The relationship between preoperative anxiety level, ABO blood types and birth outcomes in cesarean sections

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ABSTRACT

Objective: There is a relationship between ABO blood groups, which are part of the genetic phenotype, and various psychiatric diseases. Our primer aim in this study is to examine the relationship between ABO blood groups and preoperative anxiety (POA) levels in patients undergoing elective cesarean section. The secondary aim is to determine the relationship between POA levels and birth outcomes in pregnant women.

Material and Method: A total of 132 patients with different ABO blood groups who were scheduled for elective cesarean section under spinal anesthesia between August 2020 and July 2021 at the Medical Faculty Hospital were included in this prospective observational study. State Anxiety Inventory scores (SAI) were used to assess preoperative anxiety in groups A, B, AB, and O. Birth outcomes (fetal birth weight, birth sex and APGAR scores at the 1st and 5th minutes) were recorded.

Results: There were 55 people (41.7%) in the A blood group, 43 people (32.6%) in the O blood group, 25 people (18.9%) in the B blood group, 9 people (6.8%) in the AB blood group. A total of 73/132 (55.3%) patients with SAI score >40 were identified. There was no significant difference in mean SAI scores in A, B, AB and O blood groups (p=0.531). Fetal birth weight was found to be lower in patients with high SAI scores (p=0.044).

Conclusion: There was no relationship between ABO blood groups and preoperative anxiety and birth outcomes in elective cesarean sections under spinal anesthesia, but low fetal birth weight was found in pregnant women with high anxiety. More studies with larger sample sizes in the future are needed to confirm the results of our study.

Keywords: ABO blood types, preoperative anxiety, birth outcomes, spinal anaesthesia, caesarean section

INTRODUCTION

Antenatal preoperative anxiety (POA) is a common problem that can cause negative physiological responses in pregnant women due to pain and fear of delivery. POA is more common in cesarean section, which is the most common obstetric surgery (1-4).

High-level anxiety symptoms before cesarean section cause an increase in catecholamine levels and thus may result in increased heart rate, blood pressure, and cardiac stimulation (1,2,5). However, many studies have shown that maternal stress causes many negative clinical outcomes such as low birth weight and preterm delivery (5-7). For these reasons, predetermining the factors that trigger POA by clinicians can reduce these negative outcomes.

While POA level varies according to age, gender, type of operation and negative operation experience, genetic factors also affect anxiety level (8). Multifactorial factors play a role in the etiology of many psychiatric diseases. These factors are generally genetic and environmental factors. Studies examining the genetics of psychiatric diseases have shown that gene-environment interaction is determinant, especially in anxiety disorders (9). Blood group types are genetically inherited from parents and ancestors (9,10). Observational studies investigating ABO blood types, preoperative anxiety and phenotypic factors are limited in the literature. To the best of our knowledge, a study examining ABO blood types and preoperative anxiety was found in the literature (11). In this study, POA levels of patients with AB blood group were found to be higher than those with other blood groups (11).

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When the literature is examined, it has been found that ABO blood groups are associated with many clinical conditions, including diabetes, various types of cancer, and cardiovascular diseases (12,13). Thus, it reveals that ABO blood group types may be associated with some diseases. For these reasons, we hypothesized in this study that there is a relationship between ABO blood types and preoperative anxiety levels in CS deliverys, which is a stressful surgical procedure.

The main aim of current study is to evaluate the relationship between POA levels according to ABO blood groups in patients undergoing elective cesarean section. The secondary aim is to determine the relationship between POA levels and birth outcomes in pregnant women.

MATERIAL AND METHOD

Study Design
This prospective cross-sectional study was conducted at Yozgat Bozok University Faculty of Medicine Hospital (Yozgat, Turkey) between August 2020 and July 2021. The study was carried out with the permission of Yozgat Bozok University Clinical Research Ethics Committee (Date: 29.07.2020, Decision No: 2017-KAEK-189_2020.07.29_07). All procedures were carried out in accordance with the ethical rules and the principles of the Declaration of Helsinki.

Participants
A total of 132 pregnant women between the ages of 18-45 whose gestational age was 36-41 weeks, who gave written informed consents and who underwent elective cesarean section with medical indications under spinal anesthesia were included in the study. The numbers of the A, O, B and AB blood type groups were 55, 43, 88 and 9, respectively. Patients with a known psychiatric or neurological disease, drug users, patients who did not have the mental competence to understand the survey questions or were illiterate, patients scheduled to undergo an emergency cesarean operation, urgent patients were not included in the study.

Procedures
Preoperatif anxiety levels in patients who were referred to an anesthesia outpatient clinic due to elective cesarean section were evaluated using the State Anxiety Inventory (SAI). Maternal demographic and medical data (smoking status, educational level, employment status, anesthesia history) were recorded for prenatal evaluation by anesthetists. The gestational week was calculated based on the ultrasound imaging performed during the first trimester by the obstetrics department. Following delivery, fetal birth weight, birth sex and APGAR scores

at the 1st and 5th minutes were recorded. The health status of the newborns was evaluated using the 10-point APGAR score, which evaluates five parameters (heart rate, respiratory effort, muscle tone, reflex irritability and color) with a score from 0 to 2. A total score of 7 or higher suggests that the newborn is in good health, while a total score of 4 to 6 means the newborn needs medical attention, and scores of 3 or lower indicate a critical condition (14).

Preoperative anxiety assessment
The SAI scale (20 items) determines how the individual feels at a certain time and under certain conditions. The SAI scale is scored between 20 and 80 points, where higher scores indicate a higher level of anxiety. The SAI is widely used to assess anxiety in pregnancy, and their validity and reliability have been demonstrated (1). In the evaluation of the scale score, 40 points was considered the threshold value, as is common in the literature (1), scores below 40 were classified as 'low to moderate' anxiety, and scores above 40 were classified as 'high' anxiety.

Statistical Analysis
Data were analyzed using SPSS v.20.0 (SPSS Inc., Chicago, IL, USA) software. Data were expressed as mean±standard deviation. The normality of distribution was checked using the Kolmogorov–Smirnov test and histograms. Normally distributed continuous variables are reported as mean ± standard deviation (SD), non-normally distributed variables as median [interquartile range], and categorical variables as counts (%). Differences in non-normally distributed variables between two independent groups were assessed using the non-parametric Mann–Whitney U-test. A one-way ANOVA, chi-square test, or Kruskal-Wallis pairwise comparisons were used to identify the difference among the A, B, AB, and O blood type groups in some variables. All comparative analyzes were 2-tailed, and a P-value of less than 0.05 was considered to be statistically significant.

RESULTS

Of the 132 female patients included in the study, 41.7% (n=55) A, 32.6% (n=43) O, 18.9% (n=25) B, and 6.8% (n=9) AB were patients with blood group. The mean age of blood groups A, B, AB and O was 28.8±6.0, 31.6±5.8, 31.5±7.3 and 29.3±5.9, respectively. Blood groups did not differ significantly according to sociodemographic (age, gravity, parity, gestational age, smoking status, education level, employment status, anesthesia history) and clinical characteristics. Fetal birth weight was similar between groups (p=0.456). There was no difference between ABO blood groups according to birth sex (p=0.230). The 1st min and 5th min APGAR scores were similar between the groups (0.747, 0.539, respectively) (**Table 1**).

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Table 1. Demographic and clinical characteristics of patients according to ABO blood groups

Variables		A (n= 55)	B (n= 25)	AB (n= 9)	O (n= 43)	Total (n=132)	P value
Age (years)		28.8±6.0	31.6±5.8	31.5±7.3	29.3±5.9	29.7±6.0	0.198[a]
Gravity		2 [2 to 3]	3 [2 to 4]	3 [2 to 4]	3 [2 to 4]	3 [2 to 4]	0.296[b]
Parity		1 [1 to 2]	2 [1 to 2]	2 [1 to 2]	2 [1 to 3]	1 [1 to 2]	0.280[b]
Gestational age (weeks)		38 [38 to 39]	38 [38 to 39]	38 [38 to 39]	38 [38 to 39]	38 [38 to 39]	0.992[b]
APGAR score 1st min		8 [8 to 9]	8 [7 to 9]	8 [7 to 9]	9 [7 to 9]	8 [8 to 9]	0.747[b]
APGAR score 5th min		9 [9 to 10]	9 [8 to 10]	10 [9 to 10]	10 [9 to 10]	9 [9 to 10]	0.539[b]
Fetal birth weight (grams)		3175±454	3327±373	3283±432	3287±480	3248±447	0.456[a]
Birth sex	Male	36 (65.5)	11 (44)	4 (44.5)	22 (51.2)	73 (55.4)	0.230[*]
	Female	19 (34.5)	14 (56)	5 (55.5)	21 (48.8)	59 (44.6)	
Smoking status, n (%)	Yes	14 (25.5)	8 (0.32)	1 (11.2)	15 (34.9)	38 (28.7)	0.462[*]
	No	41 (74.5)	17 (0.68)	8 (88.8)	28 (65.1)	94 (71.3)	
Educational level	Primary school	20 (36.3)	8 (32)	3 (33.3)	18 (39.5)	49 (36.3)	0.906[#]
	Secondary school	26 (47.2)	10 (40)	4 (44.4)	17 (39.5)	57 (43.1)	
	University	9 (16.3)	7 (28)	2 (22.3)	8 (18.6)	26 (19.6)	
Employment status	Employed	21 (38.1)	10 (40)	3 (33.4)	14 (32.5)	48 (36.4)	0.913[*]
Anesthesia history	Yes	36 (65.5)	16 (64)	5 (55.5)	30 (69.7)	87 (66.0)	0.859[*]
	No	19 (34.5)	9 (36)	4 (44.5)	13 (30.3)	45 (34.0)	

Values are quoted as the mean ± SD and median [interquartile range] for continuous variables and percentage for categorical variable. [a]One-way ANOVA test and [b]Kruskal-Wallis test were used to identify the difference among the A, B, AB, and O blood type groups in some variables. *Chi-square Test; #Fisher's exact test. SAI, State Anxiety Inventory.

Table 2. Comparison of patients' SAI scores according to ABO blood groups

Variables	A (n= 55)	B (n= 25)	AB (n=9)	O (n= 43)	Total (n=132)	P value
SAI score	42.1±10.9	45.4±11.9	43.4±11.0	41.5±10.7	42.6±11.0	0.531[a]
Patients with SAI score >40, n (%)	31 (56.4)	15 (60.0)	5 (55.6)	22 (51.2)	73 (55.3)	0.921[#]

Values are quoted as the mean ± SD for continuous variable and percentage for categorical variable. [a]One-way ANOVA test was used to identify the difference among the A, B, AB, and O blood type groups in SAI score. [#]Fisher's exact test, SAI: State Anxiety Inventory

SAI score was used to assess preoperative anxiety in patients with blood groups A, B, AB, and O. Then, the relationship of different blood groups with SAI scores was examined. The mean SAI score of the patients was 42.6±11.0. A total of 73/132 (55.3%) patients with SAI score >40 were identified. The number of patients with high preoperative anxiety did not differ according to ABO blood groups (p=0.921). There was no significant difference in mean SAI scores in A, B, AB and O blood groups (p=0.531) (**Table 2**). The lowest SAI score was found in O blood group (41.5±10.7) and the highest SAI score was found in B blood group (45.4±11.9).

Detailed information about the differences between pregnant women with and without high anxiety is presented in Table 3. There was no statistically significant difference between maternal age and gestational week and POA groups (p=0.367, p=0.436, respectively). Fetal birth weight was found to be lower in patients with high SAI scores (p=0.044) (**Table 3**). However, there was no significant correlation between SAI scores and APGAR scores (respectively, p=0.055, p=0.066) (**Table 3**).

DISCUSSION

Although many studies have investigated the relationship between various psychiatric diseases and blood groups, the relationship between POA and ABO blood groups has not been studied in pregnant women with high anxiety levels who will have a cesarean delivery. The

Table 3. Characteristics of the mother and the newborn according to preoperative anxiety groups

Variables	Patients with SAI score <40	Patients with SAI score >40	P value
Maternal characteristics			
Age (years)	30 ± 6	29 ± 6	0.367[a]
Gestational age (weeks)	38 [38 to 39]	38 [38 to 39]	0.436[b]
Newborn characteristics			
Fetal birth weight (grams)	3327 ± 468	3187 ± 421	0.044[a]
APGAR score 1st	9 [8 to 9]	8 [7 to 9]	0.055[b]
APGAR score 5th	10 [9 to 10]	9 [9 to 10]	0.066[b]

Values are quoted as the mean ± SD and median [interquartile range] for continuous variables. [a]Independent sample t test, [b]Mann Whitney U test, SAI: State Anxiety Inventory.

primary aim of this prospective, observational study was that preoperative anxiety scores of pregnant women in cesarean deliveries were associated with ABO blood group types; The secondary aim was to test the hypothesis that POA scores affect birth outcomes. Several important findings were identified in the current study. Firstly; POA levels of pregnant women did not differ according to ABO blood group types. Secondly; Lower fetal birth weight was found in pregnant women with high POA levels. Finally; There was no significant correlation between POA levels and APGAR scores.

Many studies have shown that genetic factors such as blood group antigens are associated with the development and severity of some diseases (diabetes, cardiovascular diseases, endocrine diseases) (12,13,15). It has been determined that genes controlling blood group antigen

expression are associated with genes encoding dopamine beta-hydroxylase, catechol-O-methyl-transferase and argininosuccinate synthetase activities that regulate neuropsychiatric responses. It has even been claimed that genes encoding ABO blood group antigens control dopamine beta-hydroxylase activity (15,16). For these reasons, the potential role of the ABO blood group in psychiatric diseases (schizophrenia, bipolar and unipolar depression) and personality traits, which are thought to be predominantly inherited, has been investigated in various studies, but conflicting results have been found (17-19).

When the literature was examined, in a study examining the relationship between dental anxiety and blood group in children, the highest level of dental anxiety was found in those with AB blood group (20). Similarly, Feng Xu et al. (11), preoperative anxiety levels were found to be higher in people with AB blood type. In another study examining blood groups and stress levels, it was found that pathological and general stress levels were found in people with the lowest O blood group (21). Similarly, in the current study, the mean SAI score was found in the lowest O blood group (41.5±10.7) and the highest in B blood group (45.4±11.9). However, no significant relationship was found between the POA levels of pregnant women and ABO blood groups. The reason for these results may be related to the effect of many variables on POA, including surgical factors other than blood groups.

In the literature, there are studies reporting a relationship between maternal ABO blood groups and adverse birth outcomes (most commonly preeclampsia, venous thromboembolism, chorioamnionitis, and postpartum hemorrhage) (22,23). Premature birth and low birth weight are among these negative outcomes associated with blood type. In a recent study, it was reported that pregnant women with maternal B blood group had lower fetal birth weight, but there was no relationship between preeclampsia and gestational week and blood groups (22). In the same study, the authors reported that fetal growth may be adversely affected as a result of placental insufficiency due to the etiological role of blood groups in arterial thrombosis. However, in this study, the authors did not analyze other adverse pregnancy risk factors such as gestational diabetes mellitus, smoking, chorioamnionitis and venous thromboembolism (22). According to the results of our study, no significant difference was found between ABO blood groups and fetal birth weight, APGAR scores and gestational week. This issue, which are still controversial, need to be investigated with further studies.

Another important result in our study is that pregnant women with high POA levels have lower fetal birth weights and similar APGAR scores. POA, which is more common in cesarean deliveries, has been shown to cause many adverse birth outcomes such as premature birth, low birth weight, and low APGAR scores (5-7). It has been reported that the autonomic stress response triggered by maternal anxiety may cause negative fetal outcomes due to uterine artery vasoconstriction (7,24). On the other hand, although there are studies reporting that there is no relationship between maternal anxiety and APGAR scores (25), there are also studies reporting that maternal anxiety causes low APGAR scores (4,7). There is still no consensus on whether there is a true relationship between POA and adverse birth outcomes.

This study has some strengths and limitations. One of its strengths is that, to the best of our knowledge, it is the first original study in the literature to investigate the relationship between AB0 blood groups and preoperative anxiety in pregnant women. Other strengths are that the study is prospective and blood groups are obtained from data of the Hospital Blood Bank, not verbally. The limitations are; rare blood groups require more patients due to the small number of patients, and Rh sub blood groups are not included in the study.

CONCLUSION

We planned this study with the hypothesis that there may be a relationship between ABO blood groups, which are known to be associated with many psychiatric disorders and various personality types, and preoperative anxiety. As a result, it was determined that there was no relationship between ABO blood groups and preoperative anxiety and birth outcomes in cesarean section, but low fetal birth weight was found in pregnant women with high anxiety. For this reason, the identification of pregnant women with high preoperative anxiety levels and removing anxiety may contribute to the prevention of negative birth results to the fetus such as low birth weight. However, we think that our results are interesting and further studies are needed in different races and geographical regions to clarify these results.

ETHICAL DECLARATIONS

Ethics Committee Approval: The study was carried out with the permission of Yozgat Bozok University Clinical Researchs Ethics Committee (Date: 29.07.2020, Decision No: 2017-KAEK-189_2020.07.29_07).

Informed Consent: All patients signed the free and informed consent form.

Referee Evaluation Process: Externally peer-reviewed.

Conflict of Interest Statement: The authors have no conflicts of interest to declare.

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