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## Research Article

### FREQUENCY PATTERN OF BLOOD GROUP SYSTEMS AMONG TWO HEALTHY GROUPS AT ALBAHA PROVINCE, SAUDI ARABIA; A CROSS SECTIONAL, LABORATORY BASED STUDY

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#### ABSTRACT

**Objective:** This study was aimed to determine and document the frequency pattern of ABO and Rh blood groups among two healthy population at Albaha, Saudi Arabia.

**Method:** The design used for this study was a retrospective, cross sectional, laboratory based study for the distribution of ABO blood group and Rh factor conducted at both Albaha Central Blood Bank and Faculty of Medicine, Albaha University, Saudi Arabia. The study population constitute 2356 subjects enrolled into the study during the years 2015 and 2016. While the second group were medical students studying at Faculty of medicine Albaha University, who were potential blood donors (270 participant) **Data Collection:** Data regarding frequency and distribution of ABO and Rh groups of the screened blood donors at the Central Blood Bank were retrieved from registration books from Jan 2015 up to December 2016 using prepared Checklists. A total of 2155 blood donors were screened within the study period

**Results:** A total of 2425 study population were included over the study period from January 2015 to December 2016. Out of these (88.87%) were Blood Bank donors and (11.13 %) were medical students. Amongst ABO blood group system, the most common group was O (47.67%) followed by group A (33.57%), B (13.69%) and AB (5.07%). The overall frequency of RhD positive and RhD negative blood group among our population was found to be 90.88 % and 9.11% respectively, with equal rates in the two groups

**Conclusion:** Frequency of "Rh-positive blood group" is A, O, AB and B, whereas the frequency of the most common Rh-negative blood group are B, AB, O, and A respectively. The determination of the frequency of blood groups in the region would not only help in blood transfusion services, but also reduce the risk of erythroblastosis foetalis in the neonates.

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#### INTRODUCTION

Many blood group systems, such as ABO, Rhesus, Kell, Duffy, MNS, Lewis and Kidd, have been reported so far in humans.<sup>1</sup> Blood transfusion requires a mandatory cross-match test to examine the compatibility between donor and recipient blood groups. The pioneering efforts of Karl Landsteiner on human blood groups, leads to a safe blood transfusion today.<sup>2,3</sup> The ABO blood group system was the first system described and remains the most significant in transfusion medicine. A mismatch of ABO may be fatal, whereas a mismatch of other blood groups initially mostly is harmless.<sup>4</sup> 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.<sup>5</sup> The Rh (not Rhesus) system is the second most important blood group system in transfusion medicine because antigen-positive RBCs frequently immunize antigen-negative individuals through transfusion and pregnancy.<sup>4,6</sup>

ABO and Rh gene phenotypes differ widely across races and geographical boundaries.<sup>7-9</sup> Many studies were carried out on the frequency of ABO and Rh phenotypes in different populations.<sup>10</sup> These frequencies distribution differs among population across the world and varies significantly in different ethnic groups and time to time in the same region<sup>11,12</sup> reflecting the interaction between genetics and environmental factors<sup>13,14,15</sup>

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The knowledge of distribution pattern of ABO blood groups is helpful in the operational management of blood banks and safe blood transfusion<sup>16,17</sup>, in addition to aid in clinical studies. While knowledge of Rh blood group studies for reducing maternal and premature mortality rate<sup>18,19</sup>. It is, therefore imperative to have information on the distribution of these blood groups in any population group. Studies to document the distribution of ABO and RHD blood groups in Albaha Province of the Saudi Arabia were scares if not available, so we conducted our present study to determine and document the frequency pattern of ABO and Rh blood groups among two healthy populations at Albaha i.e.

1. Blood donors at Al-Baha Central Blood Bank and
2. Registered medical students of Faculty of medicine, Al-Baha University, Al-Baha, KSA. That act as a readily available voluntary donor population

## MATERIALS AND METHODS

### Study Design

The design used for this study was a retrospective, cross sectional, laboratory based study for the distribution of ABO blood group and Rh factor conducted at both Albaha Central Blood Bank and Faculty of Medicine, Albaha University, Saudi Arabia. The study was based on the following: (1) extracted data from the blood bank information system which include records of healthy blood donors who were recruited and came to donate blood during the study period, (2) laboratory data provided by the tested blood groups done among registered students at skill lab during the Blood System Module for the 2nd year level at faculty of medicine, Albaha University.

### Study Population

The study population constitute 2356 subjects enrolled into the study. The study was conducted among two groups; the first one were the recruited blood donors at Albaha Central Blood Bank (2155 donors) who were considered medically fit & with eligible age range (18–65 years old) and who donate blood during the years 2015 and 2016. While the second group were medical students studying at Faculty of medicine Albaha University, who were potential blood donors (270 participants).

**Exclusion criteria:** were as follows: non Saudi donors, those who were not Albaha residents

### Data collection

#### Reviewing Central Blood Bank registration books

Data regarding frequency and distribution of ABO and Rh groups of the screened blood donors from laboratory registration books of the Central Blood Bank from Jan 2015 up to December 2016 were reviewed using prepared Checklists. A total of 2155 blood donors were screened within the study period.

#### Determination of ABO and Rh Blood Groups for blood collected from medical students

There is a wide range of blood typing techniques<sup>20</sup>, which differ from each other in terms of sensitivity, reagents and equipment required, the time of operation and throughput analysis. The slide test methods was used, although it is relatively the least sensitive method among others for blood

grouping determination, but due to its prompt results, it is very much valuable in our study.

For respondents medical students fingerpick with a sterile lancet was used for blood samples collection. Commercially available standard antisera A, antisera B, and Antisera D monoclonal antiserum were used after validation (Spinreact, Spain) according to manufacturer's procedural instructions. Three drops of blood were obtained from each volunteer from the tip of middle ring finger of left hand pricked with a sterile lancet. Surface of finger cleaned with an alcohol swab for sterilization the blood samples were placed on three different locations on the tile. Then a drop of each blood sera is placed on the drop of blood. Three type of sera were employed, anti-A serum for determining blood group A, anti-B serum for blood group B and anti-D serum for rhesus factor determination. Agglutination or clumping of blood cells in anti-A serum indicates blood group A, and clumping of cells in anti-B serum indicates blood B. No clumping or agglutination of cells in both anti-A and anti-B sera indicate blood group O. Agglutination of cell in both anti-A and anti-B sera indicates blood group AB. Agglutination of blood cells of in any blood type in anti-D serum indicates rhesus positive (+) and no agglutination indicates rhesus negative (-). Microscope was used in case of doubt to see the presence or absence of agglutination and to be more accurate the results were confirmed by reverse grouping by using red cells of known groups.<sup>21</sup>

### Statistical Analysis

Analysis and calculations as percentage and proportions were done for individual blood group.

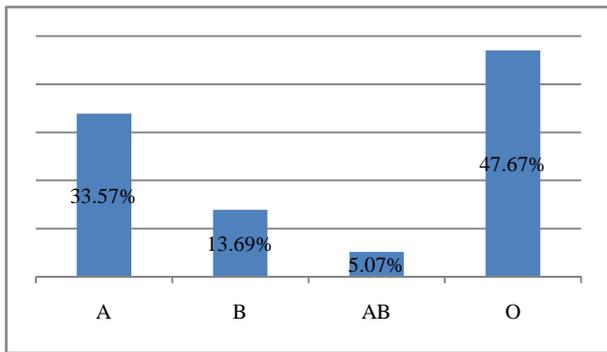
## RESULTS

A total of 2425 study population were included over the study period from January 2015 to December 2016. Out of these (88.87%) were Blood Bank donors and (11.13 %) were medical students as shown in Table (1).

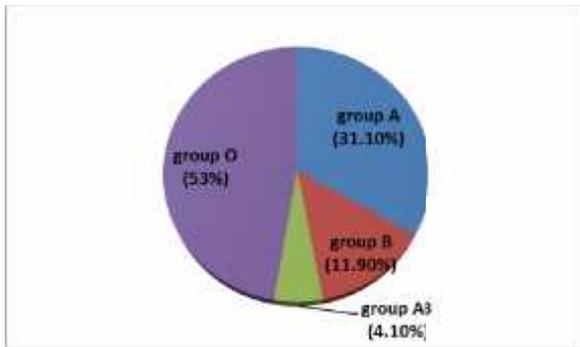
**Table 1** Distribution of ABO and Rhesus blood group among study population (n=2425)

| Site              | Number (%)    | ABO Blood group |              |               |             |
|-------------------|---------------|-----------------|--------------|---------------|-------------|
|                   |               | A N (%)         | B N (%)      | O N (%)       | AB N (%)    |
| Blood bank donors | 2155 (88.87%) | 730 (33.87%)    | 300 (13.9%)  | 1013 (47.0%)  | 112 (5.2%)  |
| Medical students  | 270 (11.13%)  | 84 (31.1%)      | 32 (11.9%)   | 143 (53.0%)   | 11 (4.1%)   |
| Total             | 2425          | 814 (33.57%)    | 332 (13.69%) | 1156 (47.67%) | 123 (5.07%) |

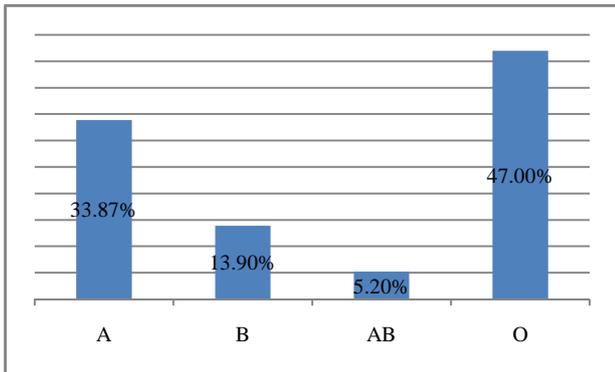
Amongst ABO blood group system, the most common group was O (47.67%) followed by group A (33.57%), B(13.69%) and AB (5.07%)Fig(1). But the prevalence of group O was higher among the medical students compared to blood bank donors (53.0% versus 31.1%) while for group A and B were higher among blood bank donors than among medical students (33.87% versus 31.1%) and (13.9% versus 11.9%) respectively, the distribution of blood group AB among both groups were almost with equal distribution Fig(2&3).



**Fig 1** Distribution of ABO blood group among study population (n=2425)

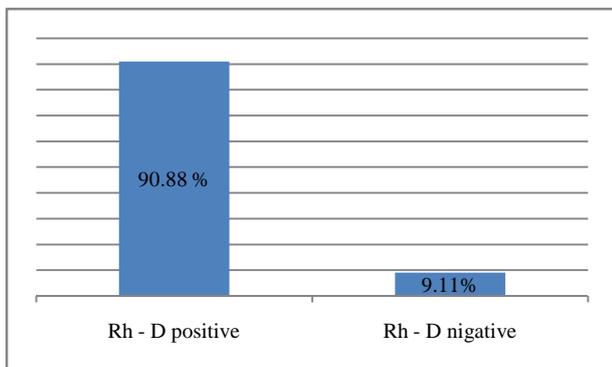


**Fig 2** Distribution of ABO blood group among university students population (n=270)

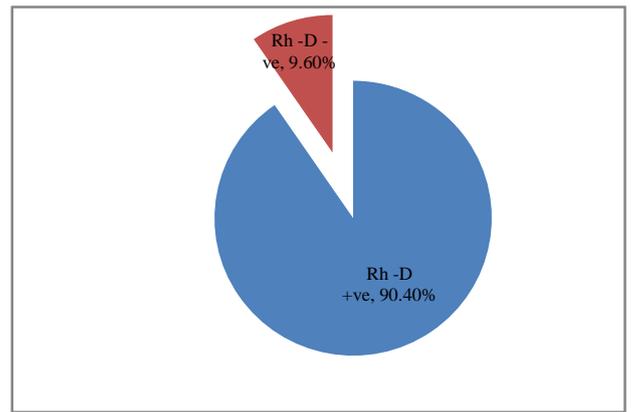


**Fig 3** Distribution of ABO blood group among blood donors population (n=2155)

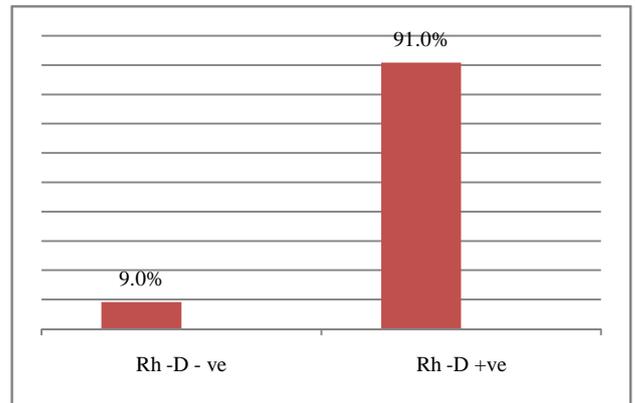
The overall frequency of RhD positive and RhD negative blood group among our population was found to be 90.88 % and 9.11% respectively, with equal rates in the two groups Fig (4,5 & 6).



**Figure 4** Distribution of Rhesus blood group among study population (n=2425)



**Figure 5** Distribution of Rhesus blood group among university students population (n=270)



**Figure 6** Distribution of Rhesus blood group among blood donors population (n=2155)

The analysis of ABO blood group amongst RhD positive and negative groups showed that the blood group O positive was the most common (91.24%) among RhD positive while in RhD negative people it was blood group B negative (12.35%). The detail distribution rhesus blood groups among people with different ABO blood groups and in RhD positive and negative people is shown in Table(2).

**Table 2** Distribution of Rhesus blood groups among different ABO blood groups of study population

| ABO blood group system | Total Number  | RhD system |         |          |         |
|------------------------|---------------|------------|---------|----------|---------|
|                        |               | Positive   |         | Negative |         |
|                        |               | N          | (%)     | N        | (%)     |
| A                      | 814 (33.57%)  | 751        | (92.26) | 63       | (7.74)  |
| B                      | 332(13.69%)   | 291        | (87.65) | 41       | (12.35) |
| O                      | 1156 (47.67%) | 1052       | (91.24) | 104      | (8.76)  |
| AB                     | 123(5.07%)    | 110        | (89.43) | 13       | (10.57) |
| Total                  | 2425          | 2204       | (90.88) | 221      | (9.12)  |

## DISCUSSION

Knowledge of ABO blood groups is an important tool to determine the direction of recruitment of voluntary donors as required across the country.

Our present study has been carried out to study the frequency distribution pattern of ABO and Rh-D blood groups in Albaha a city in the south west of Saudi Arabia, the headquarters of the Governor where the central blood bank was located, that supply the different hospitals with blood transfusion services. Currently no similar studies have been done in the area.

This type of studies on blood group system can be used for improvement of donor data base for collection of blood and blood products. These data will also help in organ transplantation, development of legal medicine and anthropological study of a group or society.<sup>22</sup>

Our study findings comparable with many other studies have shown that blood group O was the most common blood group and blood group AB was the least common blood group in different populations and ethnic groups. For example, among some countries in the area like Syria and Untied Arab Emirate, the distribution is blood group O were 43% and 44.1% ; blood group A, 30% and 21.9 %; blood group B, 14% and 20.8%; and blood group AB, 3.7% and 4.3% respectively<sup>23</sup>.

When compared with other reports from similar studies, the results of this study are also consistent with previous findings from other parts of the country. For example, a study among random sample of Saudi students from the King Khalid University, Abha, Saudi Arabia<sup>24</sup> carried out by Sarhan MA. *et al* showed that the distribution of group O is 56.8% , 33.4% group A, 6% group B and 3.8% group AB . Only 7.2% of them were found to be Rh-negative.

The results of this study are also in agreement with the data from the Saudis blood donors who came to donate blood for various reasons to the Blood Bank Department of King Fahd Hospital of the University, Al-Khobar, Saudi Arabia<sup>25</sup>, conducted by Bashwari LA *et al*, the distribution of type O, is 48%; type A, is 24.5 %; type B, is 17%; and type is AB, 4 % . Our findings are similar to findings of studies carried out in neighbor countries such as Kuwait (Al-Bustan *Set al* <sup>26</sup>, Oman (Moftah FM<sup>27</sup>) and Bahrain (Al-Arrayed S, *et al*<sup>28</sup>)

However, the results of this study do not agree with the results from some Asian countries where blood group A has the highest frequency in some and blood group B in the others, for example in Palestine,(Skaik YA *et al*<sup>29</sup>) Jordan, (Hanania S. *et al*,<sup>30</sup> and Turkey,(Dilek Iet *al*<sup>31</sup>) where the blood group A is the highest in frequencies. In India (Punjab) (Sidhu S<sup>32</sup>) and Pakistan (Hammed A *et al* <sup>33</sup>) the blood group B is the highest in frequencies

## IN A CONCLUSION

This study provide basic data for the frequencies of ABO and Rh phenotypes in order to ensure safe blood transfusion in the area , and to our knowledge the study will be considered as a first study giving such an information , so it will be of great value to the health authorities at Al- Baha. also this study will draw the attention to the scarcity of Rh negative type of blood in Al-Baha population which is very essential to blood banks and voluntary blood donation campaigns.

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