;O&gt;A&gt;AB</td>
<td>Rahman (1975)</td>
</tr>
<tr>
<td>Middle-East</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Kuwait</td>
<td>O&gt;A&gt;B&gt;AB</td>
<td>Al-Bustan et al. (2002)</td>
</tr>
<tr>
<td>Saudi Arabia</td>
<td>O&gt;A&gt;B&gt;AB</td>
<td>Khattak et al. (2008)</td>
</tr>
<tr>
<td>Africa</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Kenya</td>
<td>O&gt;A&gt;B&gt;AB</td>
<td>Lyko et al. (1992)</td>
</tr>
<tr>
<td>Sudan</td>
<td>O&gt;A&gt;B&gt;AB</td>
<td>Khalil et al. (1989)</td>
</tr>
<tr>
<td>Nigeria</td>
<td>O&gt;A&gt;B&gt;AB</td>
<td>Falusi et al. (2000)</td>
</tr>
<tr>
<td>Europe</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Britain</td>
<td>O&gt;A&gt;B&gt;AB</td>
<td>Frances (2002)</td>
</tr>
<tr>
<td>Hungry</td>
<td>O&gt;A&gt;B&gt;AB</td>
<td>Tuaszik (1995)</td>
</tr>
<tr>
<td>Turkey</td>
<td>O&gt;A&gt;B&gt;AB</td>
<td>Akbas et al. (2003)</td>
</tr>
<tr>
<td>Asia</td>
<td>This study</td>
<td>B&gt;O&gt;A&gt;AB</td>
</tr>
</tbody>
</table>

### Table 4. Frequency of Rh blood groups studied in different populations across the world.

<table>
<thead>
<tr>
<th>Population</th>
<th>Rh+(%)</th>
<th>Rh-(%)</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pakistan</td>
<td>91.40</td>
<td>8.60</td>
<td>Anees et al. (2007)</td>
</tr>
<tr>
<td>India</td>
<td>94.45</td>
<td>5.50</td>
<td>Khattak et al. (2008)</td>
</tr>
<tr>
<td>Bangladesh</td>
<td>97.4</td>
<td>2.6</td>
<td>Haque et al. (2013)</td>
</tr>
<tr>
<td>Saudi Arabia</td>
<td>93.00</td>
<td>7.00</td>
<td>Khattak et al. (2008)</td>
</tr>
<tr>
<td>Nigeria</td>
<td>94.30</td>
<td>5.70</td>
<td>Falusi et al. (2000)</td>
</tr>
<tr>
<td>USA</td>
<td>85.00</td>
<td>15.00</td>
<td>Khattak et al. (2008)</td>
</tr>
<tr>
<td>Britain</td>
<td>83.00</td>
<td>17.00</td>
<td>Khattak et al. (2008)</td>
</tr>
<tr>
<td>Germany</td>
<td>95.00</td>
<td>5.00</td>
<td>Akbas et al. (2003)</td>
</tr>
<tr>
<td>This study</td>
<td>90.72</td>
<td>9.28</td>
<td>-</td>
</tr>
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</table>

Blood transfusion among the population of a country. This study will serve as a reference for other studies particularly to the geneticists and to the clinicians especially in the planning of blood transfusion programs since they play integral role of the genetic profile of the Bangladeshi population.

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**Conflict of interest**

The authors declare that there are no conflicts of interest.

**REFERENCES**


