

# Effect of ABO Blood Group on Blood Pressure Indices among Apparently Healthy Young Adults of Yoruba Ethnicity in Ile-Ife

Asafa MA<sup>1\*</sup>, Ogunlade O<sup>1</sup> and Bolarinwa RA<sup>2</sup>

<sup>1</sup>Department of Physiological Sciences, Obafemi Awolowo University, Ile-Ife, Nigeria

<sup>2</sup>Department of Haematology and Immunology, Obafemi Awolowo University, Ile-Ife, Nigeria

## Abstract

**Background:** This study evaluated the effects of ABO blood groups on blood pressure indices.

**Materials and methods:** Eighty apparently healthy young adults between the ages of 18 and 40 years were purposively selected for the study. Twenty participants of blood group AB were first identified through mass blood group screening process and 20 age and sex-matched participants each of the other three blood groups were also selected for the study. Two millilitres of venous blood was obtained from superficial cubital vein of each participant into a Sodium Ethylene Diamine Tetra-acetic Acid (EDTA) anticoagulant bottle for blood grouping following standard procedure using anti-sera A, B and AB. Blood pressure was measured in sitting position after 5 minutes of rest with digital sphygmomanometer (Omron) and the BP indices were derived from systolic, diastolic and pulse rate. Comparison of means of parameters among the four blood groups was done using Analysis of Variance (ANOVA) and Duncan Post-hoc test. A p value of <0.05 was taken as statistically significant.

**Results:** The highest mean systolic, diastolic blood pressure, heart rate, mean arterial blood pressure and rate pressure product were found in blood group O while the highest mean pulse pressure was found in blood group AB. The effects of ABO blood group on blood pressure and its indices were not statistically significant. This study showed that ABO blood group system does not significantly affect blood pressure indices.

**Keywords:** ABO blood group; Blood pressure indices; Young adults; Yoruba ethnicity

## Introduction

Landsteiner discovers three blood groups A, B, and O in 1900 [1]. Identification AB was done in 1902 by Decastello and Struli [2]. ABO blood group system was the first to be described among other blood group systems and still the most significant in transfusion medicine [3]. ABO blood group is genetically determined and plays role in the development of certain genetic disorders [4]. It is an easily accessible genetic make-up that has been linked up with some diseases [5-7]. The importance of ABO blood group system in blood transfusion had already been established [4]. Blood pressure (BP) is an important cardiovascular parameter being one of the four main vital signs routinely checked by medical professionals and health care provider [8]. The known risk factors for cardiovascular diseases are tobacco use, physical inactivity, dietary factors, alcohol abuse and genetics [9]. Among cardiovascular diseases, the most common in Black population is the hypertension and its complications [10]. Hypertension can be defined according to the Seventh Report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure (JNC 7) as persistent elevation of systemic arterial blood pressure [11]. The diagnosis of hypertension is made when the blood pressure is greater or equal to 140 mmHg and or 90 mmHg on two or more occasions [11]. Most of the blood group studies on blood pressure have been on adult population with already established hypertension [12]. This study assessed the effect of ABO blood group on blood pressure and its indices among apparently healthy young adults of Yoruba Ethnicity.

## Materials and Methods

This study was carried out at the University Health Centre and the Department of Physiological Sciences, Obafemi Awolowo University, Ile-Ife. It was a cross-sectional descriptive study involving apparently healthy young adults between the ages of 18 and 40 years (inclusive) of

Yoruba ethnicity. The target population were the students of Obafemi Awolowo University community, Ile-Ife, Nigeria. Eighty (12 males and 68 females) participants were purposively selected for the study. Twenty participants of blood group AB were first identified through mass blood group screening process and 20 age and sex- matched participants each of the other three blood groups (A, B and O) were also selected for the study. Blood sample (2 mL) was obtained from superficial cubital vein from each participant at resting position after cleaning with 75% ethyl alcohol using 2 mL syringe and the sample was dispensed into Sodium EDTA anticoagulant bottle. All sample collections followed standard procedure. A drop of each antisera A, B and AB were placed on a clean white tile in three different places marked X, Y and Z respectively. Drops of blood were added to the antisera at points X, Y and Z and mixed with the aid of glass rods. Then, the mixture was rocked gently for 60 seconds and observed for agglutination. The observations at points X, Y and Z were recorded immediately after mixing. The tests were done in duplicates to ensure validity of results. If agglutination was observed at points X and Z, Y and Z and X, Y and Z, the participants were classified to belong to blood groups A, B and AB, respectively. If no agglutination at points X, Y and Z, the participants were classified to belong to blood group O. Agglutination at point X or Y or Z were considered invalid and the test was repeated. Blood pressure (BP) measurement was done by an

**\*Corresponding author:** Asafa MA, Department of Physiological Sciences, Obafemi Awolowo University, Ile-Ife, Nigeria, Tel: +234(0)8060063353; E-mail: drashafa@gmail.com

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indirect method using a validated Omron digital sphygmomanometer of appropriate cuff size attached to the arm. The BP measurements were taken twice in a sitting position after five minutes of rest. Systolic Blood Pressure (SBP), Diastolic Blood Pressure (DBP) and pulse rate were recorded. Pulse Pressure (PP) was calculated as the difference between SBP and DBP. Mean Arterial Pressure (MAP) was calculated using the formula  $MAP = DBP + 1/3 (PP)$ . Rate Pressure Product (RPP) was calculated as the product of SBP and pulse rate. The data were analyzed by the aids of IBM version 20.0 software using descriptive statistics and cross tabulations. Comparison of means of parameters among the four blood groups (A, B, AB and O) was done using Analysis of Variance (ANOVA) and Duncan Post-hoc test. A p value of <0.05 was taken as statistically significant.

## Result

The mean age  $\pm$  SD of the participants was  $21.50 \pm 3.52$  years. The mean  $\pm$  SD of systolic blood pressure (mmHg), diastolic blood pressure (mmHg), pulse rate (beats per minute), Pulse pressure (mmHg), rate pressure product and mean arterial pressure (mmHg) were,  $113.05 \pm 10.49$ ,  $65.06 \pm 10.12$ ,  $75.33 \pm 12.82$ ,  $47.99 \pm 9.20$ ,  $8524.54 \pm 1708.347$  and  $81.06 \pm 9.27$ , respectively. The highest mean systolic blood pressure, diastolic blood pressure, rate pressure product and mean arterial pressure were found in blood group O while the highest mean heart rate and pulse pressure were found in blood group AB. The relationship between ABO blood group and BP indices were not statistically significant (p-value>0.05) as shown in Table 1.

## Discussion

The mean systolic (SBP), diastolic blood pressure (DBP) and mean arterial pressure (MAP) were slightly lower to what was reported in a study conducted among 60 young adults in Brazil [13]. The

difference in mean values may be due to racial differences and life style. The highest mean SBP and DBP was found in blood group O which is in support of the report of Kondam and Chandrashekar that the prevalence of hypertension is highest in blood group O in a study done in 500 known hypertensive patients within the age range of 20-70 years [14]. This is also in support of a report of a study on prevalence of hypertension among post-menopausal women in India within the age range of 45 to 80 years [15]. Increased susceptibility of hypertension in blood group O may be due to the fact that individuals with blood group O have about 25% less factor VIII (F VIII) and von Willebrand factor (vWF) in their plasma which was said to predispose them to hypertension [16]. The high protein diet preference for blood group O as described in 1996 by D'Adamo and Whitney may also be responsible for the highest mean SBP and DBP in this blood group [17]. This is in contrast with blood group AB reported in studies done among young adults in India. This may be due to varying number of participants in each blood groups used in their studies. It is also in contrast with what was reported among young adults of northeast Bosnia between the age range of 18-23 years with highest mean of SBP in blood group A [18]. The report from this study is also in contrast with the findings of a study done among young adults of a tertiary institution in Mardan by Shams et al. in 2014 which reported blood group A to be at higher risk of developing high blood pressure [19]. This contrast may be due to a high prevalence of blood group A among the study population. RPP is the correlate of myocardial oxygen consumption, which is the heart work load [20]. The highest mean of RPP was found in blood group O hence this may put blood group O at risk of myocardial infarction. The highest mean of pulse pressure (PP) was in blood group AB. The increase PP has been said to be associated with an increase in central vascular stiffness as described by Franklin in 2006 [21]. Thus, blood group AB individuals may be predisposed to atherosclerosis.

## Conclusion

This study showed that individuals with blood group O have highest values of blood pressure indices and may be predisposed to high blood pressure. ABO blood group does not significantly affect blood pressure indices.

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## Authors' Contributions

AMA and OO designed the study and performed the statistical analysis. AMA, OO and BRA wrote the protocol, drafted the manuscript and managed the literature search. All authors read and approved the final manuscript.

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Cardiovascular Indices	Blood group	Parameters (Mean $\pm$ SD)	F	p-value
Heart rate (bpm)	A	74.64 $\pm$ 14.61	0.132	0.941
	B	73.77 $\pm$ 13.10		
	O	75.82 $\pm$ 8.99		
	AB	75.77 $\pm$ 13.43		
SBP (mmHg)	A	111.00 $\pm$ 12.58	0.776	0.511
	B	112.68 $\pm$ 9.55		
	O	115.50 $\pm$ 9.66		
	AB	111.14 $\pm$ 11.09		
DBP (mmHg)	A	64.09 $\pm$ 12.67	1.163	0.329
	B	66.00 $\pm$ 11.61		
	O	68.91 $\pm$ 8.94		
	AB	63.64 $\pm$ 7.69		
PP (mmHg)	A	46.91 $\pm$ 11.77	0.040	0.989
	B	46.68 $\pm$ 8.59		
	O	46.59 $\pm$ 8.66		
	AB	47.17 $\pm$ 9.22		
RPP	A	8295.91 $\pm$ 2006.43	1.241	0.300
	B	8321.41 $\pm$ 1663.70		
	O	8749.82 $\pm$ 1212.54		
	AB	8417.77 $\pm$ 1761.18		
MAP (mmHg)	A	79.73 $\pm$ 11.36	0.338	0.798
	B	81.56 $\pm$ 10.19		
	O	84.44 $\pm$ 8.23		
	AB	79.17 $\pm$ 8.46		

SBP: Systolic Blood Pressure; DBP: Diastolic Blood Pressure; MAP: Mean Arterial Pressure; PP: Pulse Pressure; RPP: Rate Pressure Product.

**Table 1:** Relationship between ABO blood group and some cardiovascular Indices.

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