

Short Article

The Relation between ABO Blood Group and Pre-eclampsia in Primipara Women

Mostafa Amiri¹Ph.D., Mohammadreza Rahmani²M.Sc.
Hossein Solemani³Ph.D., Mohammad Ghorbani¹M.Sc.
Roghaieh Rahmani Bilandi^{4*} Ph.D.

¹Department of Basic Sciences, Faculty of Medicine, Gonabad University of Medical Sciences, Gonabad, Iran.

²Department of Clinical Psychology, Islamic Azad University, Gonabad Branch, Gonabad, Iran.

³Department of Management, Payam-e Noor University, Tehran, Iran.

⁴Department of Midwifery, Faculty of Medicine, Gonabad University of Medical Sciences, Gonabad, Iran.

ABSTRACT

Article history

Received 26 Aug 2017

Accepted 20 Nov 2017

Available online 13 Jun 2018

Key words

Blood group

Hypertension

Preeclampsia

Pregnancy

Background and Aims: Preeclampsia is one of the causes of maternal mortality whose leading cause is still unknown. This study was conducted to investigate the relation between blood group and pre-eclampsia in primipara women.

Materials and Methods: This case-control study was performed on 100 primipara women in Gonabad city. The samples were assigned, by census, sampling method, into two groups of case (with pre-eclampsia) and control (without pre-eclampsia). The data were analyzed using descriptive statistics and Chi-square through SPSS software version 16.

Results and Conclusions: The incidence of preeclampsia in the blood group of A, B, AB, and O were 36%, 34%, 22%, and 8%, respectively. Also, there was a significant difference between blood group O and blood group non-O to preeclampsia ($p < 0.001$). The findings showed that the women with A and B blood types require special care with an emphasis on controlling and preventing the factors which cause hypertension/preeclampsia during pregnancy.

Introduction

Each year hundreds of women die due to the complications of pregnancy and delivery [1], 16% percent of whom are nearly because of preeclampsia followed by hypertension in pregnancy; nevertheless, its leading cause is not yet known [2]. This process is aggravated following the increase in venous thrombosis and antigenic and antibody reactions between the level of mother's blood cells and that of the fetus [3]. The blood group types are regarded as a risk factor in coagulation disorders [4], and it seems that there is a relationship between preeclampsia and coagulation disorders. Moreover, pregnancy increases blood changes which consequently increase the possibility of undesirable pregnancy outcomes such as miscarriage and venous thrombosis [5]. In one study, it was observed that there is a significant relationship between mothers' blood type and frequent miscarriages [6]. Therefore, it seems that blood type is a factor affecting vascular lesions and its respective outcomes. Accordingly, this study was carried out to investigate the relationship between the ABO blood group and preeclampsia.

Materials and Methods

Through a case-control study, a comparison was made between the blood type of 50 women with preeclampsia and 50 healthy women. The sample included all women referring to the midwifery clinic in Gonabad city. The samples were then assigned by census sampling method into two groups. The control group consisted of women

who had experienced one delivery without hypertension and those who had preeclampsia characterized by blood pressure $\geq 140/90$ mmHg and proteinuria repeatedly ≥ 0.3 g/l or ≥ 0.5 g/24 hours or dipstick $\geq +$ after 20 weeks of gestational age. For all pregnant women, surface antigens of red blood cells were prepared using anti-A, B antibodies and D prepared from Blood Transfusion Organization of Iran by the method of agglutination metacotype group blood vessels ABO and Rh and using ABO study kit (Company, Iran) and blood drops were taken by needles. Also, women with negative Rh were excluded from the study. The inclusion criteria included being in the age range of 18-35 years and primipara, and having no previous miscarriages, diabetes, infertility, exposure to smoking, hypertension prior to pregnancy, kidney and pulmonary diseases. The women's weight increase was in the normal range during pregnancy, too. They also had no particular mental diseases. The preeclampsia in women in the case group was confirmed and then they received doses of sulfamethazine to be treated. The data were collected through the checklist prepared by the researchers. Finally, the collected data were analyzed employing descriptive statistics and Chi-square via SPSS version 16. This study was approved by the Ethics Committee of Deputy of Research at Gonabad University of Medical Science.

Results and Discussion

The mean age of women in case and control groups were 24 and 23.6 with a standard

deviation of 1.8 and 1.6, respectively. The women with blood group A showed the highest frequency of preeclampsia, and the lowest frequency of preeclampsia belonged to

the women with blood group O (Table 1). The Chi-square revealed a significant relationship between the incidence of preeclampsia and blood group (Table 2).

Table 1. The frequency of the blood types in women with and without preeclampsia

Type	Preeclampsia	No preeclampsia
	N (%)	N (%)
A	18 (36)	8 (4)
B	17 (34)	17 (34)
AB	11 (22)	5 (10)
O	4 (8)	20 (40)

Table 2. The relationship between O blood type and non O blood types

Type	Preeclampsia N (%)	No preeclampsia N (%)	P-value
O	4 (8)	20 (40)	p<0.001
Non O	46 (92)	30 (60)	

The results showed that the women with blood types other than O are more susceptible to preeclampsia (hypertension and proteinuria), a finding which is in line with that of the study conducted by Lee et al. [7]. The relationship between blood type B and preeclampsia was observed in our study. Franchini et al. noted a significant relation between blood group and thrombosis risk so that von Willebrand factor (VWF) in people with blood groups other than O (A, B, AB) was higher as much as 25 percent than blood type O. That is, the people with blood types other than O bear as much as 2.2 the risk of thrombosis than the people with blood type O, a risk which can increase as much as 7 times if complicated with other acquired and inherited risk factors. There is a higher risk of thrombotic events in non-O blood group compared with O blood group because the activity of ADAMS13 enzymes in non-O

phenotype, which is von Willebrand enzyme, was less in comparison to blood type O, resulting in less destruction of VWF, hence, the thrombosis risk will increase as much as four or five times [8]. Furthermore, the hemostasis proceeds towards thrombosis or an increase in coagulation during pregnancy and a decrease in the usual body inhibitors like anti-thrombin III and S protein [9].

When coagulation cascades are aggravated in pregnancy, pregnant women with this blood type are more susceptible to clotting inside the vessels, and finally the pathologic reactions inside the vessels are aggravated because blood types and consequently preeclampsia increase [10-11]. In our study, blood groups A and B enjoyed the highest frequency of preeclampsia. Blood groups A and B secrete antitumor factors which can damage the veins. Moreover, A and B blood groups stimulate the coagulation

process if compared with the blood group O although there has been found a relation between blood group O and infertility [12].

Conclusions

It seems that blood groups play an effective role in increasing the hypercoagulability of hemostasis system especially in pregnancy. In other words, blood types play a significant role

in inducing thrombotic complications such as preeclampsia.

Conflict of Interest

Authors have no conflict of interest.

Acknowledgements

The authors would like to thank the women participating in the study especially those with preeclampsia and thank the Clinical Development Research Center of Allameh Behlol Hospital in Gonabad University of Medical Sciences for its advice.

References

- [1]. World Health Organization; Maternal mortality. Fact sheet N. 348, May 2014. Available at: <http://www.who.int/mediacentre/factsheets/fs3>
- [2]. Reshmarani VH, Bennial A. Association between ABO blood type and pregnancy induced hypertension. *Sch J App Med Sci.* 2014; 2(6C): 3054-3056.
- [3]. Than NG, Romero R, Meiri H, Erez O, Xu Y, Tarquini F, Maternal ABO blood types and the risk assessment of pregnancy complications. *PLoS ONE* 2011; 6(7): e21564.
- [4]. Paterson AD, Lopes-Virella MF, Waggott D, Boright AP, Hosseini SM, Carter RE, et al. Genome-wide association identifies the ABO blood group as a major locus associated with serum levels of soluble E-selectin. *Arterioscler Thromb Vasc Biol.* 2009; 29(11): 1958-967.
- [5]. Hassanzadeh-Nazarabadi M, Shekouhi S, Seif N. The incidence of spontaneous abortion in mothers with blood type O compared with other blood types. *Int J Mol Cell Med.* 2012; 1(2): 99-104.
- [6]. Bottini N, Meloni GF, Finocchi A, Ruggiu G, Amante A, Meloni T, et al. Maternal-fetal interaction in the ABO system: a comparative analysis of healthy mothers and couples with recurrent spontaneous abortion suggests a protective effect of B incompatibility. *Hum Biol.* 2001; 73(2): 167-74.
- [7]. Lee BK, Zhang Z, Wikman A, Lindqvist PG, Reilly M. ABO and RhD blood types and gestational hypertensive disorders: a population-based cohort study. *BJOG.* 2012; 119(10): 1232-237.
- [8]. Franchini M, Franco Capra F, Targher G, Montagnana M, Lipi G. Relationship between ABO blood type and von Willebrand factor levels: from biology to clinical implication. *Thromb J.* 2007; 5:14.
- [9]. Moores L, Bilello K, Murin S. Sex and gender issues and venous thromboembolism. *Clin Chest Med.* 2004; 25(2): 281-97.
- [10]. Guleria I, Sayegh MH. Maternal acceptance of the fetus: true human tolerance. *J Immunol.* 2007; 178(6): 3345-351.
- [11]. Bakkeheim E, Bergerud U, Schmidt-Melbye AC, Akkøk CA, Liestol K, Fugelseth D, et al. Maternal IgG anti-A and anti-B titres predict outcome in ABO-incompatibility in the neonate. *Acta Paediatr.* 2009; 98(12): 1896-901.
- [12]. Kamil M, Al-Jamal HAN, Yusoff NM. Association of Blood Types with Diabetes Mellitus. *Libian J Med.* 2010; 5: 4847.