



Relationship between the ABO blood group and hyperemesis gravidarum, anemia, and preeclampsia

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Received 06 January 2016; Accepted 03 March 2016

Available online 01.04.2016 with doi: 10.5455/medscience.2016.05.8453

Abstract

This study aimed at analyzing the relation between ABO blood group with three pregnancy complications that frequently occur in Indonesia (hyperemesis gravidarum, anemia, and preeclampsia). The sample was all the pregnant women recorded in the medical record in RSKDIA Pertiwi Makassar, Makassar Baji Labuang Hospital and Health Center-Kassi Kassi Makassar in 2013. Inclusion criteria for this study included maternal age 20-35 years, gestational age of over 28 weeks, domiciled in Makassar City, signed the informed consent form to participate in this research. Exclusion criteria included a history of blood disorder disease. ABO blood group was assessed by standard procedures using agglutination technique. There is no significant association between ABO blood group and the incidence of hyperemesis gravidarum ($p > 0.05$). There is no significant association between ABO blood group and the Gestational anemia incidence ($p > 0.05$). There is significant association between ABO blood group and the preeclampsia incidence ($p < 0.05$). In conclusion, there is a relationship between ABO blood group and the incidence of preeclampsia in pregnant women. Therefore, pregnant women need to go through the blood group screening from the beginning of pregnancy.

Keywords: Pregnancy, complications, hyperemesis gravidarum, anemia, preeclampsia

Introduction

ABO blood group system that was firstly discovered by Karl Landsteiner consists of three major allele, which are co-dominant A and B, and recessive O. This allele is controlled by a single gene located on the long arm of chromosome 9 (9q34.2) [1- 4]. The combinations of these three alleles produce four phenotypes, namely A, B, AB, and O. The four phenotypes are characterized by the presence or absence of antigens A and B on the surface of red blood cells and the presence of natural antibodies against the absence of antigen on the surface of red blood cells in serum [1]. Besides being expressed on the surface of red blood cells, this antigen is also expressed in the body fluids on the surface of cells and tissues, including epithelial cells, sensory neurons, platelets, and vascular endothelium [5].

Until now, it is already known that the ABO blood group antigen is associated with various diseases, such as infections, cancer, and vascular disease [6,7]. Gastric cancer incidence increased in blood group A. Individuals

with blood group A are also sensitive to *Pseudomonas aeruginosa* infection, but individuals with blood group B are sensitive to *Salmonella typhi*. *Helicobacter pylori* infection is associated with blood group O [8,9]. The association between ABO blood group and the infection is dependent on high levels of von Willebrand factor in the blood group A and non-O blood group due to the lower clearance ability [10,11].

Various obstetrical complications which commonly occur are including intrauterine growth restriction (IUGR), post-partum bleeding, and gestational hypertension [12-14]. Pregnancy accompanied by these complications will lead to increased morbidity and mortality for both mother and baby at the moment and in the future [15-18]. In addition to these complications, some of the conditions that occur in pregnancy are hyperemesis and anemia. Hyperemesis occurs in 0.3-3.6% of pregnancies and results in dehydration, ketosis, and weight loss. Hyperemesis usually occurs between 6-12 weeks of the pregnancy and is associated with human chorionic gonadotropin [19, 20]. Anemia is defined as a condition characterized by a decrease in red blood cells or hemoglobin [21]. Although there is a genetic back ground, the difference in ABO blood groups and the emergence of various obstetric complications become urgent and important topic. This is caused by the effects which may happen for mothers and infants in the present and the future. Therefore, this study

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aimed at analyzing the relation between ABO blood group with three pregnancy complications that frequently occur in Indonesia (hyperemesis gravidarum, anemia, and preeclampsia). These results will certainly become a recommendation for preventive medicine in developing countries, especially in Indonesia.

Materials and methods

Subjects

The study population was all the pregnant women recorded in the medical record in RSKDIA Pertiwi Makassar, Makassar Baji Labuang Hospital and Health Center-Kassi Kassi Makassar in 2013. The sample was all the pregnant women recorded in the medical record in RSKDIA Pertiwi Makassar, Makassar Baji Labuang Hospital and Health Center-Kassi Kassi Makassar in 2013. Inclusion criteria for this study included maternal age 20-35 years, gestational age of over 28 weeks, domiciled in Makassar City, signed the informed consent form to participate in this research. Exclusion criteria included a history of blood disorder disease.

Research procedures

The sample corresponding to inclusion criteria was subject to a physical examination in the forms of a blood pressure measurement, examination of the edema on the legs, and laboratory tests such as blood group, urine albumin, and hemoglobin with cyanmethemoglobin colorimeter method.

Blood group analysis

Venous blood was drawn from the entire sample. ABO blood group was assessed by standard procedures using agglutination technique. ABO blood group system is classified into 2 by the agglutination process, blood group O and non-O blood group consisting of A, B, AB.

Statistical analysis

Univariate and bivariate analysis was performed using STATA 11.

Results

Of the 364 samples, 75 pregnant women (20.60%) experienced hyperemesis gravidarum. The highest prevalence of cases of hyperemesis gravidarum was found on blood group O (36.00%) compared with other blood groups, A (22.67%), B (21.33%), and AB (20.00%). Regarding the relationship analysis, it is concluded that there is no significant association between ABO blood group and the incidence of hyperemesis gravidarum ($p > 0.05$).

Gestational anemia was found in 125 cases (24.24%) of 364 pregnant women. The highest prevalence of anemia cases was found on blood group O (42.4%) compared with other blood groups, A (21.60%), B (18.40%), and AB (16.80%). Regarding the relationship analysis, it is concluded there is no significant association between ABO

blood group and the Gestational anemia incidence ($p > 0.05$).

In this study, the prevalence of preeclampsia in non-O blood group is by 18.6% compared with blood group O ($p < 0.05$). The highest prevalence of preeclampsia cases was found on blood group O (31.65%) compared with other blood groups, A (20.25%), B (26.58%), and AB (21.52%). Regarding the relationship analysis, it is concluded there is significant association between ABO blood group and the preeclampsia incidence ($p < 0.05$).

Discussion

Nausea and vomiting are commonly experienced by pregnant women and may lead to severe complaints in the first trimester of pregnancy diagnosed with hyperemesis gravidarum. Although to date, causes and risk factors for this disorder are still controversial and multifactorial; the low body mass index becomes a major cause [22-24]. In this study, there are 75 (20.60%) of pregnant women who experienced hyperemesis gravidarum. The highest prevalence of cases of hyperemesis gravidarum on blood group O is by 36.00%. The correlation analysis shows that there is no significant association between ABO blood group and the incidence of hyperemesis gravidarum ($p > 0.05$). This indicates that hyperemesis gravidarum is a major abnormality frequently found in pregnant women with blood group O, but the blood group O does not constitute cause or risk factor. This study is the first study that evaluates the association between blood group and the incidence of hyperemesis gravidarum. Although it is already revealed that *H. pylori* infection is associated with blood group O, but other studies found no association between *H. pylori* infection and hyperemesis gravidarum [25].

In this study, of the three complications evaluated, the gestational anemia is the most common obstetric cases, amounting to 125 cases (24.24%) of the total 364 samples. Regarding the analysis of the relationship between gestational anemia and blood group, it is concluded that there is no significant relationship between the blood group and the incidence of gestational anemia. These findings indicate that the incidence of gestational anemia although red blood cells are affected, is not caused by the blood group. Anemia due to *Plasmodium falciparum* infection is found in blood group A. This is caused by the presence of specific receptors and adhesion molecules in individuals with blood group A that supports the rapid invasion of plasmodium into red blood cells [26].

In this study, there is a significant relationship between blood group and preeclampsia ($p < 0.05$). This research is consistent with previous studies saying that there is relationship between ABO blood group and preeclampsia, with an increased risk by 2.1-3.1 folds [27, 28]. In addition, the incidence of preeclampsia is higher in

individuals with non-O blood group than those with blood group O. One of the mechanisms is the increased levels of von Willebrand factor and FVIII [29]. However, not all researchers proved the existence of a relationship between ABO blood group and preeclampsia [30].

It is inferred that there is a relationship between ABO blood group and the incidence of preeclampsia in pregnant women. Therefore, pregnant women need to go through the blood group screening from the beginning of pregnancy.

Declaration of interest

The author(s) declare(s) that there is no conflict of interests regarding the publication of this article.

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