



The Role of ABO Blood Groups in Gestational Diabetes Mellitus Prediction

Nafiseh Saedi, Sedigheh Pourmahdigholi, Sara Saeedi, Nasim Shokouhi, Mehrnaz Valadan, Elham Feizabad and Mona Mohseni*

Department of Obstetrics and Gynecology, Yas Hospital, Tehran University of Medical Sciences, Tehran, Iran

Abstract

Background: This study aimed to evaluate the ABO blood group characteristics in women with Gestational Diabetes Mellitus (GDM).

Methods: This cross-sectional research was conducted on pregnant women with GDM in Yas Hospital, Tehran, Iran, from April 2018 to March 2019.

Results: Totally, 449 pregnant women enrolled in the study. The average age of the participants was 32.26 ± 5.08 years with a range between 18 and 45 years. 46% of the participants were treated with insulin. In this study, 35% were typed as group O, 34.3% as group A, 24.3% as group B, and 6.5% as group AB. The Rh+ blood antigen was present in 92% of the pregnant women. Blood group A (35.7%) was the highest in pregnant women with insulin therapy and the frequency of blood group O was the highest in pregnant women with diet (39.5%) and metformin therapy (35.7%).

Conclusion: In pregnant women with insulin therapy, the most prevalent blood group was A. This was different from those that are frequent in the Iranian normal population and pregnant women with GDM who underwent diet therapy. It seems that blood group A, as a probable associated factor for GDM, can be beneficial in high-risk pregnancy detection for GDM in the Iranian population.

Keywords: Blood groups, Gestational diabetes mellitus, Pregnancy

* Corresponding author

Mona Mohseni, MD

Department of Obstetrics and Gynecology,
Yas Hospital, Tehran University of Medical
Sciences, Tehran, Iran

Email: monamohsenigyneco@gmail.com

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Introduction

Gestational Diabetes Mellitus (GDM) is considered as the onset or first recognition of glucose intolerance in pregnancy. GDM is the most prevalent medical complication within pregnancy that happens due to physiological changes in glucose metabolism (1,2).

The prevalence of GDM is reported at 17.8% (range 9.3-25.5%) and this disorder has a greater frequency rate in pregnant women with other endocrine disorders (such as abnormality in thyroid, adrenal or pituitary glands) and hypertensive disorders, 42 and 61%, respectively (3,4).

Evidence showed that the mean incidence rate of GDM is increasing by 9% annually; the possible causes include pregnancy at an advanced age, high Body Mass Index (BMI), access to the prenatal screening test, and changes in diabetes diagnostic thresholds (4,5).

Previous studies expressed different complications for GDM such as pre-eclampsia, higher rate of cesarean section, macrosomia, and shoulder dystocia. Furthermore, it was shown by previous studies that females with GDM have more chance for type 2 diabetes mellitus and cardiovascular disease happening in future (6,7).

The most defined human blood group is the ABO grouping that is applied in different human-related sciences such as anthropology, physiology, and legal issues (8). In addition, former studies indicated that the ABO blood groups are associated with some disorders including cancers, cardiovascular diseases, vascular diseases, peptic/duodenal ulcers, and diabetes (9,10).

Although this is inconsistent and inconclusive about diabetes, some studies in India, Malaysia, Nigeria, and Qatar showed that the most common blood group in patients with diabetes was B, with the lowest prevalence of A and O blood groups in these patients (11-13).

The association between ABO blood group and pregnancy complications have been assessed (14-17), and the relation between ABO blood group and GDM remains unknown due to the small number of studies in this regard. Hence, this study aimed to evaluate the ABO blood group characteristics in women with GDM.

Materials and Methods

This cross-sectional research was carried out on pregnant women with GDM that their diagnosis was according to American Diabetes Association (ADA)

criteria in Yas Hospital, Tehran, Iran, from April 2018 to March 2019.

All pregnant women, who were assessed in the perinatology clinic of Yas Hospital at age 18 years and older, enrolled in the study. Exclusion criteria were having a history of type 1 or 2 diabetes mellitus, and overt DM among women with screening tests. In addition, patients who withdrew to participate at any time during the study were excluded from the study.

Then Glucose Challenge Test (GCT) (blood glucose 1 hour post-50-gr glucose) was measured for all the participants. All tests were done in a single lab at Yas Hospital. In the cases with abnormal blood glucose levels (GCT ≥ 140), OGTT with 100 gr glucose after 8 hours of overnight fasting was requested and plasma glucose concentration was checked before and one, two, and three hours after 100 gr glucose administration.

The GDM was diagnosed according to American Diabetes Association (ADA) criteria (when equal or more than two of the following were positive: Fasting Blood Sugar (FBS) ≥ 95 mg/dl, BS one hour after 100 gr glucose ≥ 180 mg/dl, BS two hours after 100 gr glucose ≥ 155 mg/dl, BS three hours after 100 gr glucose ≥ 140 mg/dl) (2).

The pregnant women with GDM diagnosis were admitted to our prenatal ward for more evaluation. At first low sugar regimen therapy was applied to control their blood glucose, with blood glucose checking every four hours. If regimen therapy was not sufficient, insulin or metformin therapy was added.

The demographic information, ABO blood group, Rhesus (Rh) factor, and the GDM treatment types (insulin, diet, or metformin therapy) of all the pregnant women were extracted.

Statistical analysis

Then, all data were analyzed with SPSS 24.0. A p-value of lower than 0.05 was determined as the level of statistical significance. Mean \pm standard deviation for continuous variables and frequency and percentage for qualitative variables were used. In addition, the Chi-square test was utilized to test the differences in proportion.

Results

In this study, 476 pregnant women were eligible for participation; of them, 27 women were excluded due to

incomplete data (not recording the ABO blood group), and finally, 449 enrolled in the study. The average age of the participants was 32.26 ± 5.08 years with a range between 18 and 45 years. The average BMI and FBS were $30.09 \pm 4.76 \text{ kg/m}^2$ and $98.46 \pm 30.75 \text{ mg/dl}$, respectively. Other participants' information is shown in table 1.

Only regimen therapy consultation was applied in 50.5% of the pregnant women, metformin in 3.5%, and 46% of the participants were treated with insulin. In this study, 35% were typed as group O, 34.3% as group A, 24.3% as group B, and 6.5% as group AB. The Rh+ blood antigen was present in 415 pregnant women (92%).

Demographic data of the participants according to blood group was assessed. Results showed that the pregnant women with A blood group had the highest FBS concentration (103.62 ± 35.22), while women with allele B in their blood group, despite significant higher age and BMI, had the lowest FBS (Table 2).

According to the type of GDM therapy, the frequency of blood group was different. The blood group A

(35.7%) was the most frequent in pregnant women with insulin therapy and the frequency of blood group O was the highest in pregnant women with diet (39.5%) and metformin therapy (35.7%) (Table 3).

Discussion

There was not a significant ($p\text{-value}=0.605$) difference between the frequencies of the ABO blood group in our study with which was reported in the Iranian population (18).

For detecting high-risk pregnant women GDM, factors such as the women's age and BMI, positive family history of diabetes, experience of GDM or macrosomia are considered routinely (2).

Yet, there are some other GDM risk factors that remain unknown. One of them may be the patients' blood group type. Due to immunologic effect of blood group, former studies showed the relation between blood group and several diseases such as cancers, cardiovascular diseases, gastrointestinal disorders, some type of malaria, as well as DM with a number of studies regarding this association with GDM (11,12,19).

Evidence showed that blood group A and AB is a risk factor for DM incidence, while blood group B is considered as a protective agent against DM (20,21). To the best of our knowledge, the number of researches that have evaluated a probable association between ABO blood groups and GDM is very small. Some former studies (15,16) reported a greater risk of pregnancy adverse outcomes such as preeclampsia and venous thromboembolic disease in females with blood group A or AB. The current study also showed that the most common blood group in women with GDM treated by insulin was the blood group A.

Table 1. The participants' information

Variables	Frequency	Percent
Nulliparous	108	24.1
High blood pressure*	49	10.9
Family history of diabetes	129	28.7
History of GDM	56	12.5
History of macrosomia	26	5.8
Smoking	2	0.4

* Blood pressure $\geq 140/90 \text{ mmHg}$.

Table 2. Demographic data of the participants according to the blood groups

Blood group	Frequency (%)	Age (yrs.)	BMI (kg/m^2)	FBS (mg/dl)
O	157 (35)	31.87 ± 4.70	29.36 ± 5.52	97.18 ± 28.52
A	154 (34.3)	32.24 ± 5.31	30.18 ± 4.29	103.62 ± 35.22
B	109 (24.3)	32.87 ± 4.66	29.98 ± 4.95	94.83 ± 29.10
AB	29 (6.5)	32.34 ± 6.59	32.39 ± 3.75	94.20 ± 23.27
p-value	-	0.473	0.297	0.302

Table 3. The blood group frequency of the participants according to the treatment type of GDM

Blood group	Treated with insulin	Treated with diet	Treated with metformin
O	57 31.3%	79 39.5%	5 35.7%
A	65 35.7%	65 32.5%	4 28.6%
B	47 25.8%	44 22.0%	4 28.6%
AB	13 7.1%	12 6.0%	1 7.1%

Similar to our study, in Karagoz *et al's* study, it was shown that the participants with blood group B owned a noticeably lower probability of developing DM, hence, the blood group B may be considered as a protective factor for DM incidence (22).

In contrast with former studies, Zhang *et al* found that females with blood group A, B or O had a higher risk for GDM compared with those with blood group AB (9). This difference indicates the importance of local studies due to variation in the prevalence of the ABO blood group and its relation with GDM in different populations.

Given that in insulin-dependent GDM women, the common blood group was different from the frequent blood group of the Iranian population, and since GDM has multiple preventable maternal and fetal adverse outcomes, blood group A can be considered as a helpful tool for early diagnosis of GDM. However, further studies will be required on this topic.

The strong points of this study were its novelty in defining an independent associated factor for GDM and all the patients' blood glucose were measured in the same lab. Despite the strong points of this study, our study had some limitations. The first was the lack

of a control group and the other was being single-center research. Future studies are suggested with a large study sample and different Iranian ethnicities.

Conclusion

In pregnant women with insulin therapy, the most prevalent blood group was A. This was different from those that are frequent in the Iranian normal population and pregnant women with GDM who underwent diet therapy. It seems that blood group A, as an independent associated factor for GDM, can be beneficial in high-risk pregnancy detection for GDM in the Iranian population.

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Conflict of Interest

The authors declared no conflict of interest.

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