



Pattern of distribution of ABO and Rhesus (RH) blood groups in hail province, Saudi Arabia

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Abstract

Background: The single most important test performed in blood banking services is the determination of ABO blood groups to avoid mismatching transfusion reaction and death.

Objective: The current study was undertaken to determine the pattern and distribution of the ABO and rhesus (Rh) blood groups among Hail population living in different cities of Hail.

Material & Methods: ABO and RH blood grouping test was carried out on 600 Saudi participants from different cities of Hail province namely Hail, Baqaa, Al-shanan, Al-hayat and Al-gazalh. Blood samples were collected by finger prick and tested for the blood groups by routine slide method.

Results: Group O was found the highest (51.3 %), followed by B (26.2%), A (19.2%), and AB (3.3%) while the percentage of RH Positive (95.5%) was greater than RH negative (4.5%).

Conclusion: The current study could have significant implications for the major blood banks in Hail area where certain blood groups are needed more than others in emergency conditions. In addition, the data recorded would be helpful to researchers to clarify the factors responsible for the observed distribution patterns of the studied blood group systems.

Keywords: pattern, distribution of abo grouping, rhesus blood groups, hail province, Saudi Arabia

1. Introduction

The ABO blood group system was the first human blood group system to be discovered by Landsteiner in 1901. Later, Landsteiner and Wiener defined the Rh blood group in 1941 (Landsteiner, 1900^[19], (Landsteiner *et al.* 1940)^[20]. The distribution of ABO and Rh blood groups have been repeatedly investigated in various populations all over the world during the last several decades (Mourant *et al.*, 1976)^[22] and their frequencies exhibited considerable variation in different geographic locations, reflecting the underlying genetic and ethnic diversity of human populations (Cavalli-Sforza *et al.* 1994)^[7].

The single most important test performed in blood banking services is determination of ABO blood groups to avoid mismatching transfusion reaction and death (Honig and Bore, 1980)^[17].

According to the ABO blood group, individuals are divided into four major blood groups namely, A, B, AB and O, according to the presence of antigens and agglutinins. Group A blood has type A antigens, group B blood has type B antigens and group O blood has neither A nor B antigens. Also plasma from blood group A contains Anti-B antibodies which act against type B antigens, whereas plasma from type B blood contains Anti-A antibodies, which act against type A antigens. Type AB has neither type of antibody and type O blood has both A and B antibodies (Seeley *et al.*, 1998)^[28].

The study of blood grouping is important as it plays an important role in genetics, blood transfusion and forensic pathology. Blood group has some association with diseases

like duodenal ulcer, diabetes mellitus, urinary tract infection, Rh incompatibility, obesity and ABO incompatibility of newborn. (Akhtar *et al.*, 2003) (Ziegler *et al.*, 2004)^[30] (Pramanik T and Pramanik S, 2000)^[25]

It is well known fact that the ABO blood groups are not found in equal numbers. Most of the worlds' countries including Saudi Arabia are belonging to the blood group O and the least are having AB blood group (El-Himaidi & Umar, 2002)^[19]

Blood grouping researches were done in most of Saudi provinces. However and unfortunately, there is no study to document the distribution of ABO and RHD blood groups in Hail Province of Saudi Arabia. The present study was therefore is the first study in Hail area that was planned to investigate these blood group polymorphisms in different cities of the Province namely Hail, Baqaa, Al-shanan, Al-hayat, AL-gazalh.

Aim of the work

To determine the pattern and distribution of the ABO and rhesus (Rh) blood groups among Hail population living in different cities of Hail province, and to compare the results of the current study with other studies.

2. Materials and Methods

- 1. Study Area:** The study was performed on the 5 main cities of Hail province of Saudi Arabia namely Hail, Baqaa, Alghazala, Alhaet and Alshinan.
- 2. Study Design:** The present study is a cross sectional type of study conducted to determine the distribution of ABO

and Rh blood grouping.

3. **Sample Size:** A total of 600 random Citizens, were selected from the study area during the year 2015.
4. **Study Subjects:** Male and female adult Hail citizens of all age groups participated in the current work. Each participant, who accepted to participate in the study, received three sheets, (consent form, information about the study form and questionnaire to collect sociodemographic data).
5. **Methods:** (Harvey & David, 2005) [16]: ABO and Rhesus blood group typing were done by antigen antibody agglutination test by commercially available standard antisera i.e. anti A, anti B and Anti D (BioTec Laboratories. UK). Blood groups were determined by slide agglutination method. The blood samples were collected by finger prick with sterile lancet and after warming and cleaning the puncture site with 70% ethyl alcohol swabs. A drop of each of the antisera, anti A, and anti B and anti D was added and mixed with each blood sample with the aid of glass rods. Blood groups were determined on the basis of agglutination and the results of agglutination were recorded immediately for each individual



Fig 1

6. Data Analysis: Comparison of distribution of ABO and RH blood groups among different Hail cities was done using the percentages and ANOVA test

3. Results

Age and sex distributions of the target population in the present study are presented in Table (1&2) while the distributions of ABO and RH blood groups are demonstrated in Tables (3&4) respectively. It was found that blood group O was the most common (51.3%), followed by group B (26.2%), A (19.2%), and AB (3.3%). Taking into consideration the different cities, the pattern observed was O> B>A>AB. Regarding the RH blood groups, RH positive (95.5%) were found predominant over the RH negative people (4.5%). In the current work one way ANOVA analysis was done to compare the statistical significant differences of ABO and RH blood groups among the five different cities of Hail Province. The analysis demonstrated no significant difference in ABO blood groups when comparing the major five cities (F (2,136)

=1.003, P>0.05). No significant difference was also found among the subjects of the different cities as regards the RH grouping (F (1,172)=1.89, P>0.05).

Dividing the ABO blood groups subjects into positive and negative is presented in Table 5. It was recorded that RH negative cases were highest among blood group O participants (6.5%) while no single case was found negative among those with blood group AB.

Table 1: Age distribution of ABO blood grouping among Hail population, Hail province, Saudi Arabia:

Age in years	Frequency	Percentage			
Below 10 years	88	14.6%			
10-20	107	17.8%			
20-30	155	25.8%			
30-40	73	12.1%			
40-50	49	8.3%			
>50	128	21.4%	Total	600	100%
Total	600	100%			

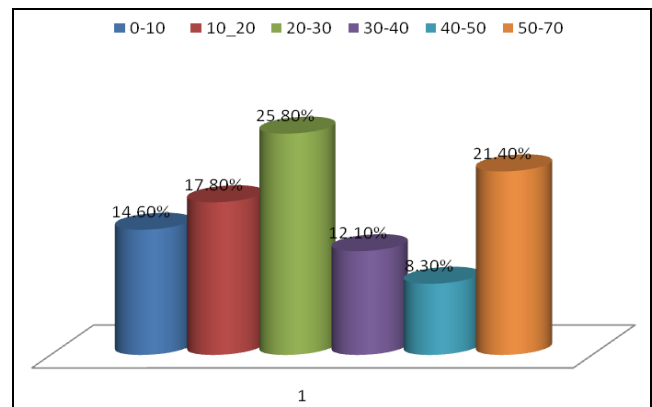


Fig 2: Age distribution of ABO blood grouping among hail population

Table 2: Sex distribution of ABO blood grouping among Hail population, Hail province, Saudi Arabia.

Sex	Frequency	Percentage
Males	248	41.3%
Females	352	58.7%
Total	600	100%

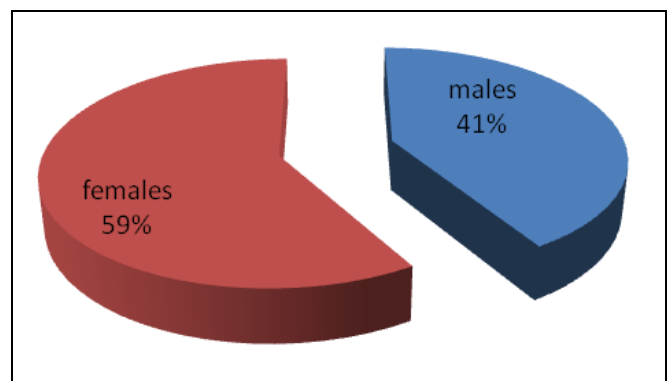


Fig 3: Sex distribution of ABO blood grouping among Hail population

Table 3: Location distribution of ABO blood groups in different cities of Hail Province, Saudi Arabia

Cities	O	A	B	AB	Total No & (%)
Hail city	112 59.9%	32 17.1%	37 19.8%	6 3.2%	187 100%
Baqaa	36 41.8%	20 23.3%	26 30.2%	4 4.7%	86 100%
Alghazala	65 48.9%	25 18.8%	38 28.6%	5 3.8%	133 100%
Alhaet	48 49%	19 19.3%	28 28.6%	3 3.1%	98 100%
Alshinan	47 48.9%	19 19.8%	28 29.2%	2 2.1%	96 100%
Total	308 51.3%	115 19.2%	157 26.2%	20 3.3%	600 100%

(F (2,136) =1.003, P>0.05)

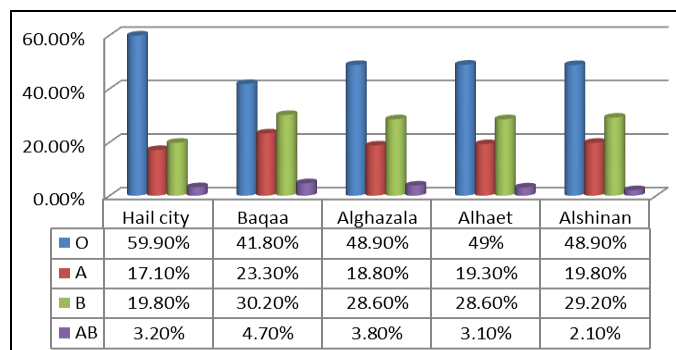


Fig 4: Location distribution of ABO different cities of Hail Province, Saudi Arabia

Table 4: Distribution of RH blood groups among different Hail cities, Saudi Arabia

Cities	RH+ve	%	RH-ve	%	No (%)
Hail city	182	97.3%	5	2.7%	187 100%
Baqaa	82	95.3%	4	4.7%	86 100%
Alghazala	124	93.2%	9	6.8%	133 100%
Alhaet	92	93.8%	6	6.2%	98 100%
Alshinan	93	96.9%	3	3.1%	96 100%
Total	573	95.5%	27	4.5%	600 (100%).

(F (1, 172. =1.89, P>0.05.

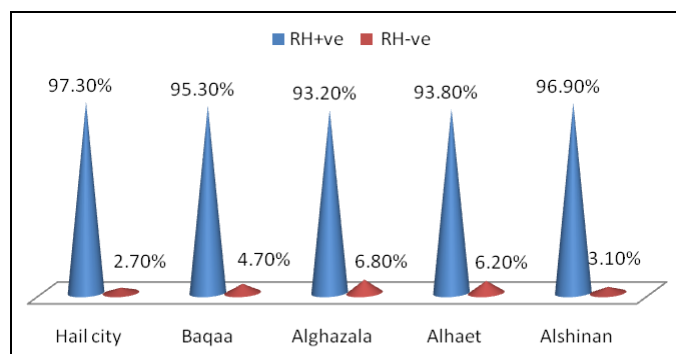


Fig 5: Distribution of RH blood groups different Hail cities
Table 5: Distribution of ABO and RH blood groups among Hail population, Saudi Arabia

Blood group	Positive	Percentage	Negative	Percentage	Total
A	111	96.5%	4	3.5%	115
B	154	98.1%	3	1.9%	157
AB	20	100%	0	0%	20
O	288	93.5%	20	6.5%	308
Total	573	95.5%	27	4.5%	600

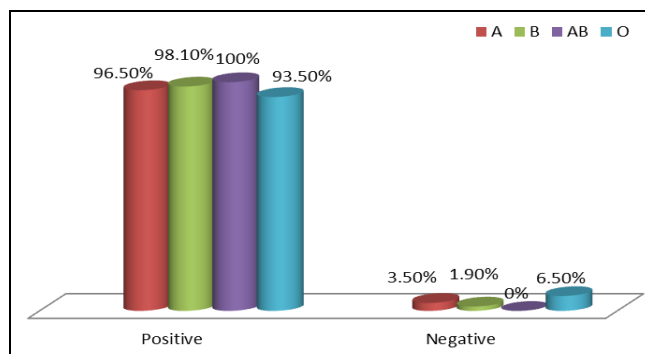


Fig 6: Distribution of ABO and RH blood groups among Hail population, Saudi Arabia

4. Discussion

To our knowledge, the current study is the first study carried out in Hail Province of Saudi Arabia as no available research data has been recorded about ABO blood grouping.

ABO blood groups studies are very necessary for genetics, blood transfusion and organ transplantation (Harvey and David, 2005 [16]. Moreover, some diseases have been linked to ABO blood groups like duodenal ulcer (Ziegler *et al.* 2004 [30], diabetes (Akhtar *et al.* 2003. diet regimen and urinary tract infection. ABO transfusion incompatibilities are very serious specially in neonates (Qureshi and Bhatti, 2003 [26]. (Mourant *et al.*, 1976 [22]. In addition, study of Blood grouping is of importance in detection of certain crimes and paternity conflicts (Jolly, 2000 [18].

The present study showed that the blood group O is the most common among Hail population (51.3%. as expected, whereas AB was found on the lowest side (3.3%. The average distributions of ABO blood grouping, recorded in the current work, was not found to be much different from results detected in other kingdom regions. Similar results were obtained in Jeddah (Elsayid *et al.*, 2015 [10]. Aljouf (Eweidah *et al.*, 2011 [11]. eastern area of Saudi Arabia (Bashwari *et al.*, 2001. Lower results were in studies done in Western and Medina areas in which O group was reported as (38.2%. and (44.8%. respectively (ozslyu & Alhujaili, 1987. (El-Himaidi & Umar M, 2002 [9]. Moreover, more or less similar results have also been recorded in Bahrain, Oman and Hadhramout and Kuwait (Al Mulla *et al.*, 2001, (Moftah, 2003, (Bahaj, 2003. (Al-Bustan *et al.*, 2002.

In the present study, distribution of blood group B was detected as (26.2%. However, disagreement was clear in a study done in Tabuk province (ozslyu & Alhujaili, 1987. which recorded much lower percentage of B blood group (12%. than ours. Moreover, and to the opposite of the current work, Abha study reported blood group B as lower as (11.3%. The previous differences could be explained on the basis of mixing through intermarriage between tribes with predominance of certain blood group (ozslyu & Alhujaili,

1987. While blood group B among Hail citizens in the present work was found to be 26.2%, it was detected as much lower percentage among Syrian Arabs (13 13%). (Sakharov *et al.*, 2006^[27]). It was also found that group B in our work similar in frequency to Nigerian population (Egesie *et al.*, 2008^[8]).

Blood group a phenotype was less common than O group among Hail population as reported in the present study (19.2%. Much higher percentage of a blood group was clear in Abha study (33.6%. (El-Himaidi & Umar, 2002^[9]). In the contrarily, Blood group A is predominant among Egyptian (49.5%). (Awany *et al.*, 1995^[4]), and in Sudanese populations (40%. (Abu-Sin *et al.*, 1978^[1]). This differences could be contributed to the difference in ABO gene distribution between African and Asian Arabs. Similar to Egypt, other countries such as Syria (Sakharov *et al.*, 2006^[27]), Lebanon (Nasif *et al.* 1953^[23]), and Jordan (Hanania *et al.*, 2007^[15]), have a different ABO distribution pattern in which blood group A was predominant. This may be explained on the basis of different ethnic background, and natural selection.

Dividing the ABO blood groups subjects into RH positive and negative, it was demonstrated that the RH positive people were predominant over the RH negative people as recorded as 95.5%, 4.5% respectively. Hand in hand with agreement with our work, previous Saudi studies with similar percentages (Eweidah *et al.*, 2011^[11]). (El-Sayed *et al.*, 2015). (El-Himaidi & Umar M, 2002^[9]). On the other little higher percentages of RH positive individuals were detected in studies done in, Jordan and syria (Hanania *et al.*, 2007^[15]). (Sakharov *et al.*, 2006)^[27].

As regards AB blood group, similar results were reported in most other kingdom regions (El-Himaidi & Umar M, 2002^[9]).

It should be noted in the present study that RH negative cases were highest among blood group O participants (6.5%. while no single case was found negative among those with blood group AB. This is not in the favor of people with group O regarding the issues of blood transfusion as their group could not receive blood except from those of B -ve groups

Globally, the distribution of ABO and Rh blood group varies from race to race. In case of the Western Europeans, 42% have a group, 9% are belonging to B group, 3% are AB group, and rest 46% have O group. Additionally, some of the Western Europeans show higher proportion (up to 40%. of group B. On the other hand, pure American Indians belong almost exclusively to group O. Among the Americans, the frequency of group A is 41%, B is 10%, AB is 4%, and O blood group is 45%.(8).

Regarding the Rh grouping, the literature demonstrated that 85% of Caucasians are Rh-positive, and 15% are Rh-negative. In addition, 95% of African- Americans are Rh-positive, whereas the original Africans are almost 100% Rh-positive. (Ganong *et al.* 2005^[12]). (Guyton *et al.*, 2005^[13]). (Wilkinson *et al.* 1995^[29]).

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