

Distribution and Association of Hypertension, Obesity, Diabetes and Transfusion Transmitted Infections with ABO and Rh Blood Groups in Blood Donors at King Saud Hospital, Unaizah, Saudi Arabia

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ABSTARCT

Objective: To evaluate the prevalence rates of metabolic syndromes (MS) and transfusion transmitted infections (TTIs) among blood donors and study their associations with ABO and Rh blood groups.

Methods: A prospective cross-sectional study was done at blood bank centre, King Saud hospital, Unaizah, Saudi Arabia from January 2017 to December 2017. Testing of the presence of TTIs was done using ELIZA method and detection of MS was achieved using national guidelines. General demographic data was collected and ethical approval was obtained before conducting the study for all blood donors.

Results: Out of 502 blood donors, O blood group constitutes 228 (45.42%) followed by A 130 (25.80%), B 115 (22.90%) and 29 (5.78%). Majority of donors were Rh+ve (433, 86.25%) compared with Rh-ve (69, 13.74%) blood group. The prevalence rates of obesity and hypertension were 171 (34.10%) and 67 (13.34%), respectively and no cases were reported for diabetes. High levels of obesity and hypertension were observed among group O followed by group B, A, and AB, respectively.

Conclusion: Generally, this study shows significant association between overweight and obesity against ABO blood groups and no significant associations were observed with hypertension or diabetes.

Keywords: ABO and Rh blood groups, association, blood donors, diabetes, hypertension, obesity

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INTRODUCTION

Metabolic syndrome (MS) (silent diseases) such as hypertension, hyperglycaemia, dyslipidaemia and central obesity are very common among people worldwide (1). High prevalence rates were reported in different countries such as 25% in United States of America, 17.8–34% in Europe, 12.8–41% Asian Pacific, the Middle East as well as in Saudi Arabia 39.3% (2–4). Usually, it is asymptomatic diseases; hence individuals are careless and this is the main cause behind hiding of MS among persons for long time until its complications developed (5). Its appearance increase with age and it affects the quality of life and impair health of people as well as it stimulates economic burden of the country (6).

Hypertension occurs as a result of development and adaptation in lifestyle following the western countries, is estimated to cause about 7.1 million deaths globally (6). Obesity and weight gain are playing a crucial role as modifiable independent risk factors in developing hypertension. Highly correlation was observed between obesity and blood pressure and a possible genetic connection of AB blood groups with hypertension has been reported previously (7).

Obesity is defined as an excessive accumulation of fat in the body was found to affect about 13% of adult worldwide (15% women and 11% men) and the rate of adult's overweight was found to reach 39% according to the 2014 statistics (8). In 2007, it was reported that the prevalence rate of obesity in Saudi Arabia is 23.6% and 14% in women and men, respectively and the overweight rates were 30.7% and 28.4% for men and women, respectively (9).

In addition, diabetes mellitus (DM) is one of the most common MS with high morbidity and mortality rates globally (10). Diabetes mellitus occurs as a result of defects of insulin secretion and/or increased cellular resistance to insulin (11). In 2014, the prevalence of DM among Saudi Arabia population was found to be 40.2 and 25.4% for individuals ≥ 45 years and

≥ 30 years, respectively (12). However, in 2011 the prevalence rates of DM among Saudi people male and females was found to be 34.1% and 27.6% with mean age 57.5 and 53.4 years, respectively (13). In 2012, Waseem and his collages reported the presence of an association between Rh-negative blood groups and DM (11). Another study revealed a negative association between ABO blood groups A and O with DM Type 2, with A and O group having less chances of diabetes (14).

Several studies have been done on patients suffering from several diseases such as hypertension, diabetes, colorectal, lung and gastrointestinal cancer, tumours in salivary gland and ovaries, duodenal ulcer, thyroid disorders and coronary heart disease have shown some association with ABO and Rh blood groups (7).

Such associations between blood groups against hypertension, obesity, diabetes and TTIs may provide an important insight to identify susceptibility of diseases among different blood groups and enable us to adopt possible preventive measurements to decrease their prevalence.

Consequently, this study was designed to assess the prevalence rates of MS and TTI and their correlation with ABO and Rh blood groups among blood donors at King Saud Hospital, Unaizah, Saudi Arabia.

SUBJECTS AND METHODS

A prospective cross-sectional study was carried out at blood bank centre, King Saud hospital, Unaizah, Saudi Arabia from January 2017 to December 2017. Ethical approval was obtained from research Ethics Committee at Qassim Health (No 45/87/1649) in January 4th, 2017. Healthy individuals who fulfil the blood donor eligibility criteria and signed the consent form

were only included in this study. Informed consent was obtained from all individual participants.

Medical and laboratory investigations

Demographical data including gender and age were collected from all donors. In addition, blood pressure, pulse and diabetes were measured and obesity and overweight were calculated depending on the bodyweight and body mass index (BMI). Obesity was also classified according to the international guidelines as follows; 18.5–24.9 normal weight, < 18.5 underweight, 25.0–29.9 overweight, 30.0–34.9 obesity class I, 35.0–39.9 obesity class II, ≥ 40.0 obesity class III (15, 16).

Screening for TTIs (HBV, HCV, HIV and syphilis) was performed for all donors using serological tests and ELIZA (BioRad, USA). Nucleic acid testing (individual NAT) was performed for confirmation of reactive donors and to confirm false negative and false positive cases which could be occurred.

Statistical analysis

Statistical package for social science (SPSS) version 20.0 and Microsoft excel 2010 was used for data statistical analysis. Association between ABO and Rh blood groups with hypertension, obesity and diabetes as well TTI as was done using Chi-square. A *p*-value < 0.05 was considered statistically significant at confidence level 95%.

RESULTS

The current study showed the distribution of blood donors in a period of 2017 who accepted to be part of this study. A total of 502 (males) donors were donating their blood at the blood bank at King Saud Hospital, Unaizah, Qassim, Saudi Arabia from January to December 2017. The percentage of replacement and voluntary blood donors was 87.60% and 12.40%, respectively. The ages of blood donors ranged between 29–54 years with an average of 31.4 ± 8.7 years.

In this study, most of blood donors were identified as government employee 242 (48.20%) followed by private employee 153 (30.47%) and students 107 [21.31%] (Fig. 1).

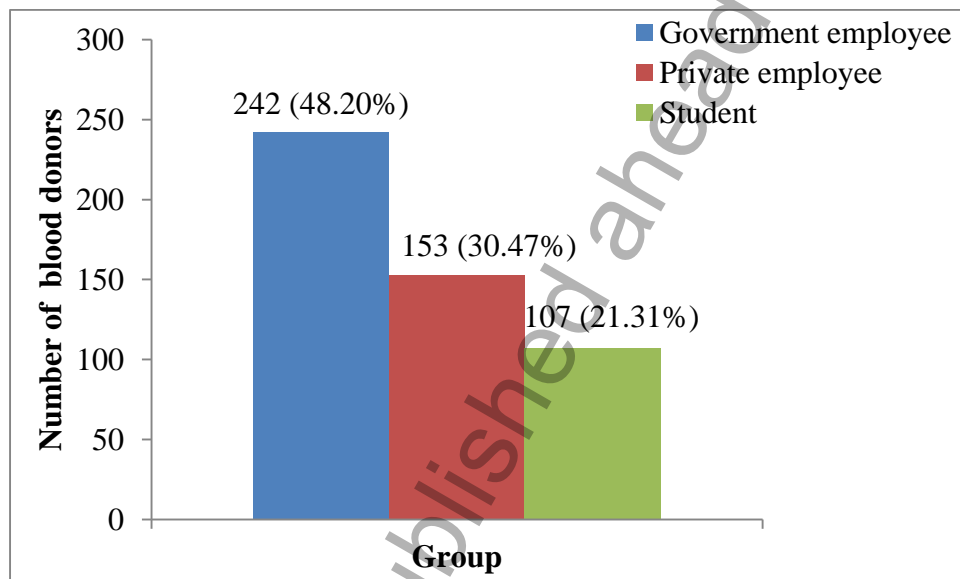


Fig. 1: Distribution of blood donors according to their situation.

The frequency rates of MS among blood donors were 238 (47.41%) distinguished as obesity 171 (34.10%), hypertension 67 (13.34%) and no cases were reported for diabetes. The prevalence rates of normal, underweight, overweight and obesity among different blood groups are shown in Table 1. Group O presented high levels of obesity and hypertension followed by group B, A, and AB, respectively (Table 1).

Table 1: General distribution of metabolic disorders and transfusion transmitted infections among blood donors.

Blood groups	HBsAg n(%)	HCV n(%)	HIV n(%)	Syphilis n(%)	Obesity n(%)	Diabetes n(%)	Hypertension n(%)
O	0	0	0	1(50)	87(50.88)	0	29(43.28)
A	0	0	0	1(50)	37(21.64)	0	11(16.42)
B	0	0	0	0	38(22.22)	0	23(34.33)
AB	0	0	0	0	9(5.26)	0	4(5.97)
Total	0	0	0	2	171	0	67

HBsAg; hepatitis B surface antigen, HCV; hepatitis C virus, HIV; human immunodeficiency virus.

In regards to TTIs, only two cases infected with syphilis were detected which represent about 0.40.0% and no cases were recorded for other HBV, HCV or HIV among blood donors (Table 1). Similar values and neglected changes were observed in the averages of different parameters such as blood pressure, pulse, haemoglobin and BMI of blood donors (Table 2).

Table 2: Mean of blood pressure, pulse, haemoglobin and body mass index of blood donors among different blood groups.

Parameters	A	B	AB	O
Systolic (mmHg)	137.15	137	136.9	137.08
Dystopic (mmHg)	79.52	79.47	79.58	79.5
Pulse (BPM)	80.92	80.97	80.9	80.91
Haemoglobin (g/dL)	15.56	15.55	15.54	15.56
Body mass index (kg/m ²)	28.42	28.39	28.20	28.41

BPM; beats per minute, kg/m²; kilogram per square meter.

About 143 (28.49%) out of 502 donors had normal weight with age average 33.4 years and the overweight donors constitute about 184 (36.65%) with age average 24.22 years. Higher levels in the percentages of overweight donors were noticed in group AB-ve followed by B+ve, B-ve, A+ve and A-ve, respectively according to their numbers in the same blood group. Group AB-ve showed high levels of obese one donors followed by A-ve and O+ve, while group AB-ve did not showed any cases belong to obese two. Number of donors identified as obese

three were very few 12 (2.39%) compared with obese I 114 (22.71%) and obese II 45 [8.96%] (Table 3).

Table 3: Detailed distribution of blood donors according to ABO and Rh blood groups and body mass index.

Body Mass Index	ABO & Rh blood group							
	A+ n(%)	A- n(%)	B+ n(%)	B- n(%)	AB+ n(%)	AB- n(%)	O+ n(%)	O- n(%)
<normal weight	1(0.87)	0(0.0)	1(1.01)	0(0.0)	0(0.0)	0(0.0)	2(1.03)	0(0.0)
Normal	35(30.43)	6(40.0)	20(20.20)	5(31.25)	10(40.0)	0(0.0)	54(27.8)	13(38.23)
Overweight	49(42.6)	2(13.33)	44(44.44) ^b	7(43.75)	8(32.0)	2(50) ^c	64(32.99)	8(23.53)
Obese 1	24(20.86)	5(33.33) ^a	22(22.22)	2(12.5)	6(24)	2(50) ^c	47(24.23)	6(17.65)
Obese 2	6(5.22)	2(13.33)	8(8.08)	1(6.25)	1(4)	0(0.0)	20(10.31)	7(20.59)
Obese 3	0(0.0)	0(0.0)	4(4.04)	1(6.25)	0(0.0)	0(0.0)	7(3.61)	0(0.0)
Total No.	115	15	99	16	25	4	194	34

^a≤.05, ^b≤.01, ^c≤0.001.

Majority of blood donors were found to be belong O blood group 228 (45.42%), distributed as 194 (38.64%) O+ve and 34 (6.77%) O-ve. While, the frequency rates of group A and B were 130 (25.80%) and 115 (22.90%), respectively distributed as 115 (22.91%) A+ve and 15 (2.99%) A-ve and 99 (19.72%) B+ve and 16 (3.29%) B-ve. AB blood group showed the smallest frequency rate which was 29 (5.78%), AB+ve 25 (4.98%) and AB-ve 4 (0.79%) (Table 3). In addition, most of donors were Rh+ve 433 (86.25%) compared with 69 (13.74%) Rh-ve blood group.

In the current study, no significant associations were noticed between TTIs, diabetes and hypertension against ABO and Rh blood groups. However, significant associations were found between obesity against ABO and Rh blood groups ($p \leq 0.001$ and $p \leq 0.01$), respectively. Significant associations were detected between AB-ve and B+ve against overweight ($p \leq 0.001$ and $p \leq 0.05$, respectively) and between AB-ve and A-ve against Type 1 [$p \leq 0.001$ and $p \leq 0.05$, respectively] (Table 3).

DISCUSSION

As a result of the high prevalence rates and severe side effects of MS among population in Saudi Arabia [39.3%] (4) and in order to increase the awareness of community about it, this study was designed to explore the prevalence and distribution of MS and TTIs among blood donors at blood bank center at King Saud hospital, Unaizah, Saudi Arabia. Also, this study is the first study attempt to investigate about the MS among blood donors and there is no similar study has been conducted so far as these studies usually are applied in public and community health fields.

The prevalence rate of obesity among male's blood donors in this study was 34.10% which is equivalent to the findings of Alwasaidi *et al* which displayed 35.7% (17). However, this study displays an association between the ABO and Rh blood groups against obesity and overweight, whereas no statistically significant difference between ABO and Rh blood groups with obesity has seen in the earlier study (17). Newly, one study reported the presence of correlation between blood group (B) with obesity and hypertension among blood donors (6, 7). Similarly, several studies showed the presence of significant association between ABO and Rh against overweight and obesity (18).

On the other hand, this study revealed no significant association between ABO and Rh blood groups against hypertension, which comes in contrast with other findings which suggested the presence of significant associations between ABO and Rh blood group with hypertension (19).

During consultation with blood donors, it was found that majority of them had a bad and sedentary lifestyle that would defiantly affect their health and lead to increase in their bodyweight which will eventually result in arising of such MS. They were eating fast food once or twice weekly and not practicing exercises regularly. It was found that 13% of donors have

obesity and hypertension in family history. Pre-glucose was clearly in 40% of obese donors reflecting the relation between the obesity and diabetes. Furthermore, under normal weight and obese three were rare and only representing 2%.

The distribution of ABO blood groups among blood donors in this study showed that O blood group was the most common blood group which constitutes about 45.42% followed by A (25.90%), B (22.90%) and AB (5.78%) which is similar to the findings of other study (17).

Most of volunteer's blood donors were Rh +ve which is in line to the findings of other studies (17). Nonetheless, Rh-ve blood groups were more susceptible to overweight (AB-ve and B+ve) and obesity [AB-ve and A-ve] (Table 3).

Lastly, there is reasonable variation regarding the distribution of the ABO blood groups and prevalence of MS worldwide, which may be attributed to many factors such as origin, race, hereditary factors, food style and cultural habits. This distribution is playing a vital role and could help to understand the important procedures which could be applied for better lifesaving.

CONCLUSION

This study showed that most of blood donors were O+ve (45.42%) followed by A, B and AB. Rh+ve was most frequent compared with Rh-ve. High levels of obesity and hypertension were observed compared with low levels of TTIs and the absence of diabetic cases among blood donors. No relationship was detected between hypertension or diabetes with ABO blood groups. However, significant associations were observed between ABO blood group with obesity and overweight. Some limitations were noticed in this study such as small sample size, concentration only on blood donors and one area (Unaizah). Future comprehensive studies are needed to observe the potential effects of genetics and environmental factors on MS and TTIs.

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Author contributions

Sulaiman Almiman was responsible about the donor's interview to select volunteer's blood donors and samples collection. Amer Almainan carried out all experiments, data analysis and writing the manuscript. The authors declare that they have no competing interests and they did not receive any fund for this research.

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