



**Full Length Research Article**

**ASSOCIATION OF ABO BLOOD GROUPS WITH SERUM TOTAL CHOLESTEROL AND TRIGLYCERIDE IN HEALTHY VOLUNTEERS**

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**ARTICLE INFO**

**Article History:**

Received 23<sup>rd</sup> September, 2015  
Received in revised form  
14<sup>th</sup> October, 2015  
Accepted 11<sup>th</sup> November, 2015  
Published online 30<sup>th</sup> December, 2015

**Key Words:**

Blood groups,  
Total cholesterol,  
Triglyceride,  
Jordan.

**ABSTRACT**

So far, no studies have been performed in Jordan to look at association of ABO blood groups with high serum cholesterol and triglyceride. These biochemical markers are strongly implicated in the development of cardiovascular diseases. Recently, it has been identified ABO as focus for thrombosis, myocardial infarction and cardiovascular biomarkers. The relationships between ABO blood groups total cholesterol and triglyceride concentrations have been evaluated in many studied but the results differ. One hundred ninety four healthy subjects were participated in the study. There were 39% male and 61% female participants with age range of 21 to 55 years. Blood groups, total serum cholesterol and triglyceride levels were determined. Data were analyzed with SPSS program and by applying ANOVA test. The p-value less than 0.05 was considered statistically significant. ANOVA test results showed that there was an association between ABO blood groups total cholesterol and triglyceride levels were negatively associated with A blood group ( $p < 0.05$ ), higher in individual with A-antigen than in subject without this antigen, but no significant association was noted between total cholesterol and blood group was negatively associated with triglyceride levels ( $p = 0.320$ ). The results in present preliminary study revealed that in our population there was a negative association between ABO blood group A and total cholesterol and there was also a negative association between ABO blood groups, B and AB groups with triglyceride levels. Further studies are necessary to confirm the mechanisms by which ABO blood type or closely linked genetic variants may influence cardiovascular disease in our population, may be only family history of CAD had significant relation with ABO.

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**INTRODUCTION**

The clinical significance of ABO blood groups are beyond transfusion medicine and organs/ hematopoietic transplantation. Recently, many reports have suggested important relationship between ABO blood groups and various diseases, for example pancreatic cancer (Wolpin *et al.*, 2009), skin cancer (Xie *et al.*, 2010), ovarian cancer (Gates, *et al.*, 2011), gastric cancer (Wang, *et al.*, 2012), and diabetes mellitus (Kamil *et al.*, 2010; Gong *et al.*, 2012). Relationship between blood groups and male infertility has also been reported (Khan *et al.*, 2010). Several investigation have appeared in recent years suggesting an association between blood groups and various manifestations of cardiovascular diseases (Bayoumi *et al.*, 2007; Abdollahi *et al.*, 2009; and Zhang, *et al.*, 2012). ABO blood groups particularly non-O blood groups are associated with risk of cardiovascular diseases (Erikssen *et al.*, 1980; Platt *et al.*, 1985).

In the last seven years the Genom- wide association (GWAs) has confirmed ABO as a locus for multiple cardiovascular biomarkers (Zeller *et al.*, 2011). Although, many epidemiological studies have suggested evidence for ABO association with circulating levels of cholesterol and triglyceride with non- O groups appearing to have higher levels (Oliver *et al.*, 1969; Langman *et al.*, 1969; Hagerup *et al.*, 1972; George *et al.*, 1987, and Gali *et al.*, 2010). Clinical studies have shown that individuals with A phenotype blood group are more susceptible to cardiovascular diseases. Nevertheless, the association between ABO blood type and serum total cholesterol and triglyceride and the risk of cardiovascular disease has not been prospectively evaluated in Jordan. We therefore examined the relationship between ABO blood type and those biochemical markers in healthy male and female population.

**MATERIALS AND METHODS**

One of hundred subjects participated in the study, male 39% and female 61% (age between 21-55 years). We have been

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conducting all the tests and collected blood samples from private laboratories in Amman/ Jordan and with the agreement and consent of the patients and also blood samples were collected from the people who carry out routine checks at the same lab. Subjects with known cases of smoking, obesity and diabetes mellitus were excluded from this study. Blood grouping (ABO) and Rhesus factors was done by the antigen – antibody agglutination test, monoclonal reagent for determination of ABO and Rh- factor were used. Serum total cholesterol and triglyceride were determined by enzymatic colorimetric method according to the manufactures instruction.

### Statistical Analysis

All data were expressed as mean  $\pm$  S.D. significant differences among the groups were determined by two- ways analysis of variance using the SPSS statistical analysis program. Statistical significance was considered at  $p < 0.05$ .

## RESULTS

In our study, two way ANOVA test results showed a negative association between ABO blood groups and serum total cholesterol. A blood group showed negative association with gender ( $p < 0.05$ ) which implied that a blood group has less chances of vascular disease in our population study. However, no significant association was found between total cholesterol level and blood group A, and AB ( $p < 0.403$ ) (Table 1). The frequency of A (44%) followed by O blood group (35%) was high among subjects with serum total cholesterol as shown in (Table 1). Results also showed a negative association between ABO blood phenotypes and triglyceride concentration. The frequency of O blood group followed by A group was high among subjects with triglyceride levels, as shown in (Table 2). B 6% and AB 15% blood groups showed negative association with gender ( $p < 0.05$ ) which implied that B and AB blood groups have less chances (CVD) in our population study. However, no significant association was found between triglyceride levels and blood group with B-antigen ( $p < 0.320$ ) (Table 2).

**Table 1. Means and standard deviation for cholesterol indicator according to blood group and gender**

Blood group	gender	No.	cholesterol		
			Mean	SD	
A	M	19	5.54	$\pm$	1.03
	F	25	6.10	$\pm$	1.78
	Total	44	5.86	$\pm$	1.52
B	M	2	4.60	$\pm$	1.56
	F	4	4.60	$\pm$	1.74
	Total	6	4.60	$\pm$	1.51
AB	M	7	4.40	$\pm$	1.35
	F	8	5.78	$\pm$	1.97
	Total	15	5.13	$\pm$	1.80
O	M	11	5.65	$\pm$	1.15
	F	24	5.47	$\pm$	1.45
	Total	35	5.53	$\pm$	1.35
Total	M	39	5.32	$\pm$	1.20
	F	61	5.71	$\pm$	1.69
	Total	100	5.56	$\pm$	1.52

Table 1: Indicates the mean values for cholesterol according to gender and blood group. As the mean values may reflect, there are apparent differences among the mean values suggesting possible differences according to either gender, blood group or

the interaction between these two variables. Two ways ANOVA was performed the results are included in table (1).

**Table 2. Two way ANOVA for cholesterol variable according to blood group and gender**

variables	Source of variation	Sig.
cholesterol	Gender	0.180
	Blood group	0.298
	Gender*blood group	0.403

As could be figured out from the results included in table (2), the probability value of gender main effect (0.180) was  $> 0.05$  suggesting no statistical mean differences for cholesterol according to gender. In addition the probability value for cholesterol according to blood group main effect (0.298) was  $> 0.05$  suggesting no statistical mean differences for cholesterol according to blood group.

Concerning the interaction between gender and blood group the probability value (0.403) was  $> 0.05$  suggesting no statistical mean differences for cholesterol according to gender and blood group.

**Table 3. Means and standard deviation for triglyceride indicators according to blood group and gender**

Blood group	gender	N	Triglyceride		
			Mean	$\pm$	SD.
A	M	19	2.11	$\pm$	0.81
	F	25	1.96	$\pm$	1.62
	Total	44	2.02	$\pm$	1.32
B	M	2	1.40	$\pm$	0.99
	F	4	2.10	$\pm$	1.02
	Total	6	1.87	$\pm$	0.98
AB	M	7	1.21	$\pm$	0.43
	F	8	1.89	$\pm$	0.75
	Total	15	1.57	$\pm$	0.69
O	M	11	2.03	$\pm$	0.85
	F	24	2.36	$\pm$	1.95
	Total	35	2.25	$\pm$	1.67
Total	M	39	1.89	$\pm$	0.83
	F	61	2.12	$\pm$	1.63
	Total	100	2.03	$\pm$	1.38

Table 3: Indicates the mean values for triglyceride according to gender and blood group. As the mean values may reflect, there are apparent differences among the mean values suggesting possible differences according to either gender, blood group or the interaction between these two variables. Two ways ANOVA was performed the results are included in table (3).

**Table 4. Two way ANOVA for triglyceride variables according to blood group and gender**

Variables	Source of variation	Sig.
Triglyceride	Gender	0.513
	Blood group	0.320
	Gender*blood group	0.719

As could be figured out from the results included in table (4), the probability value of gender main effect (0.513) was  $> 0.05$  suggesting no statistical mean differences for triglyceride according to gender. In addition the probability value for triglyceride according to blood group main effect (0.320) was  $> 0.05$  suggesting no statistical mean differences for

triglyceride according to blood group. Regarding the interaction between gender and blood group the probability value (0.719) was  $> 0.05$  suggesting no statistical mean differences for triglyceride according to gender and blood group.

## DISCUSSION

The association between thrombosis and ABO blood groups has a long history suggesting that non- O blood groups confirm a higher risk of myocardial infarction, angina and peripheral vascular disease than group O. In a number of studies it has been found that healthy men and women of blood group A have higher mean serum cholesterol levels than those of group B or O. High serum cholesterol and triglyceride are strongly implicated in the development of cardiovascular diseases.

The relationships of ABO blood groups with cholesterol and triglyceride levels has been investigated in many studies but the results of these studies differ. Several investigations have been reported in the scientific literature that individuals, who are blood type A have higher rates of heart attack across all age groups, both genders and all ethnic and national groups. Multiple studies in many Western European populations, Danish, British, Hungarian and Italian were analyzed and significant associations were found between blood type A and serum cholesterol and low density lipoprotein cholesterol, while a negative association was found with blood type B, AB and O and serum total cholesterol (Conteiro *et al.* 1994; Hagerup, 1972; Whincup *et al.* 1990). On the other hand, triglyceride levels were higher in individual with type B or AB than in subjects without this antigen. Contiero *et al.*; (1994), reported that in Italian population age (21-59) years did not find any association between total cholesterol and ABO blood groups, they concluded that environmental and diet factors could be more important than genetic factors in causation of cardiovascular disease.

Furthermore, different frequencies worldwide were reported, in Japanese population study the result showed that cholesterol levels were very significant elevated in the blood type A group (Conteiro *et al.* 1994). In Pakistani (Asia) and in Nigerian (Africa) population, they have found a high level of cholesterol among blood group A (Akund *et al.* 2006; Gali *et al.* 2010; Wazirali *et al.* 2005) respectively. In Iranian population, the prevalence of cardiovascular major risk factor was equal in different blood groups is significantly associated with CHD risk, those with blood type O have moderately lower risk of developing CHD. A, B, or AB were more likely to develop CHD had higher risk of CHD compared with O-blood group. However, as some studies have found a particular effect of group A, researcher in Canada, India, Poland and Guatemala found absolutely no correlation between the amount of cholesterol in the blood and the degree of atherosclerosis of large number individuals. Systemic analysis and establishment of relationship between ABO blood group phenotype and total serum cholesterol and triglyceride in Jordanian population have not been reported.

Therefore, our study was designed to investigate the association of these biomolecules and ABO blood group in our

population. We found insignificant association between A-antigen of the ABO blood groups and total serum cholesterol (Table 1) and also negative association between B- antigen and triglyceride (Table 2). Our results in this work agrees with finding of other population, this could be due to the environmental, diet and life style factors. Further, the role of blood group antigens in the pathogenesis of various cardiovascular disorders may be used as markers for monitoring the disease activity and were found to have prognostic significance for disease stage and outcome.

## Acknowledgment

We thank the head of medical Lab, Prince Hamza Hospital, Toutanji- Hospital and Al-Hijawi Med-Lab- Amman-Province –Jordan for their cooperation to conduct this work.

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