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Original Article

Association of ABO and RH Blood Groups with Gestational Diabetes Mellitus in Patients Attending a Tertiary Care Hospital of Lahore, Pakistan

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ABSTRACT

***Objective*:** To find out any association of ABO and Rh blood groups with gestational diabetes mellitus (GDM).
***Study Design*:** Comparative cross-sectional study.
***Place and Duration of Study*:** Pathology and Gynecology departments of Combined Military Hospital-Lahore from Jun to Sep 2020.
***Methodology*:** A total of 250 patients of GDM and 250 pregnant ladies with normal glucose tolerance (NGT) were included in the study. The Oral glucose tolerance test (OGTT) was performed with a 75g glucose load, and results were interpreted according to the American Diabetes Association 2020 criteria. Blood glucose samples were taken in sodium fluoride containers in fasting conditions, 1 hour and 2 hours post-glucose load. Samples for blood groups were obtained in plain and EDTA containers. Blood glucose samples were analyzed using the Hexokinase method's automated chemistry analyzer, Cobas c-501. ABO and RhD blood grouping were carried out by forward and reverse techniques in the blood bank of CMH Lahore.
Results: A total of 250 (50%) pregnant ladies with OGTT suggestive of Gestational Diabetes Mellitus and 250 (50%) pregnant ladies with OGTT suggestive of Normal Glucose Tolerance (NGT) were included in the study. No statistically significant difference was observed with ABO and RhD blood groups among them (p=0.944).
Conclusion: There is no significant association found between ABO and RhD blood groups with Gestational Diabetes Mellitus.

Keywords: ABO and Rh blood groups, Gestational diabetes mellitus, Normal glucose tolerance.

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INTRODUCTION

Gestational diabetes mellitus (GDM) is defined as diabetes first diagnosed in the second or third trimester of pregnancy and not either preexisting Type 1 diabetes mellitus or Type 2 diabetes mellitus (T1DM or T2DM).[1] According to the International Diabetes Federation, 2019 an estimated 20 million or 16% of live births had some form of hyperglycaemia in pregnancy, and approximately 84% were due to gestational diabetes mellitus. The vast majority of cases of hyperglycaemia in pregnancy were in low and middle-income countries, where access to maternal care is often limited.[2,3]

The studies have established the role of ABO blood groups in the pathogenesis of various metabolic, infective and neoplastic disorders.[4,5] However, even in international literature, studies on the relationship between blood groups and GDM still need to be completed.[6-8] In our country, studies are being undertaken to establish the role of ABO blood groups with diseases;[9,10] however, GDM and pregnancy-related complications need to be explored, and future studies are required.

The high-risk factors so far identified internationally in pregnant women are having delivered heavy/good-sized babies in the past/ previous pregnancies, obesity, previous poor obstetric outcomes, and family history of diabetes and South Asian ethnicity. Keeping in line with these high-risk factors, the current study aimed to find any association of ABO and Rh blood group types with GDM in our setup.

METHODOLOGY

The comparative cross-sectional study was conducted at Pathology and Gynaecology Departments Combined Military Hospital Lahore, Pakistan from June to September 2020 after Ethical Research Committee approval (ERC letter No: 178/2020). The sample size was calculated using the WHO sample size calculator taking the prevalence of GDM at 16%.[3]

Inclusion Criteria: Females with singleton pregnancies referred from Gynecology Outdoor Clinics for assessment of glucose tolerance with OGTT 75 grams of glucose were included.

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Exclusion Criteria: Pregnant ladies who were hospitalized due to any intercurrent ailment, overt or known diabetics, with co-morbidities including hypertension, hypo or hyperthyroidism, preeclampsia, cardiovascular or renal diseases or cases having any contraindication for undergoing OGTT procedure, were excluded.

The sampling technique was non-probability convenience sampling. During the study, pregnant ladies referred to the laboratory for assessment of glucose tolerance with OGTT were thoroughly evaluated. Written consent for participation in the study was taken. The OGTT was performed as per protocol with 75g of the glucose load. A total of 250 GDM (patients) and 250 NGT cases (controls) were included in the study. Blood glucose samples were taken in fasting conditions, 1 hour and 2 hours post-glucose load (PG) in sodium fluoride containers. Samples for blood groups were obtained in plain and EDTA containers.

Blood glucose samples were analyzed using the Hexokinase method's automated chemistry analyzer, Cobas c-501. ABO and RhD blood grouping were carried out by forward and reverse techniques in the blood bank of CMH Lahore.

OGTT results were interpreted according to the American Diabetes Association (ADA) 2020 criteria for diagnosis of GDM. The cut-off used for glucose values during OGTT were: fasting ≥5.1 mmol/l, 1 hour PG ≥10 mmol/l, and 2 hours PG ≥8.5mmol/l. If one, two, or all three glucose readings were equal or more than the cut-offs, then the pregnant women were diagnosed with GDM. If all three values were less than the desired cut-offs, then pregnant women were labelled as having Normal Glucose Tolerance (NGT). NGT cases were taken as controls.

Statistical Package for Social Sciences (SPSS) version 24.0 was used for the data analysis. Quantitative variables were expressed as Mean±SD and qualitative variables were expressed as frequency and percentages. Chi-square test was applied to explore the inferential statistics. The *p*-value lower than or up to 0.05 was considered as significant.

RESULTS

A total of 250 GDM (cases) and 250 NGT (controls) were included in the study. Approximately 62% of pregnant ladies were multipara, and 38% were primigravida. The mean age of the GDM cases was 28.5±4.45 years, ranging from 20 to 46 years. The mean age of NGT (controls) was 26.8±4.04 years with a range of 18-43 years. Among GDM, total number of cases with blood Group-O were 87 (34.8%), followed by blood Group-B with 81(32.4%), blood group A with 61 (24.4%) and blood Group-AB approximately 21(8.4%). Among GDM individuals, Rh+ve patients had a frequency of 226 (90.4%) compared to Rh-ve individuals 24 (9.6%) (Figure). However, when we compared the distribution of ABO and Rh blood groups in GDM (250 cases) and NGT (250 controls), no statistically significant difference was observed among them (*p*= 0.944). No statistically significant association of GDM with blood groups and Rh type was documented (Table).

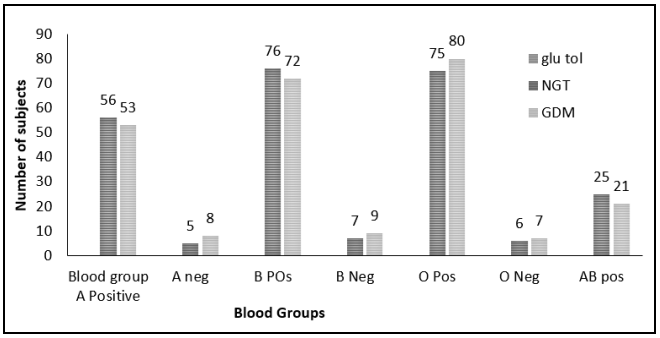

Figure: Distribution of ABO Blood Groups and Rh factor in Study Groups (n=500)

Table: Association of ABO blood groups and Rh factor in Study Groups (n=500)

Blood Groups and Rh Factor	Study Groups		*p*-value
	Normal Glucose Tolerance-Group n=250	Gestational Diabetes Mellitus-Group n=250	
A	61(24.4%)	61(24.4%)	0.944
B	83(33.2%)	81(32.4%)	
O	81(32.4%)	87(34.8%)	
AB	25(10.0%)	21(8.4%)	
Rh positive	232(92.8%)	226(90.4%)	0.944
Rh negative	18(7.2%)	24(9.6%)	

DISCUSSION

The ABO blood group system was first discovered by Karl Landsteiner in 1900. The A, B, O, and AB are phenotypes of ABO blood groups that are found in close association with the Rhesus system (also known as Rh D).[11] Internationally, studies conducted on GDM and its relationship with different blood group types had shown varying results. The study by Huidobro *et al*. showed no differences in Rh blood groups. At the same time, B antigen was detected in significant numbers of controls (*p*=0.037).[12] A recent study by Sharjeel *et al*. (2021) emphasized that in the past decade, the risk of development of GDM in women had increased due to obesity and diabetes.[13]

A study by Seyfizadeh *et al*. (2015) recruiting 792 healthy Iranian women showed that fasting glucose

readings of AB blood groups were higher in the second trimester than those of the A group.[6] A recent study by Rom *et al*. (2021) showed a reduced risk of GDM with AB blood group type.[14] In contrast, a retrospective case-control study recruiting 5,424 pregnant ladies showed that the AB blood group is a risk factor for GDM in the Japanese population.[15] In contrast, in our study, frequencies of AB positive in GDM and NGT were 8.4% and 10%, respectively. These frequencies were lowest among positive blood groups. The frequency of AB positive in GDM cases documented in our study matched with the findings of Rom *et al*. having an incidence of GDM cases with AB blood group up to 8.8%.[14] However, AB negative blood group was not documented in our study, probably because of low prevalence in our population and this finding matched with a recent study conducted by Sabir *et al*., in which frequencies of AB negative blood groups in female participants of Faisalabad and Safdarabad cities of Pakistan were quite low, i.e., 1.73% and 2% respectively.[16] In another study by Donma, blood Group A was documented in pregnant women having good-sized fetuses, while blood Group O was dominant in GDM cases.[17] Sapanont *et al*. (2021) found an increased risk of GDM in women with blood group O and with a family history of DM.[18]

Our results matched with the study carried out in Khartoum (Sudan) by Hassan *et al*., recruiting 253 pregnant women, & the study documented no significant difference in the blood groups in GDM and controls.[19]

The study by Keisam *et al*. found that the frequencies of blood group O in T2DM and controls were 31.2% and 34%, respectively.[20] These figures closely matched with frequencies of blood group O documented in GDM and controls as 34.8% and 32.4%, respectively, in our study. A Turkish study (2015) by Karagoz *et al*., recruiting 233 patients concluded higher risk of GDM with AB and O blood groups.[21]

Our study results also matched with a local study carried out in Karachi on pregnancy-related complications by Sajan *et al*.,[22] which found that the rate of GDM was not statistically significant among different blood groups. However, in our study, pregnant women with hypertension, preeclampsia and other co-morbidities were excluded.

RECOMMENDATIONS

Further prospective multicenter studies, including molecular and Human leukocyte antigen (HLA) are suggested to be carried out.

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CONCLUSION

There is no significant association found between ABO and RhD blood groups with Gestational Diabetes Mellitus.

Conflict of Interest: None.

Authors Contribution

Following authors have made substantial contributions to the manuscript as under:

SS: MAN: Study design, drafting the manuscript, concept, approval of the final version to be published.

MF: MTK: Critical review, data acquisition, drafting the manuscript, approval of the final version to be published.

VA: AA: Data acquisition, data analysis, data interpretation, critical review, approval of the final version to be published.

Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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