

Association of ABO Blood Groups with Blood Pressure among the Students of Abdul Wali Khan University Mardan

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ABSTRACT

Cardiovascular diseases are the most common cause of death in the world and their prevalence rate is rapidly increasing in developing countries. Blood group is a classification of blood based on the presence or absence of inherited substances on the surface of red blood cells. The most well-known and medically important blood groups are ABO blood types which are associated with various diseases including Diabetes, Migraine, Stomach Ulcer, Hypercholesterolemia and particularly cardiovascular diseases. In the present study we aimed to investigate the correlation between the ABO blood groups and blood pressure and ultimately with myocardial infarction in young generation of university. A descriptive study was performed in the Biochemistry laboratory of Abdul Wali Khan University Shankar Campus Mardan Khyber Pakhtunkhwa to find out the blood groups and its association with blood pressure among the university students. Blood sample from eight hundred and thirty five (835) young and healthy students comprising 335 male and 500 female were collected. ABO blood group was determined using commercially available anti-sera and blood pressure was calculated by using digital blood pressure apparatus (Sphygmomanometer). Among the studied population, the students having blood group A (36%) have high blood pressure (SBP \geq 140 or DBP \geq 90 mmHg) followed by blood group AB (24%), B (22%) and O (18%). Furthermore, male's students have high blood pressure than female. People belong to A blood group have high risk of heart diseases as compared to people having blood groups B, AB and O. Therefore, doctors must have to advise people with type A blood to avoid eating fatty foods, take regular exercise and refrain from smoking.

KEYWORDS: Blood Group, Blood Pressure, Students, University.

INTRODUCTION

All humans and many other animals have four principal blood types: A, B, AB, and O [1]. Karl Landsteiner discovered A, B and O blood type in 1901 [2, 3]. The human red blood cell contains various kinds of polysaccharide antigens, called agglutinin [4]. ABO blood groups are composed of complex carbohydrate molecules with different antigenic structures [5]. Two antigens and two antibodies are generally involved for the ABO types and a particular combination of these four types determines an individual's blood group. However, along with their expression on red blood cells, ABO antigens are also highly expressed on the surface of a variety of human cells and tissues, including the epithelium, sensory neurons, platelets, and the vascular endothelium [6]. Thus, the clinical significance of the ABO blood group system extends beyond transfusion medicine and numerous reports have suggested an important associations among ABO blood groups and in the development of various diseases such as oncological, Diabetes, Migraine, Stomach Ulcer, Hypercholesterolemia and particular cardiovascular [7,8].

Among cardiovascular diseases the preliminary and most common is blood pressure. Blood pressure that is pathologically high is called hypertension which have many causes and can range from mild to severe. Blood pressure (BP), sometimes referred to as arterial pressure, is the pressure exerted by circulating blood upon the walls of blood vessels. During each heartbeat, blood pressure varies between a maximum (systolic) and a minimum (diastolic) pressure. The blood pressure in the circulation is principally due to the pumping action of the heart [9]. For each heartbeat, blood pressure varies between systolic and diastolic pressures. Systolic pressure is peak pressure in the arteries, which occurs near the end of the cardiac cycle when the ventricles are contracting. Diastolic pressure is minimum pressure in the arteries, which occurs near the beginning of the cardiac cycle when the ventricles are filled with blood. An example of normal measured values for a resting, healthy adult human is 120 mmHg systolic and 80 mmHg diastolic (written as 120/80 mmHg). Blood pressure is one of the four main vital signs routinely monitored by medical professionals and healthcare providers [10]. Previous studies have revealed that heart disease is more commonly encountered in people of blood type other than O [11]. Until now, in Pakistan especially in young people of district Mardan KPK blood groups are not associated with blood pressure or any other heart diseases. So to the best of our knowledge this was the first ever study to check the correlation between ABO blood types and blood pressure in young educated population of this area. The current study summarizes the basic concepts of the biochemistry of ABO blood groups and their co-relation with Cardiovascular diseases.

2. MATERIAL AND METHODS

2.1. Study Design: This is a cross-sectional study. Blood samples were collected from AWKUM Shankar campus Mardan.

2.2. Subjects and Blood Collection: A total of 835 registered students belonging different departments of AWKUM, KPK Pakistan comprising males and females were screened for their blood groups. The blood was collected via finger prick method [12]. Then the blood pressure of each student was measured through digital Sphygmomanometer (Wrist monitor).

2.3. ABO Blood Group Test: Finger of each student was pricked via Lancet/pricker, a drop of blood was placed on a transparent glass slide in three places. A drop of each of the anti-sera, anti A, anti B and anti D was added and mixed with each blood sample with the help of match sticks. Blood groups were determined on the basis of agglutination.

2.4. Blood Pressure Measurement: The cuff was fitted securely on left arm so that the display and the palm of student's hand were facing the student. The arm of the student was positioned in such a way that the cuff is around the same height as his heart. The apparatus was started by pressing the ON/OFF button. The cuff was inflated by the cuff, when the correct inflation pressure was reached the pressure began to fall. The wrist monitor detects the pulse and the "Heart" symbol began to flash. The numbers in the display were continued to change until the blood pressure reading was completed.

2.5. Layered Approach for Levels of Blood Pressure: Subjects were divided into subgroups according to their BP at entry time using the WHO classification criteria [13] (Chalmers *et al.*, 1999). We distributed individual having optimal pressure as SBP < 120 and DBP < 80 mmHg in group I; normal BP as SBP \geq 120 and <130 mmHg, and/or DBP \geq 80 and <85 mmHg in group II; high-normal BP as SBP \geq 130 and <140 mmHg, and/or DBP \geq 85 and <90 mmHg in group III; and high BP as either SBP \geq 140 or DBP \geq 90 mmHg in group IV.

3. RESULTS

3.1. Percentage Distribution of Students in different BP Groups: At baseline, of the 835 subject, 40% were male with the median age of 23+ 2 years, while 60% were females with the median age of 23 years old (23.0 \pm 3, mean \pm SD). Subjects were selected from different departments of Shankar Campus, AWKUM including Botany, Biochemistry, Biotechnology, Chemistry, Computer Science, Environmental Sciences, Physics and Zoology. Blood group A (36%) have high blood pressure (SBP >140) followed by AB(24%), B (22%) and O (18%). The greater number of subjects (36%) which were recorded in group IV having blood group A, followed by blood group AB (24%) and B (22%). While lowest number of students (18%), which were observed in high BP (group IV) have blood group O as shown in Table 1.

Table 1. Percent distribution of students in different BP groups

S. No	Groups of BP	Blood Groups			
		A	B	AB	O
Percentage of students in each group	I	16%	35%	34%	15%
	II	26%	43%	20%	11%
	III	37%	20%	28%	15%
	IV	36%	22%	24%	18%

3.2. Gender-wise Distribution of blood Groups and BP: Males have high blood pressure (SBP >140) as compare to females (as shown in Fig. 1 & 2). No Female has been recorded in high BP (group IV).

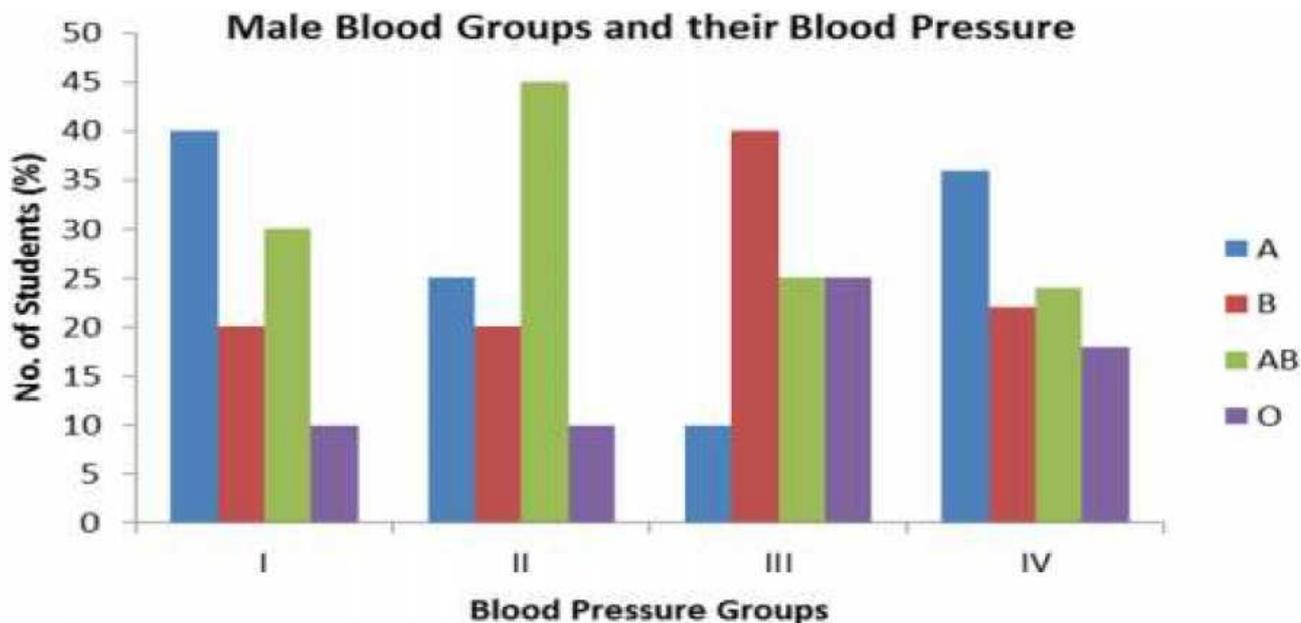


Figure 1: Male Blood Groups and their Blood Pressure in each group. Group I represented optimal blood pressure, group II represented normal BP, group II represented high-normal BP and high BP as either SBP ≥ 140 or DBP ≥ 90 mmHg were included in group IV.

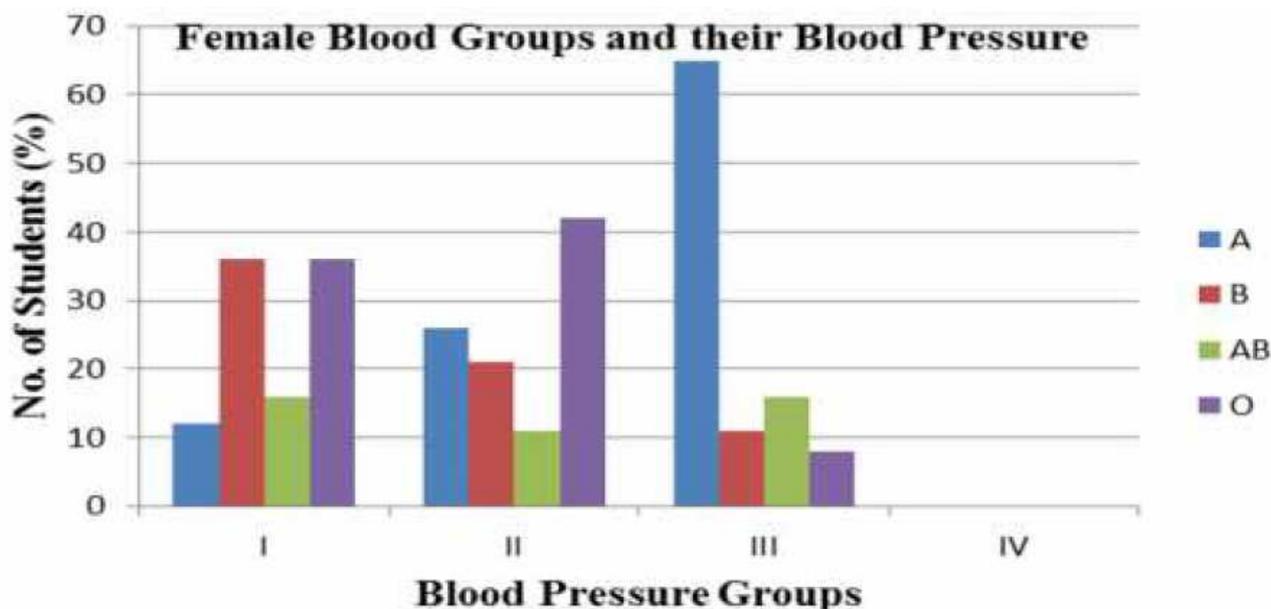


Figure 2: Female Blood Groups and their Blood Pressure in each group. Group I represented optimal blood pressure, group II represented normal BP, group II represented high-normal BP and high BP as either SBP ≥ 140 or DBP ≥ 90 mmHg were included in group IV.

4. DISCUSSION

The present study, comprising 835 subjects, 335(40%) male and 500 (60%) females in AWKUM focused to determine the association of blood group to BP level. Our study revealed that the individual having blood group A (36%) have higher BP at baseline followed by AB (24%), B(22%), and O (18%). Blood group A have risk of heart diseases as compared to other Blood groups. It is also found in the literature that blood group A have high risk of heart diseases [14]. According to the study, individuals with blood type A had a significantly greater risk of coronary artery disease and myocardial infarction, as compare to individuals who do not have type A blood group [15]. A blood group patients have the need for closer follow-up and/or preventive treatment against the risk of further cardiovascular accident. Previous studies have shown non-O group to be under higher risk for myocardial infarction, which lead to elevated mortality rates [16] and we also observed that these elevated risks may be associated to higher blood pressure.

People with high-normal and high blood pressure may be more alert to their health as health education and promotion programs are popular in varies media in Pakistan, possible actions could be intentionally or unintentionally taken, and their SBP/ DBP is, therefore, controlled or even lowered. The strengths of this research were that it was a longitudinal

study of 1 years in a university students population with data of relatively good quality. The relation between ABO and Blood pressure might be more complex than it seems and various distinct pathways related to cardiovascular risk factors may be involved. So blood types needs to be considered together with other risk factors (environmental factors, diet, less exercise, adiposities, age, stress, high salt intake, Overweight , obesity and family history) to understand the individual patient's risk. The identification of genetic and environmental factors should offer some insights into the observed epidemiological data and advance opportunities to better understand the control and development of CHD.

5. Conclusions. We concluded that people belong to A blood group have high blood pressure which may lead to risk of other heart diseases i.e. stroke, myocardial infarction, CHD etc. than people having blood groups AB, B and O. on the result of the current study doctors have advised people with type A blood to avoid eating fatty foods, take regular exercise and refrain from smoking. Further studies are needed to confirm these findings and to investigate the potential mechanisms underlying the links between ABO blood type and CHD risk.

6. REFERENCES

- [1] Maton, A., H. Jean., W.M. Charles., J. Susan., Q.W. Maryanna., L. David. and D.W. Jill, *Human Biology and Health*. Englewood Cliffs, New Jersey, USA: Prentice Hall. 1993. 13-981176-1.
- [2] Race, R.R. and R. Sagner, *Blood group in man*, 6th edition. Blackwell Scientific Publication, Oxford, 1978. 12-4.
- [3] Burns W.G, *The science of genetics: An Introduction to heredity*. 4th edition, McMillan Publishing Company Inc. New York, N.Y, 1980. 179-80.
- [4] Mosby, K. *Agglutination*, Mosby's Medical, Nursing and Allied Health Dictionary, Fourth Edition, Year-Bookp. 1994. 49.
- [5] Sar, I. O. Ozer., V. Davutoglu., S. Gorgulu., M. Eren, and M. Akso, ABO blood group distribution and major cardiovascular risk factors in patients with acute myocardial infarction. *Blood Coagul Fibrinolysis*, 2008. 19: 231-4.
- [6] Eastlund, T. The histo-blood group ABO system and tissue transplantation. *Transfusion*, 1998. 38:975–88.
- [7] Franchini, M., F. Capra. and G. Targher, Relationship between ABO blood group and von Willebrand factor levels: from biology to clinical implications. *Thromb J*, 2007. 5:14.
- [8] Franchini, M., E. J. Favaloro., G. Targher. and G. Lippi, ABO blood group, hypercoagulability, and cardiovascular and cancer risk. *Crit Rev Clin Lab Sci*, 2012. 49:137–49.
- [9] Caro C.G, *The Mechanics of The Circulation*. Oxford [Oxfordshire]: Oxford University Press, 1978.
- [10] Vital, S. *Body Temperature, Pulse Rate, Respiration Rate, Blood Pressure"*. OHSU Health Information. Oregon Health & Science University. Retrieved, 2010. 4-16.
- [11] Biancari, F., J. Satta., R. Pokela, and T. Juvonen, ABO blood group distribution and severity of coronary artery disease among patients undergoing coronary artery bypass surgery in Northern Finland. *Thromb Res*. 2002, 108: 195-6.
- [12] Din A.M., N. Fazeli., A.M. Rafiq, and S. Malik, Serological study among the municipal employees of Tehran, Iran: distribution of ABO and Rh blood groups. *Haema*, 2004. 7(4): 502-504.
- [13] Chalmers J., S. MacMahon, G. Mancia., J. Whitworth., L. Beilin., L. Hansson., B. Neal., A. Rodgers., C. Ni Mhurchu, and T. Clark, World health organization-international society of hypertension guidelines for the management of hypertension. Guidelines sub-committee of the world health organization. *ClinExpHypertens*, 1999. 21(5–6): 1009-1060.
- [14] Wazir, H., A.A. Rao. and W. Joachim, Association Of Blood Group A With Increased Risk Of Coronary Heart Disease In The Pakistani Population. *Pak J Physiol*, 2005. 1:(1-2).
- [15] Lee, H.F., Y.C. Lin., C.P. Lin., C.L. Wang., C.J. Chang. and L.A. Hsu, Association of blood group A with coronary artery disease in young adults in Taiwan. *Intern Med*, 2012. 51(14):1815-20.
- [16] Galeazzi, L. and V. Gualandri, ABO blood-group phenotypes and pathogenesis of cardiovascular diseases. Congenital, rheumatic, and coronaric heart disease and arterial hypertension. *Ital Cardiol*, 1975. 5(5):744-751.