

Possible association between ABO and Rh(D) blood groups and hypertension

Amir Hossein Tabatabaie¹, Mohammad Ali-Madadi²

ABSTRACT

Objective: To determine the possible association between ABO and Rh(D) blood groups and hypertension.

Methodology: In a cross-sectional study, blood pressure of a convenient sample of 510 (268 men and 242 women) subjects attending a general health care facility in Shiraz, South of Iran, was measured. ABO and Rh(D) blood groups were also determined for each subject. Chi square test was used to assess the frequency distribution of blood groups among hypertensive and normotensive subjects. Binary logistic regression analysis was used to determine the independent predictors for hypertension.

Results: The mean±SD age of participants was 52.3±10.1 years. Of 510 studied subjects, 208 (40.8%) were hypertensive. The frequency distribution of neither ABO nor Rh(D) blood groups was significantly different in hypertensive vs normotensive subjects ($p=0.815$, $p=0.440$, respectively). Binary logistic regression analysis of the data revealed age as the only independent predictor of hypertension (OR=1.109; 95% CI: 1.083-1.135).

Conclusion: We could not find any evidence in favor of the hypothesis that ABO or Rh(D) blood groups might be risk factors for hypertension.

KEY WORDS: Hypertension; Genetics; Blood groups.

Pak J Med Sci January - March 2012 Vol. 28 No. 1 235-237

How to cite this article:

Tabatabaie AH, Ali-Madadi M. Possible association between ABO and Rh(D) blood groups and hypertension. Pak J Med Sci 2012;28(1):235-237

INTRODUCTION

Hypertension is a common health problem in developed countries. It is a major risk factor for cardiovascular diseases.¹ The prevalence rate of hypertension is probably on the rise in developing countries the reason of which is probably adoption of western lifestyles and urbanization.² Hypertension in adults has a high economic burden for each

country and has a large impact on the quality of life of individuals with important implications for resource expenditures.³

Since uncomplicated hypertension is an asymptomatic condition, many people are unaware that they have high blood pressure. Because hypertension and its complications imply a large burden on our health care system, diagnosis of hypertensive patients is therefore of paramount importance. But, to diagnose hypertension, recognition of its probable risk factors would be important.⁴

So far, associations between many genetic markers and disease conditions have been described. Well-known examples are the association between HLA B27 and ankylosing spondylitis and HLA DR2 and multiple sclerosis. There are also associations between blood groups and certain disease conditions as people with blood group O are more likely to develop acid-peptic disease. Several studies have

1. Amir Hossein Tabatabaie, MD,
2. Mohammad Ali-Madadi, MD,
- 1-2: Shiraz NIOC Health Organization Polyclinics, Shiraz, Iran.

Correspondence:

Amir Hossein Tabatabaie, MD,
Shiraz NIOC Health Organization Polyclinics,
Eram Blvd, Shiraz 71438,
Iran.
E-mail: amirhosseintbtb@gmail.com

- * Received for Publication: October 26, 2011
- * Revision Received: January 2, 2012
- * Revision Accepted: January 5, 2012

also investigated the probable association between blood groups and hypertension and came out with conflicting results.⁵⁻⁷

It is known that hypertension is more common in some ethnic groups. For example, in approximately 40%–60% of Black Americans and Japanese, the increased rate of hypertension is explained by genetic factors.⁹ Familial patterns of primary hypertension are common. This familial pattern suggests that there would be some genetic factors for the development of hypertension.

In the view of these conflicting results, we conducted this cross-sectional study to determine the possible association between ABO and Rh(D) blood groups and hypertension.

METHODOLOGY

Between March and June 2010, a convenient sample of 510 (268 male and 242 female) patients attending to a general health care facility in Shiraz, southern Iran were studied. To determine the ABO and Rh(D) blood groups, conventional slide agglutination test was done using anti-A, anti-B, and anti-D sera (CinaGen Co., Tehran, Iran).

To measure the blood pressure, a mercury sphygmomanometer (Riester, Germany) was used. Those who were smokers or consumed caffeine during the past 30 minutes of examination were excluded from the study. The measurement was taken after a 10-minute rest. A cuff bladder encircling at least 80% of the arm circumference was applied to the non-dominant arm.⁵ The mean of two readings, recorded in two occasions was taken as the final measure. A systolic blood pressure ≥ 140 mm Hg and/or diastolic blood pressure ≥ 90 mm Hg was considered "hypertension." Statistical Package for the Social Sciences (SPSS®) for Windows® ver 12.0 was used for statistical analyses. Chi square test (χ^2) was used to assess the frequency distribution of blood groups among hypertensive and normotensive subjects. Binary logistic regression analysis was used to determine the independent predictors for hypertension.

RESULTS

The mean \pm SD age of participants was 52.3 \pm 10.1 (range: 27–85) years. Of 510 studied patients, 208 (40.8%; 95% CI: 36.5%–45.1%) were hypertensive. Distribution of ABO and Rh(D) blood groups among studied patients is shown in Table-I. The frequency distribution of neither ABO nor Rh(D) blood groups was significantly different in hypertensive *vs* normotensive subjects ($p=0.815$,

Table-I: Distribution of blood groups in the studied patients.

Blood Group	Hypertensive (n = 208)	Normotensive (n = 302)	All Patients (n = 510)
A	65 (43.0%)	86 (57.0%)	151 (29.6%)
B	45 (41.3%)	64 (58.7%)	109 (21.4%)
AB	11 (34%)	21 (66%)	32 (6.3%)
O	87 (39.9%)	131 (60.1%)	218 (42.7%)
Rh(D+)	189 (41.4%)	268 (58.6%)	457 (89.6%)
Rh(D-)	19 (36%)	34 (64%)	53 (10.4%)

$p=0.440$, respectively). Binary logistic regression analysis of the data revealed age as the only independent predictor of hypertension (OR=1.109; 95% CI: 1.083–1.135).

DISCUSSION

Distribution of ABO and Rh(D) blood groups among studied patients were similar to previous reports.¹⁰ The prevalence of hypertension among studied patients was high. We found no association between the ABO and Rh(D) blood groups and hypertension. The only important risk factor was age. Hypertension is an important risk factor for cardiovascular diseases. Numerous research studies have convincingly showed that treatment of hypertension reduces the risk of stroke, coronary heart disease, congestive heart failure, and the associated morbidities and mortalities.

Many studies have shown that environmental factors are important in development of hypertension.¹¹ Extensive efforts were so far made to identify specific genetic markers for hypertension. Several genes in the pathogenesis of hypertension were identified. Those include a chimeric mutation of the 11 β -hydroxylase/aldosterone synthase genes (glucocorticoid-remedial aldosteronism), a β -subunit mutation of the amiloride-sensitive epithelial sodium channel (Liddle's syndrome), and deletion and mis-sense mutations in the WNK family of serine-threonine kinases (pseudohypoaldosteronism type 2). These mutations, while rare, would cause hypertension by altering salt and water reabsorption in the kidney.⁴

In a study done by Delanghe et al, MN blood group polymorphism was studied in 386 Caucasians with established essential arterial hypertension, treated for at least one year. In 285 healthy normotensive blood donors, blood pressure was measured and MN blood group was typed. The frequencies of MN blood group phenotypes

were different in hypertensive patients than the distribution in the controls. Age at detection of hypertension was significantly lower for MN patients and with increasing age of detection, the relative frequency of MN phenotype gradually decreases. It was suggested that the MN phenotype is a genetic factor associated with early detection of essential hypertension.⁵ Although Miller, *et al*, showed that MNS phenotypes are distributed differently in hypertensive and normotensive Caucasian individuals, they could not find any associations between ABO, Rh(D) blood groups and hypertension.⁸ Another study from India on 200 medical students showed that blood group B and body mass index (BMI) were correlated with blood pressure.⁶ This study showed that tendency to develop hypertension is strongly associated with increase in BMI and those with blood group B appeared to be more susceptible to prehypertension.⁶ On the other hand, another study showed that there is no association between ABO blood group inheritance and essential hypertension.⁷

One limitation of this study was that we used a convenient sampling method with most participants residing in urban areas with sedentary life style. These people are more likely to develop hypertension than rural residents.¹² We also did not consider other risk factors for hypertension including age, gender, ethnicity, and BMI, but since none of these risk factors are presumably correlated with blood groups, we assumed that they should not be treated as confounding variables. Considering the sample size we studied as reasonable, we concluded that neither ABO nor Rh(D) blood groups are risk factors for hypertension.

ACKNOWLEDGEMENTS

We would like to thank Dr. Farrokh Habibzadeh for statistical analyses, editing of the manuscript and his invaluable suggestions.

REFERENCES

1. Bruce MM. Were you aware of these five typical issues on your heart? *Int J Occupational Environmental Medicine* 2011;2:184-5.
2. Castelli WP. Epidemiology of coronary heart disease. The Framingham Study. *Am J Med* 1984;76:4-12.
3. Erhun WO. Prevalence of hypertension in a university community in South West Nigeria. *African J Biomed Res* 2005;8:15-9.
4. Eric HA, Joseph L. Vascular disease and hypertension. *Cecil Essentials of Medicine*. 6th ed., Saunders Co. 2004: 155-73.
5. Delanghe J, Duprez D, De Buyzre M. MN blood group, a genetic marker for essential arterial hypertension in young adults. *Eur Heart J* 1995;16:1269-76.
6. Supratik B, Ganaraja B, Bhat R. Correlation between the blood groups, BMI and prehypertension among medical students. *J Chinese Clin Med* 2010;5:78-82.
7. Maxwell RD, Maxwell KN. ABO blood groups and hypertension. *Br Med J* 1955;2:179-80.
8. Miller JZ, Grim CE, Conneally PM, Weinberger MH. Association of blood groups with essential and secondary hypertension. A possible association of the MNS system. *Hypertension* 1979;1:493-7.
9. Newby DE, Grubb NR, Bradburg A. Cardiovascular disease. *Davidson's Principles and Practice of Medicine*. 21th ed., Churchill Livingstone; 2010: 521-640.
10. Pourfathollah AA, Oody A, Honarkaran N. Geographical distribution of ABO and Rh(D) blood groups among Iranian blood donors in the year 1361(1982) as compared with that of the year 1380(2001). *Khoon (Blood)* 2004;1:12-17. [in Persian]
11. Ugwuja EI, Ejikeme B, Obuna JA. Impacts of elevated prenatal blood lead on trace element status and pregnancy outcomes in occupationally non-exposed women. *Int J Occupational Environmental Medicine* 2011;2:143-56.
12. Habibzadeh F. The control of non-communicable diseases in rural Iran. *Lancet* 2011 [Epub ahead of print] doi:10.1016/S0140-6736(11)61678-4.