"The correlation of ABO and Rh Blood Group Phenotypes with Type 2 Diabetes Mellitus with or without microvascular complications"

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KEYWORDS
ABO blood group, DM type II, microvascular complication.

ABSTRACT:

Background: Diabetes is a global public health problem that leads to vast morbidity and mortality.The global prevalence of diabetes in 2021 was estimated to be 10.5%, rising to 12.2% in 2045.The association between ABO blood group phenotypes with Type 2 DM is that A and B antigens are linked to an increased level of inflammatory molecules such as intercellular adhesion molecule 1, E-selectin, P-selectin, and tumor necrosis factor-2 are well-known mediators of inflammation that affects insulin and its receptors, ultimately leading to the clinical expression of T2DM.

Aims & Objectives: To correlate blood grouping & Rh typing with patients with type 2 Diabetes Mellitus with or without microvascular complications (Diabetic retinopathy and Diabetic nephropathy).

Methodology: A Cross sectional observational study was conducted among 42 patients of aged >30 years with type 2 Diabetes mellitus attending Out Patient Department of Ophthalmology, at one of the tertiary care centre, Karnataka.

Results: Majority cases were belonged to 51-70 years of age group. Males were more affected in compared to females. Incidence of Diabetic retinopathy & Diabetic Nephropathy was more in AB blood group cases.

Conclusion: There is a high distribution for blood group AB in DMII without and with complications and a significant difference in the distribution of ABO blood groups was observed between healthy and DMII subjects, and between DMII without complication and DMII with complication. There is a high distribution of nephropathy among blood group AB, with no significant variation between other blood groups having A type slightly higher than O and B.

Introduction:

Diabetes is a global public health problem that leads to vast morbidity and mortality.[1] The global prevalence of diabetes in 2021 was estimated to be 10.5%, rising to 12.2% in 2045.[2]Diabetes mellitus (DM) is a chronic metabolic disorder characterized by elevated levels of glucose in circulation which result from insufficient insulin or insulin resistance[3]. Diabetes Mellitus is related with dysfunction and damage of different organs especially the eyes, kidneys and nerves. Various microvascular complications are caused due to chronic diabetes mellitus.

ABO and Rhesus (Rh) are the major human blood group systems. The blood group of an individual is thought to be genetically predetermined and plays a vital role to understand genetics and disease susceptibility.[4]The association between ABO blood group phenotypes with T2DM is that A and B antigens are linked to an increased level of inflammatory molecules such as intercellular adhesion molecule 1, E-selectin, P-selectin, and tumour necrosis factor-2 are well-known mediators of inflammation that affects insulin and its receptors, ultimately leading to the clinical expression of T2DM.[5]

Aims & Objectives:

To determine the association of ABO blood group and Rh typing among individuals with type 2 Diabetes Mellitus and age & gender matched healthy individuals.

To correlate blood grouping & Rh typing with patients with type 2 Diabetes Mellitus with or without complications.

Methodology:

STUDY DESIGN: Cross sectional observational study

STUDY DURATION: 1 year

STUDY POPULATION: All patients > 30 years with type 2 Diabetes mellitus attending Out Patient Department of Ophthalmology at R. L. Jalappa Hospital and Research, Kolar which is attached to Sri Devaraj Urs Medical College.
SAMPLE SIZE: 42 patients of type 2 Diabetes mellitus
Inclusion criteria:

- Subjects of either sex aged between >30 years, diagnosed with Type II Diabetes Mellitus as per (WHO) norms as cases and Age & Gender matched healthy individuals as Controls.

Exclusion criteria:

- Patients with Type 1 Diabetes Mellitus.
- Gestational Diabetes Mellitus.
- Hemoglobinopathies including thalassemia or sickle cell anemia.
- Individuals with a history of chronic diseases other than T2DM (heart failure, renal failure, liver disease, cancer, hematological and immunological diseases), and who are seriously ill.
  After obtaining Ethical clearance from the Institutional ethics committee, a written informed consent from the subjects was obtained prior to the start of study. Detail demographic information including age, gender, address, socio-economic status and medical history including duration of disease, diabetic complications and diabetic history in family was collected from the subjects.After a detailed history, following clinical examination was performed:
- Visual acuity by Snellens chart for distant vision.
- Near vision by Jaeger's chart.
- Slit lamp biomicroscopy for Anterior segment evaluation
- Intraocular Pressure by Goldmann applanation tonometry
- Fundus examination by Direct & Indirect ophthalmoscopy.

Data entry & analysis: Data were entered into Microsoft excel sheet and analysed using SPSS software version 26. Qualitative data were described as frequency & Percentages and quantitative data were described as Mean and SD. Association between various variables were analysed by chi square test. P value less than 0.05 considered as a stastically significant.
Results:

Table 1. Age wise distribution of study participants

Age group	DM without Complication		DM with Complication	
	N	%	N	%
<50yrs	6	14.3%	3	7.1%
51-70yrs	28	66.7%	24	57.1%
71-90yrs	8	19.0%	15	35.7%

P Value 0.179, there was no statistically significant difference found between groups with respect to age groups. Majority cases were belonged to 51-70 years of age group. [Table 1]

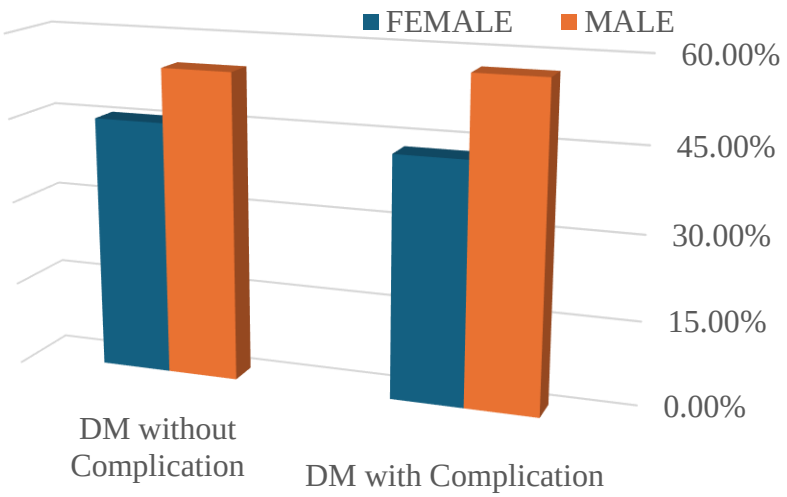

Figure 1. Gender wise distribution of study participants

Males were more affected in compared to females.P Value 0.500, there was no statistically significant difference found between groups with respect to sex. [Figure 1]

Table 2. Distribution of subjects according to blood groups among the group

Blood group type	DM without Complication		DM with Complication	
	N	%	N	%
A	12	28.6%	12	28.6%
B	8	19.0%	7	16.7%
O	7	16.7%	7	16.7%
AB	15	35.7%	16	38.1%

In the study 35.7% cases who had DM without complications and 38.1 % cases who had DM with complications had blood group AB, while 19% cases who had DM without complications and 16.7% cases who had DM with complications had blood group B. P Value 0.992, there was no statistically significant difference found between groups with respect to blood groups. [Table 2]

Table 3. Distribution of subjects according to retinopathy and Blood groups among DM with Complication

	Mild		Moderate		Severe	
	N	%	N	%	N	%
A	6	40.0%	5	22.7%	1	20.0%
B	2	13.3%	4	18.2%	1	20.0%
O	1	6.7%	6	27.3%	0	0.0%
AB	6	40.0%	7	31.8%	3	60.0%

Incidence of severe Diabetic retinopathy was 60% among AB blood group people, while no one affected severely in O blood group cases. P Value 0.502, there was no statistically significant difference found between retinopathy and Blood groups. [Table 3]

Table 4. Distribution of subjects according to DIABETIC NEPHROPATHY and Blood groups among DM with Complication.

Blood group	NO		YES	
	N	%	N	%
A	10	31.3%	2	20.0%
B	6	18.8%	1	10.0%
O	6	18.8%	1	10.0%
AB	10	31.3%	6	60.0%

Incidence of Diabetic nephropathy was more in AB blood group cases compared to other blood groups. P Value 0.442, there was no statistically significant difference found between DIABETIC NEPHROPATHY and Blood groups. [Table 4]

Discussion: The present study supports the hypothesis that DM II and blood groups are interrelated. We found that the frequency of blood group O was significantly higher among DM II subjects, compared with distribution of ABO blood groups in healthy group.

Study by Biplab Mandal et al., reported that the Nephropathy was the most common complication observed among different blood groups (high blood group type B, O, A and AB), and when relative risk (RR) has been calculated with blood group O as reference it has been observed that blood group AB and blood group A were less likely to develop neuropathy compare to blood group O[6].

Unal A et al., from Turkey conducted by a study on diabetic subjects with microvascular complications that the Blood group A is more commonly associated with diabetic nephropathy[7], Blood group B is more likely & blood group O & A are less likely to be associated with diabetic retinopathy and the overall complications were more common with blood group A[8.]

The possible explanation of these conflicting findings may be the racial and geographical factors that probably have a role in genetic expression of disease. It has been suggested that the human ABO locus might influence endothelial or inflammation markers, such as the FVIII–vWF complex, which is present in higher levels in non-O individual[9]. In addition, the ABO blood groups have been associated with plasma soluble ICAM-1 and TNF receptor 2 (TNF-R2) levels[10]. These markers have both been associated with an increased type 2 diabetes risk, thus providing a potential explanation for the observed relationships[11].

A paper in 2012 suggested that the ABO blood group is one of the genetically determined host factors that modulate the composition of the intestinal microbiota[12], which participates in metabolism by affecting the energy balance, glucose metabolism and low-grade inflammation

Limitations: It was a observational, cross sectional study so detailed glycemic control during the course of diabetes not available for comparison with development of complications in different blood groups and we have to rely mainly on clinical examination findings to evaluate complications for which subjective error may sometimes occur.

Conclusion: There is a high distribution for blood group AB in DM II without and with complications and a significant difference in the distribution of ABO blood groups was observed between healthy and DMII subjects, and between DMII without complication and DMII with complication. There is a high distribution of nephropathy among blood group AB, with no significant variation between other blood groups having A type slightly higher than O and B.

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