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Prevalence of ABO blood group and biochemistry tests among gestational diabetes mellitus patients in Alhasa, Saudi Arabia

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ABSTRACT

The prevalent disease known as gestational diabetes mellitus (GDM), which emerges during pregnancy, is characterized by glucose sensitivity intolerance. Approximately 17% of births worldwide are impacted. ABO blood groups and diabetes were shown to be correlated in earlier epidemiological and genetic studies; however, the findings were conflicting. Nonetheless, there has not yet been enough research to link ABO blood groups to GDM. The goal of this study was to explain numerous biochemical markers related to pregnancy and their relationship with the ABO blood group in pregnant women, as well as to ascertain whether the ABO blood group system has a connection to gestational diabetes mellitus. 102 pregnant GDM participants were included in the study. Moreover, pregnant women with blood types other than the Rh factor and serologically defined blood groups are excluded from the sample. Data were placed into an excel file to provide raw data for all pregnant women. To present the data, frequencies and percentages were employed. The descriptive statistical analysis data from this study. Demonstrate to expectant mothers the connection between blood types and liver and kidney function tests. Blood group O+ (40.2% of pregnant women with GDM had this blood type), blood group A+ (38.2%), blood group B+ (10.8%), and blood group O- (10.8%) were next in prevalence. The current study discovered that blood groups A+ and O+ were more prevalent in patients, while other studies have revealed that blood groups B+ and O are less likely to develop type 2 diabetes. We believe this is the first study that looks at whether ABO blood classes are linked to a change from GDM to DM.

Keywords: Pregnant, type 2 diabetes, blood groups, gestational diabetes mellitus.

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INTRODUCTION

Variable levels of glucose resistance during pregnancy are known as gestational diabetes (GDM), and initial or first-degree identification is required. This effect is related to the worldwide increase in obesity and type 2 diabetes mellitus (T2DM), which affects about 5% of all pregnancies globally. GDM is not only associated with adverse pregnancy outcomes such as macrosomia, dystocia, birth trauma, and infants' metabolic problems; it is also highly associated with transitions into obvious postpartum DM (Rajput et al., 2013).

There are a number of GDM assessments that have been suggested by different organizations test for detecting gestational diabetes mellitus is the oral glucose tolerance test (OGTT) (GDM). A 75 g OGTT will be carried out for diagnostic GDM during pregnancy, and GDM will be diagnosed when one or more glucose readings fall below or exceed the recommended thresholds: Blood sugar levels at fasting time were 5.1 mmol/L (92 mg/dl), 1 hr blood sugar levels were 10.0 mmol/L (180 mg/dl), and 2 hr blood sugar levels were 8.5

mmol/L (153 mg/dl) (Rajput et al., 2013).

The ABO blood group system was first identified by Karl Landsteiner in 1900. Two genes, A and B, establish a person's blood group based on whether they are present or absent. The gene for ABO glycosyltransferase is found on chromosome 9. The absence of ABO blood group antigens has not been associated with any diseases, although the ABO phenotype has been associated with a number of disorders. For instance, gastric cancer has grown more prevalent in people with blood group A, while people with blood group O are more likely to develop gastric and duodenal ulcers (Rice et al., 2012; Okon et al., 2008).

Nonetheless, few investigations have previously demonstrated the relationship between DM and various biochemical markers and the ABO blood groups, with inconsistent findings (Gomes et al., 2013). Although several researchers have linked Group A to diabetes, there is still insufficient evidence to support a link between ABO blood types and type 2 diabetes (Rice et al., 2012; Okon et al., 2008). Studies show that a number of conditions, including coronary artery disease, depression, type 2 diabetes mellitus, chronic kidney failure, gastroduodenal ulcers, Crohn's disease, hepatitis B infection, Covid-19, thyroiditis, and several cancer types, particularly brain, breast, skin, pancreatic, and small cell lung cancers, are linked to the ABO blood group. Rheumatic conditions, like Systemic Lupus, are also linked to the blood group. The goal of this retrospective study was to look at any possible links between GDM in pregnant women and the blood group ABO. This study also discusses the biochemical characteristics of liver and renal function tests conducted during pregnancy and how they relate to the ABO blood type.

MATERIALS AND METHODS

A total of 102 pregnant foreigners with GDM had their medical records selected from the lab department's biased data at the maternity and children's hospitals in Al-Ahsa. The maternity and children's hospital in Al-ethical Ahsa's committee accepted this study with the code number (RS-200101). The study excluded pregnant women whose blood groups were unknown but included cases in which blood groups and Rh factors could be determined from hospital records. Pregnant women were divided into groups based on their Rh status (+/-) and blood classes (A, B, AB, and O). All expectant mothers underwent a GTT. Using glucose cut points obtained from test subjects fasting glucose values of 126 mg/dl, GDM has been identified.

First method

Dimension® RxL Max® Clinical Chemistry system (CCS) is a random and discrete access system that tests a range of analytics, including body fluid enzyme activities, regulated with a microprocessor integrated chemistry system. Additionally, using its HM Module, it can process highly sensitive chromium-based heterogeneous immunoassays (Table 1).

Table 1. Information of the machine Dimension® RxL Max® clinical chemistry system.

Instruments	Analyzer, chemistry (photometric, discrete), for clinical use has been classified as Class I, JJE by the Clinical Chemistry
Sample types	Serum, whole blood
Serum sample preparation	Manually centrifuged samples
Whole blood preparation	Manually mixed will and de-capped sample tubes
Test orders	Liver function test, renal function test, HbA1c, glucose

Second method: Gel card for ABO group and Rh

Red blood cells, in particular anti-A and anti-B cells, evaluated for their respective anti-sera allowed for the determination of the ABO group and Rh using a card gel based on the presence or absence of the A and B antigens in the human red blood cells. The agglutination concept is the basis of the procedure. A specific antibody that is embedded in the gel is used for ABO forward grouping in the Anti-A and Anti-B micro tubes during the gel test.

RESULTS

102 pregnant women with gestational diabetes were involved in the study. The percentages of patients with GDM for the grades A+, O+, B+, and O- were 38.2, 40.2, 10.8, and 10.8%, respectively. Pregnant women most frequently had the blood group O+ (40.2%), followed by A+ (38.2%), while B+ and O- were the least common (Table 2).

Table 3 summarizes the clinical characteristics of the 102 subjects included in this report. The Mean ± SD

Table 2. Frequency of ABO blood groups among pregnant women with GDM blood groups (10.8%).

ABO	Frequency	Percentage
A+	39	38.2
O+	41	40.2
B+	11	10.8
O-	11	10.8
Total	102	100.0

Table 3. Demonstrate represents the mean value, standard deviation of the participants in this study for fasting blood sugar and HbA1C level.

Blood groups		HBA1C	Fasting blood glucose level
	Mean	7.1118	173.7431
A+	N	39	39
	St. Deviation	1.17824	62.16162
	Mean	7.1871	181.2000
O+	N	41	41
	St. Deviation	1.53430	67.17675
	Mean	6.4636	157.6273
B+	N	11	11
	St. Deviation	.84294	58.76897
	Mean	7.1909	205.5636
O-	N	11	11
	St. Deviation	.97206	51.21245

levels of HbA1C and fasting blood sugar for O- are 7.19 ± 0.97 and 205.56 ± 51.21.

Pregnant women with blood group O- had the highest AST levels (48.54 to 58.02), followed by those with blood group A+ (25.1 to 25.5), as shown in Table 4; pregnant women with blood group B+ and O+ had approximated blood levels observed. A+ blood types were followed by pregnant women with the highest ALT levels, which had a value of 44. Pregnant women with B+ blood had the greatest levels of ALP, whereas pregnant women with O- blood had the lowest levels. The B+ blood type had the greatest amounts of BUN, whilst pregnant O-blood group women had the lowest levels. Pregnant women with the A+ blood group had the highest concentration of creatinine, whereas pregnant women with the O-blood group had the lowest concentration.

The Kruskal-Wallis test was used to determine if there were variations in renal and liver function test parameters between participants with categorized basic characteristics. To assess the difference in baseline features between GDM cases, an independent sample test or $\chi 2$ test was also performed (Table 5).

Figure 1 displays the distribution chart for the ABO blood type and blood glucose fasting level. FBG were higher in people with blood group O+ than blood group A when compared to the blood phenotypes of A, B, and O. The blood type B+ has the lowest FBG level among all blood groups, on the other hand. The value from the lower and upper quartiles is displayed in the middle box of the Box-and-whisker plot (25 to 75 percentiles). The median is shown by the middle line. Except for outside and far-out values, which are displayed as separate points, the horizontal line runs from the lowest to the greatest value.

Figure 2 depicts a distribution graph of the ALP quantity of ABO blood systems. ALP was higher in people with blood group O+ compared to blood group A when compared to the blood phenotypes of A, B, and O. The value from the lower and upper quartiles is displayed in the middle box of the Box-and-whisker plot (25 to 75 percentiles). The median is shown by the middle line. With the exception of outside and far-out values, which are represented by separate points, the horizontal line runs from the lowest to the greatest value.

Figure 3 shows side-by-side box-whisker plots of the distributions of AST for ABO blood groups. The figure clearly shows a shift in the distributions with A+ having a much higher AST. There are many outliers at the high

Table 4. The levels of laboratory findings of renal and liver pregnant women by blood groups.

Blood groups	Normal range	AST (0-40)	ALT (0-65)	ALP (50-136)	T.Protein (67-84)	Creatinine (53-120)	BUN (1.7-8.3)
A+	Mean	25.1769	34.2718	89.0744	57.3205	58.4790	3.9805
	N	39	39	39	39	39	39
	Std. Deviation	25.5894	39.1422	33.29873	9.32482	22.99161	1.88494
O+	Mean	22.7407	26.4500	90.1122	57.7241	50.0056	3.5293
	N	41	41	41	41	41	41
	Std. Deviation	13.7632	19.7877	31.94389	13.41920	12.78868	1.60191
B+	Mean	20.8727	27.4273	94.6364	56.3727	54.6291	4.0982
	N	11	11	11	11	11	11
	Std. Deviation	10.7674	14.2207	47.63669	9.21858	51.06956	2.48427
O-	Mean	48.5455	44.0000	87.1818	51.5182	45.5455	3.3927
	N	11	11	11	11	11	11
	Std. Deviation	58.0247	22.9434	24.56753	11.81244	15.27104	1.97362

Table 5. Association in relation to alternation of renal function with etiologies of liver disease.

	HBA1C	FBG level	AST	ALT	ALP	Total protein	Creatinine	BUN
Chi-Square	4.031	5.435	7.839	7.931	.075	2.422	10.305	2.709
Df	3	3	3	3	3	3	3	3
Asymp. Sig.	.258	.143	.049	.047	.995	.490	.016	.439

A) Kruskal Wallis Test
B) Grouping Variable: Blood group.

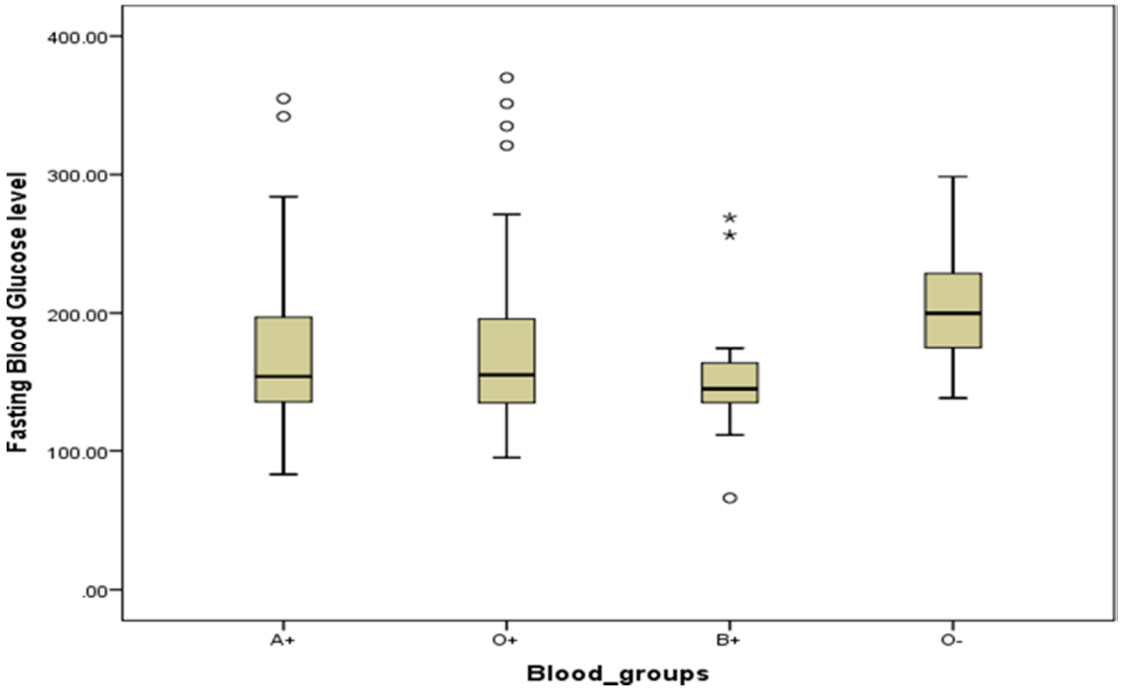

Figure 1. Distribution of blood groups among fasting blood glucose. * Indicates a statistically significant difference (p 0.05).

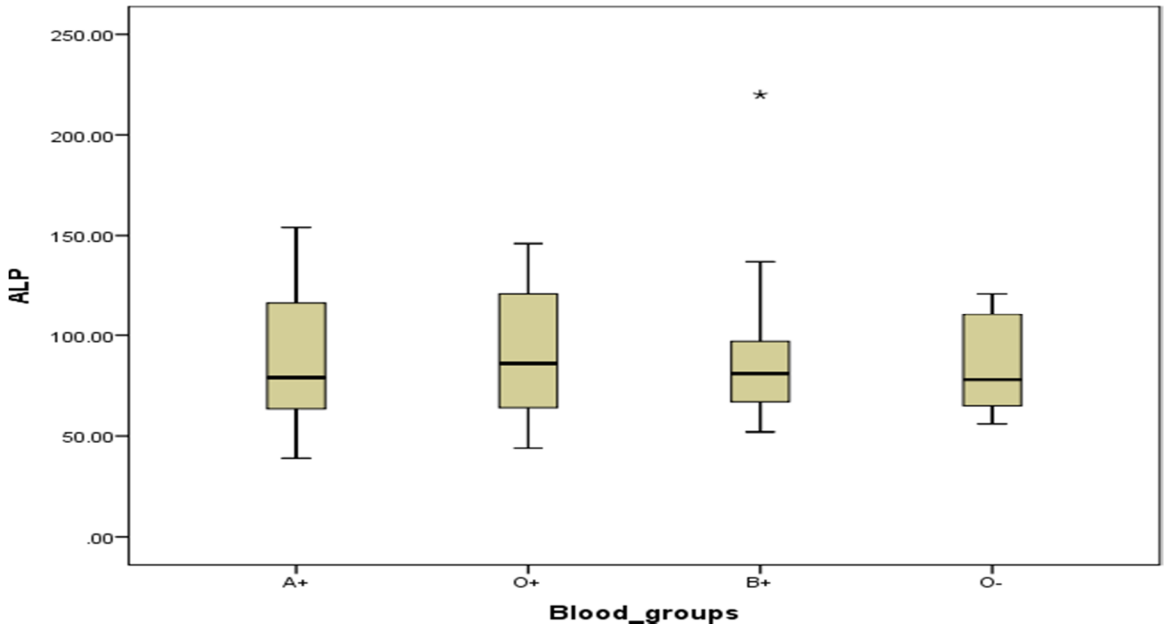

Figure 2. Distribution of blood groups among ALP. A statistically significant difference is shown by the asterisk (P 0.05).

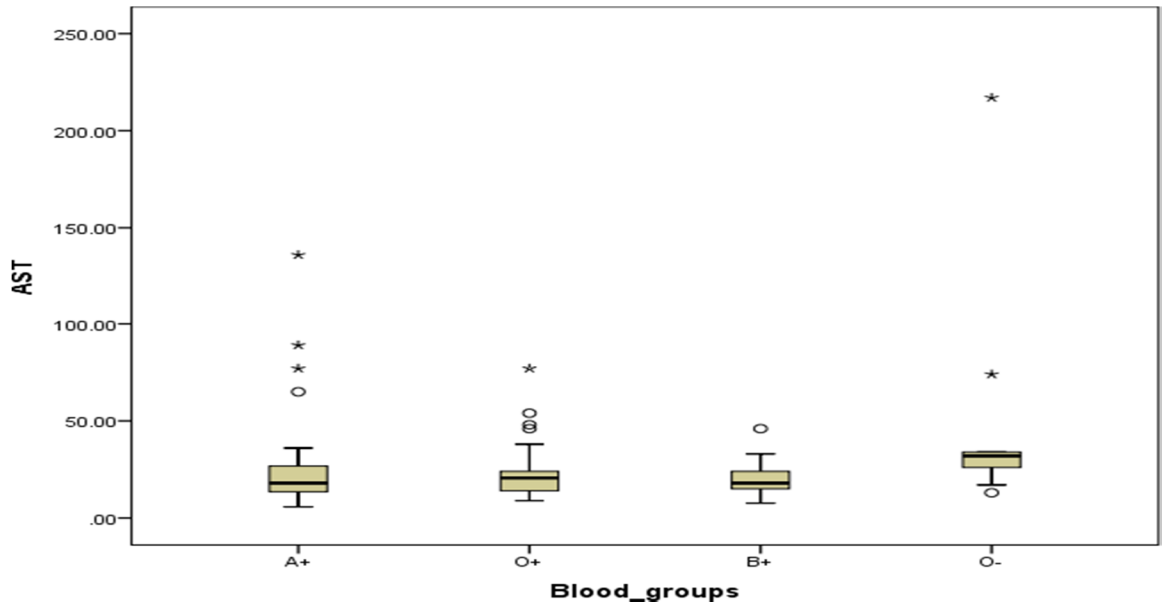

Figure 3. Distribution of blood groups among AST.

end of the distribution among A+ and O+. There is one outlying low value among O-.

The box-and-whisker plot in Figure 4 depicts the distribution of blood groups among BUN. When compared to the A, B, and O blood phenotypes, BUN was higher in subjects with blood group B+ than in subjects with blood group A+. The box and whisker plot depicts the median value as a line within the box, with the box's bounds representing the interquartile range and the whisker representing the data range. There is one outlier low value among O- and many among A+.

The box-and-whisker plot in Figures 5 and 6 depicts the distribution of total protein and creatinine by blood group. Creatinine and total protein levels were higher in subjects with blood group A+ compared to blood group O+ when compared to the A, B, and O blood phenotypes. The box and whisker plot shows the median value as a line within the box, with the box's bounds representing the

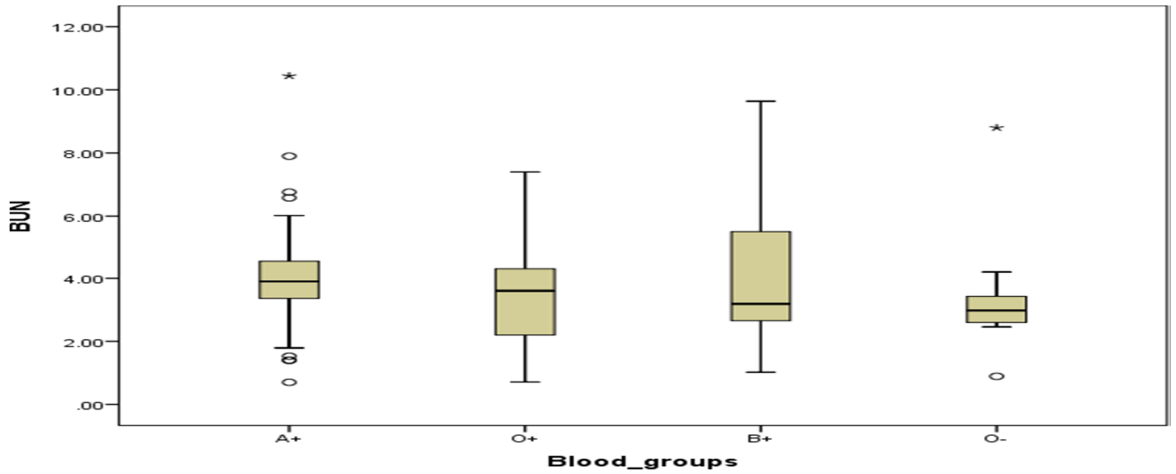

Figure 4. Distribution of blood groups among BUN.

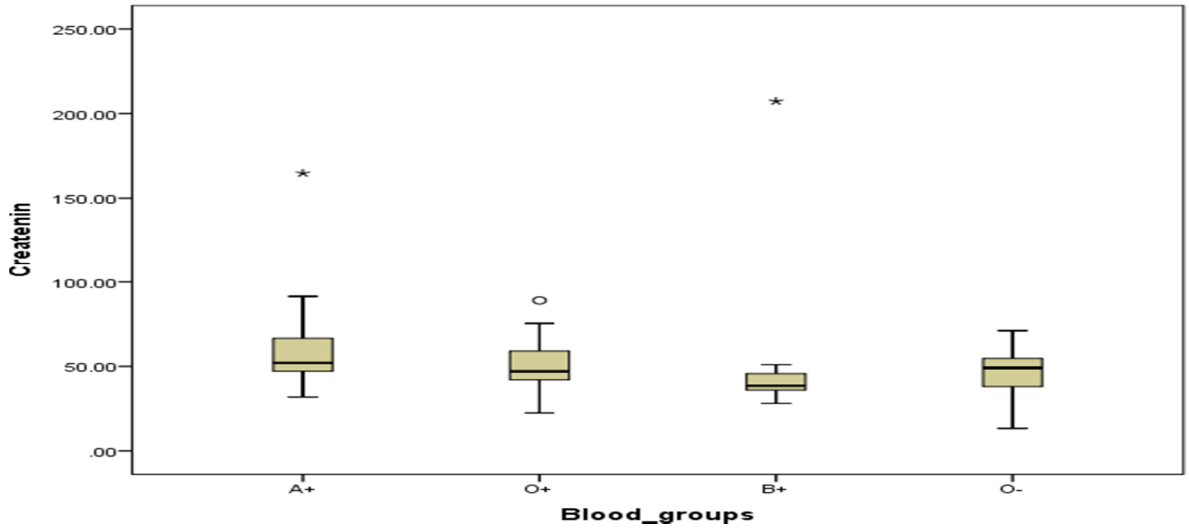

Figure 5. Distribution of blood groups among Creatinine.

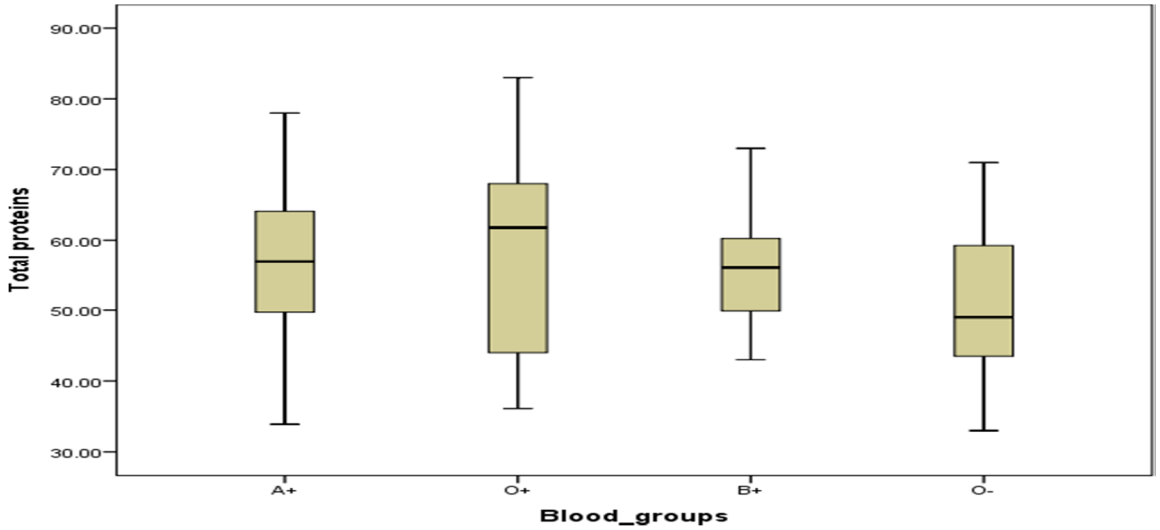

Figure 6. Distribution of blood groups among total protein.

interquartile range and the whisker representing the data range.

DISCUSSION

The specific ABO blood group has been linked to a variety of disorders including infection, cancer, cardiovascular, and nervous system diseases. Previously, an association between blood group ABO and diabetes was discovered, but the results were inconsistent. However, only a few studies have looked into its link to GDM.

There is still no consensus on the pathogenesis of GDM. T2DM is also responsible for triggering genetic predispositions, environmental factors, and their interactions with GDM (Zhang et al., 2013; Hu et al., 2004).

A genetic variant associated with insulin section and resistance regulation was significantly linked to a higher risk of GDM in a meta-analysis. Recent research into the functions of T2DM and GDM biomarkers aimed to understand the pathogenesis of GDM (Hu et al., 2004; Gomes et al., 2013).

According to one study, tumor necrosis factor-alpha and interleukin-6 (inflammatory markers) may contribute to insulin resistance and the development of GDM (Gomes et al., 2013).

Several studies on diabetes and ABO blood group schemes have been conducted. McConnell et al. (1956) demonstrated the link between diabetes and blood group A, which was later confirmed by Andersen and Lauritzen (1960).

An Indian study discovered a link between an increased risk of diabetes and blood groups A and AB (Sidhu et al., 1988). In a study of 792 pregnant Iranian women, it was discovered that females in the AB blood group had higher fasting blood glucose levels than females in the A blood group in the second trimester (Seyfizadeh et al., 2015). However, there are insufficient studies in the literature that investigate the relationship between ABO blood groups and GDM. We also wanted to look into any potential interactions between GDM and ABO blood group systems, as well as the progression to DM from GDM and DM prevalence after GDM.

During our retrospective review of 102 GDM patients, the blood type O+ group appeared to be a risk factor for the development of GDM. A significant risk of developing GDM after GDM existed among patients GDM with blood group O+ and a relatively mild growth with blood group O-. In this case, however, the lower risk of DM development after GDM appears to be a protective factor for patients with blood group B. More research is needed to determine the protective effect on the biological base and biological processes.

This study had two goals: to determine the frequency of blood groups in pregnant women with GDM and to see if there is any correlation between blood groups and certain biochemistry data, with a focus on renal function tests and liver function tests. According to our findings, the most common blood group among GDM patients (40.2 percent) was O+, followed by A+ (38.2 percent).

This subject has been examined by small studies throughout the literature. The present study's findings indicated that each of the biochemical tests examined differed between blood groups but blood urea nitrogen (BUN) was insignificantly excluded, which varies greatly between the O+ and O-blood classes (3.52 and 3.3).

In this study, we looked at the accuracy of using HbA1c as a diagnostic criterion for diabetes mellitus in the form of plasma glucose (FPG or 2hPG) and HBA1c. In recent years, HbA1c levels have been used to diagnose diabetes. Because of its 2-to 3-month average blood glucose levels, HbA1c was previously used in diabetic patients to track glycemic regulation. The diagnostic threshold of HbA1c 6.5% (48 mmol/mol) was established based on extensive epidemiological data on the inflection point of the prevalence of retinopathy.

The ability to measure 3-month average blood glucose levels is one advantage of using an HbA1c test. Furthermore, HbA1c is not as simple as FPG and is performed with a simple vein puncture as opposed to 2hPG, which requires the patient to consume 75 grams of oral blood glucose. Because there is no need to verify individual pregnant women's fasting conditions, and a cumbersome process to coordinate oral glucose ingestion and laboratory draws is not required, HbA1c testing makes pregnant women more convenient and simplifies health care providers' diabetes screening. However, Chronic hyperglycemia has been linked to HbA1c limitations (Karnchanasorn et al., 2016).

To the best of the researcher's knowledge, no previous studies that examined changes in biochemistry testing by blood groups to compare our results have been established, and thus this research offers new knowledge that could be used in future research. Our analysis has certain limitations. For starters, the study's retrospective scope is limited, and another critical limitation is a lack of awareness of the following risk factors for postpartum DM: pregnancy weight, a history of GDM, and a first-degree family history of DM. Because ABO/Rh blood group phenotypes have a stable lifetime, determining the link between ABO blood groups and the potential for GDM risk is important due to the clinical implications. If our findings from this study are confirmed by other studies in larger pregnant women populations in other countries, blood group ABOs can be used to identify individuals at high risk of GDM prevention prior to or during pregnancy, either as a single risk factor or in combination with other risk factors. However, more research is needed to establish a link between ABO blood groups and GDM.

This study discovered that people with the B+, O+, and O- blood groups are more likely to develop GDM during

routine population check-ups. In other words, we need to keep a closer eye on pregnant women with B+, O+, and O- blood groups. Even if the OGTT is normal, patients may be called for glucose monitoring in the hospital during pregnancy, or they may be called for OGTT in the earlier weeks of gestation. When in doubt, our findings support the use of FPG and/or 2hPG for early diabetes diagnosis in HbA1c. To the best of our knowledge, this is the first study to investigate the relationship between ABO blood groups and the transition to DM after GDM.

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