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Background- Various links have been made between ABO blood group antigens and Diabetes mellitus type-2. The ABO blood group is linked to the specific molecules (TNF-2, TNF-4, TNF-α, IL-6, ICAM-1, etc.) and that molecule is linked with T2DM. If a blood group has correlation with diabetes mellitus then, it will likely be beneficial for people who belong to that particular blood groups to take preventive measures.

Objective- This study planned to find relationship between ABO blood group and Diabetes mellitus type 2.

Method and Material- This Observational Study was conducted at Banas Medical College & Research Institute, Palanpur. Also, data was collected virtually through web-based app – Google form. Information collected is analysed and descriptive statistics was used to present data. Chi square test performed to seek out association between ABO blood group and Diabetes mellitus type2.

Result- 619 responses were collected in the study, 295 of them were Diabetic patients and 324 subjects were healthy. The blood type distribution of diabetic patient group was as follows: 106(35.9 %) blood group B, 79 (26.8 %) blood group O, 73 (24.7 %) blood group A, 37 (12.5 %) bloodgroup AB. From 295 diabetic patients, only 93 (31.5%) patients having positive family history and 106 (35.9 %) were female and 189 (64.1%) were male. In our study, we observed that greater numberof Diabetic patients were of age group 25-50 years with B blood group as compared to other blood groups. Conclusion- There is moderate correlation between ABO blood group and Diabetes Mellitus Type2 (p>0.05). According to our observations, people with age group 25-50 years are at higher risk of developing DM type 2. Also, distribution of B- blood group was found to be the highest amongst this particular age group.

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INTRODUCTION:
Diabetes Mellitus (DM) is a syndrome characterized through hyperglycemia because of defects of insulin secretion and/or cellular resistance to insulin. (1) Diabetes has various types but common types are type 1 and type 2. In type 1 there is a deviation either the synthesis or secretion of insulin and in type 2 there is stenosis in the pancreatic duct, or the evolution of resistance to insulin or its subnormal production. (2) Sometime diabetes also known as hyperglycemia. (3) In the current situation, diabetes mellitus type 2 is investigated by blood or plasma glucose level like random plasma glucose level(>200 mg/dl) and fasting plasma glucose level(>126 mg/dl) in an individual with classic symptoms. (4) Diabetes mellitus type 2 is stir up by an amalgam of genetic factors which are related with impaired insulin secretion, insulin resistance such environmental aspect like obesity, overeating, lack of exercise and stress. (5) Worldwide About 1 in 11 adults have diabetes and in that 90% of patients possess type 2 diabetes mellitus (T2DM). (6)

In 1900, Karl Landsteiner discovered ABO blood groups. He recognize four group called A, B, AB and O. ABO Glycosyltransferase is the gene that ascertain the human ABO blood type and is located on chromosome 9 (9q34.1). (7) In diverse section of the world, the prevalence of ABO groups significantly differs across races, racial groups, and socioeconomic groups. The nonappearance and appearance of blood group antigens have being related to numerous diseases. It have being notified that there are numerous associations between particular ABO phenotypes and enlarged susceptibility to disease. Occurrence of peptic ulcer is excessive in blood group “O” (8), although, cancer of stomach (9), tumors of salivary glands (10), and leprosy (11) are more familiar in “A” group individuals.

The pathophysiological channels for the alliance between ABO blood group phenotypes with T2DM and correlation components are not well appreciated. Although, there are few viable assumptions. At 9q34.1-q34.2, the A, B, and O genes are entirely track down. (12) The ABO blood group is associated to the particular molecules to T2DM like TNF-2, TNF-4, TNF-α, IL-6, ICAM-1, etc. A and B antigen from ABO gene loci, this is related to augment the level of plasma lipid and inflammatory markers (ICAM-1, E-selective, P-selective and TNF-2). These molecules are common mediators of inflammation that have effect on insulin and its receptor and come up with the development of T2DM. (13, 14)

ABO gene positioned on chromosomes 9q34 which encodes Glycosyltransferase that catalyzes the convey of nucleotide donor sugar to H antigen to established A and B antigen. Glycosyltransferase and nucleotide donor sugar prompt the production of inflammatory mediators such as IL-6 and TNF- in the endothelium. (15) Endothelium deploy an endocrine impression conferring insulin resistance in the liver, skeletal muscle and vascular endothelium tissue. These each of is eventually leading to the clinical expression of T2DM. (16)

FUT1 gene additionally performs a foremost function in the biosynthesis of H antigen and it acts as a precursor for A and B antigen and FUT1 gene is positioned on chromosomes 19(19q13.3) and chromosomes 9(9q34.2). (17) ICAM-1 is located on chromosomes 19p13.2 and TLR4 located on chromosomes 9(q33.1). (18, 19) So it is probably manifesting an association between blood group and T2DM. Previous study have shown that dominant gene linked with susceptibility to diabetes mellitus type 2 is TLR4 and Several single nucleotide polymorphisms (SNPs) in TLR4 have been examined for their relation to diabetes (such as Asp299Gly and Thr399Ile). Several single nucleotide polymorphisms (SNPs) in TLR4 (such as Asp299Gly and Thr399Ile) have been researched considering their relation to diabetes mellitus type 2 and T2DM. Previous study have shown that dominant gene linked with susceptibility to diabetes mellitus type 2 is TLR4 and Several single nucleotide polymorphisms (SNPs) in TLR4 have been examined for their relation to diabetes (such as Asp299Gly and Thr399Ile). Several single nucleotide polymorphisms (SNPs) in TLR4 (such as Asp299Gly and Thr399Ile) have been researched considering their relation to diabetes mellitus type 2 and T2DM. Previous study have shown that dominant gene linked with susceptibility to diabetes mellitus type 2 is TLR4 and Several single nucleotide polymorphisms (SNPs) in TLR4 have been examined for their relation to diabetes (such as Asp299Gly and Thr399Ile). Several single nucleotide polymorphisms (SNPs) in TLR4 (such as Asp299Gly and Thr399Ile) have been researched considering their relation to diabetes mellitus type 2 and T2DM. Previous study have shown that dominant gene linked with susceptibility to diabetes mellitus type 2 is TLR4 and Several single nucleotide polymorphisms (SNPs) in TLR4 have been examined for their relation to diabetes (such as Asp299Gly and Thr399Ile). Previous study have shown that dominant gene linked with susceptibility to diabetes mellitus type 2 is TLR4 and Several single nucleotide polymorphisms (SNPs) in TLR4 have been examined for their relation to diabetes (such as Asp299Gly and Thr399Ile). Previous study have shown that dominant gene linked with susceptibility to diabetes mellitus type 2 is TLR4 and Several single nucleotide polymorphisms (SNPs) in TLR4 have been examined for their relation to diabetes (such as Asp299Gly and Thr399Ile). Previous study have shown that dominant gene linked with susceptibility to diabetes mellitus type 2 is TLR4 and Several single nucleotide polymorphisms (SNPs) in TLR4 have been examined for their relation to diabetes (such as Asp299Gly and Thr399Ile). Previous study have shown that dominant gene linked with susceptibility to diabetes mellitus type 2 is TLR4 and Several single nucleotide polymorphisms (SNPs) in TLR4 have been examined for their relation to diabetes (such as Asp299Gly and Thr399Ile). Previous study have shown that dominant gene linked with susceptibility to diabetes mellitus type 2 is TLR4 and Several single nucleotide polymorphisms (SNPs) in TLR4 have been examined for their relation to diabetes (such as Asp299Gly and Thr399Ile).
to the broad genetic immunological basis in both. Recognition of a positive association between DM and blood groups might throw back increased susceptibility to DM and negative association protection in opposition to diabetes. (1)

**Rationale:**
Antigens of the ABO blood group are count to be one of the hereditary determinants of type-2 DM. Blood group phenotypes are additionally intimately linked to type-2 diabetes mellitus. If blood group has a relatedness with diabetes mellitus, it would be obliging for people with prone blood groups to supervise of themselves by preventing other risk factors such as obesity, physical activity and dietary factors (increase in carbohydrate rich diet and fat intake) which increase the risk of diabetes mellitus and taking preventive measures.

**METHODS AND MATERIALS:**

**SETTING:** This Observational Study was conducted at Banas Medical College & Research Institute, General Hospital, Palanpur. Also, data was collected virtually through web-based app – Google form.

**STUDY PERMISSIONS:**
Permission for the study conduct was taken from competent authorities as follows:

- Banas Medical College & Research Institute, General Hospital, Palanpur. [Appendix H]
- Parul Institute of Pharmacy and Research, Parul University [Appendix I]

**DATA COLLECTION:**
The data for this study was collected from:

- Individual Patient Case Files at OPD department
- Virtually via Google form

To collect data a form was designed to record all the information [Appendix E, F and G].

**Techniques/method to collect data:**
Upon confirmed medication order, data was collected by reviewing the case file and transcribing in prepared data collection form. Data collection form was generated through Google forms in three languages (English, Gujarati and Hindi).

The collection was based on the following;

**Inclusion criteria:**
- All the patients who have Diabetes mellitus type 2.
- All the patients who give consent.

**Exclusion criteria:**
- A patient who refuse to take part in the study.

**Data collection form parts:** Data collection form is divided into four parts as:

**Part I: Patient’s demographic details:** It includes demographic details of patients like age, gender and city.

**Part II: Patient’s blood group type:** It includes patient’s blood group type – A, AB, B and O.

**Part III: Patient’s diabetes information:** It includes information about diabetes like duration of diabetes, family history of diabetes.

**Part IV: Patient’s report:** It includes patient’s Diabetes report (if any)

**DATA EVALUATION:** Data collected is analysed and descriptive statistics (means and percentage) is used to present data with the help of computer facilitated with window version 10 with MS office excel. Chi square test performed to find association between ABO blood group and Diabetes mellitus type 2.

**RESULTS AND DISCUSSION**
Six hundred nineteen responses were collected in the study, 295 of them were diabetic patients and 324 subjects were healthy. The blood type dispersal of diabetic patient group was as follows: 106 (35.9 %) blood group B, 79 (26.8 %) blood group O, 73 (24.7 %) blood group A, 37 (12.5 %) blood group AB. The blood type distribution of control group was follow as: 126 (38.9 %) blood group B, 86 (26.5 %) blood group O, 66 (20.4 %) blood group A, 46 (14.2 %) blood group AB [Figure 1]. Owas the most familiar blood group (37.12%) in the India go along with B at 32.26%, followed by A at 22.88% while AB was the minimal prevalent group at 7.74%. (22)
Figure 1: Distribution of different blood groups in diabetic patients and non-diabetic patients.

Table 1: Association between ABO Blood groups and T2DM

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<th>Value</th>
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<td>3</td>
<td>.57</td>
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<tr>
<td>Likelihood Ratio</td>
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<td>3</td>
<td>.57</td>
</tr>
<tr>
<td>N of Valid Cases</td>
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Table 1 propound that there was moderate significant association between ABO blood group and Diabetes mellitus type 2 (p value>0.5). All ABO/Rhesus blood groups have been found to have Diabetes mellitus type 2. Many researchers have attempted to find a link between the ABO and Rh blood groups and Diabetes mellitus type 2. The results have been changeable, clashing and differing from one zone to the alternative.

Figure 2: Number of patients having a family history of diabetes.
Figure 2 represents the number of patients having a family history of Diabetes Mellitus. Out of 295 diabetic patients, only 93 (31.5%) patients having positive family history of diabetes mellitus type 2. The leading drivers of the worldwide epidemic of T2DM are the increase in obesity, an inactive lifestyle, energy dense diets and population ageing. Racial and geographical variation might play a role within the disease's genetic expression, that might be explain the contradictory results regarding the alliance between ABO blood groups and Diabetes mellitus type 2. In Obesity; physical inactivity, habitual energy consumption relevance expenditure, diet macronutrient composition of the edibles and metabolic attribute this all are designate that increase in obesity is connected to increased occurrence of Diabetes mellitus type proteins and fats, ameliorate insulin action, avoidance of complications of diabetes, improved muscle flexibility and strength, obliging effects on the cardiovascular system and expanding life expectancy of patients that’s why physically inactive patients having higher chance of diabetes mellitus type 2. Dietary factors, such as an increase in carbohydrate-rich diet and a high-fat diet, can comprise glucose intolerance across a variety of channels, Considerable decreased insulin binding to receptors, glucose transport debasement, TG synthesis depletion, and accretion of stockpile triglycerides in skeletal muscles. This all aggravate the risk of diabetes mellitus in people, particularly those over the age of 30.

Figure 3: Number of Female and Male Patients having Diabetes Mellitus Type 2.

Figure 3 represents, from 295 diabetic patients 106 (35.9%) were female and 189 (64.1%) were male. From our study observations, male tend to be more susceptible to diabetes mellitus type 2 than female. This may be because of male appear to be more liable than female to the result of idleness and corpulence, likely due to variance in insulin sensitivity and regional fat deposition.

New research indicates that sex-steroid hormones, adipocyte-derived hormones and cytokines may be connected to Diabetes mellitus type 2 risk and that some of these novel markers may reveal a sexual dimorphism in relation to this risk. Corroboration suggests that 17-estradiol, a female hormone, can insulate insulin production and intercept diabetes.
Figure 4: Duration and Age Based Distribution of Diabetic Patient with Blood Group B

Figure 5: Duration and Age Based Distribution of Diabetic Patient with Blood Group O
In our analysis, we observed that greater number of Diabetic patients were of age group 25-50 years with B blood group as contrasted to other blood groups. Figure 4, 5, 6 and 7 shows diffusion of diabetic patients with different blood groups as per the duration of Diabetes and Age group. Amongst different blood groups, B-blood group has shown greater distribution of diabetic patients with maximum between age group 25-50 years. Thus from our observations People with B-blood group, age between 25-50 years and with other risk factors (Obesity, Smoking/Tobacco use, Family History, etc.) are more prone to develop Diabetes Mellitus. There were also some studies showing that People with B blood group are at escalate possibility for developing Diabetes mellitus type 2. The DM
category had a lofty level of blood group B than the non-DM group, as stated by Naoto Egawa et al. in Tokyo. Its detection are similar to those of Joseph A. Buckwalter and Henry et al., who discovered a high prevalence of Group B among diabetic patients in contrast to other studies conducted in Iowa City and Basrah. In Qatar, Bener and Yousafzai looked into the connection between the "ABO" blood types and diabetes. When comparing diabetic patients to healthy non-diabetic people, they discovered that blood type "B" was notably more similar and blood group "O" was notably less common. Qureshi and Bhatti described that DM type 2 and ABO blood groups are associated; they come upon that among 70 patients with DM, blood group B was more familiar and substitute 35.71% in collate to that of control, which constitute only 22.14% of the sample people but statistical significance was not achieved (p>0.05).

In addition, El Khabous (2018) (52%) observed the predominance of group O in a sample of 10000 blood donors from various regions of Morocco, whose ages ranged from 18 to 45 years. This author also observed that group O was preceded by group A (29.69%), group B (14.85%), and the AB Group. Kamil and colleagues (2010) established a higher level of blood group O in diabetics than in controls (55 % vs. 24 %, p = 0.001), and found similar findings. McConnell & Pyke (33) demonstrated a relation between diabetes and blood group A, which was there after confirmed by Andersen and Lauritzen. According to a valuation in Saudi Arabia, 38.7% of study participants had the O blood group, 26.1 % had the B blood group, 23.5 % had the A blood group, and just 11.8 percent had the AB blood group.

In our study, we observe minimum distribution of diabetes mellitus patients in AB blood group. In another study by Waseem AG et al., diabetics had an inflated prevalence of blood group AB than controls. In their studies, ABO and Rh blood groups in diabetes mellitus, Sidhu et al. set up that there is a clear sign of a link between diabetes mellitus and blood groups, mainly A, AB, and Rh-positive blood groups. The AB groups in the two series have the greatest variations, while the A group has the smallest.

Many studies show no association could be established such as the Shyamal Koley study in Madhya Pradesh, India, which included 215 diabetes mellitus patients and 475 healthy controls and concluded that there is no link between ABO blood types and diabetes mellitus. Rahman leaded additional study in Bangladesh with a subject rate of 2312 patients and 8936 controls, and reported no connection. Furthermore, a study including 511 patients with type 2 diabetes mellitus and 454 healthy control subjects conducted in India noticed no correlation between ABO blood groups and diabetes mellitus type 2. Similarly, Zeytinoglu and Maher found no major differences between diabetic patients and controls.

There are variations between research on ABO distribution in duodenal ulcers, gastric ulcers, and gastric carcinoma. The diabetic series shows significant the ABO group system has gotten a lot of attention because of its medical relevance in a number of diseases, research on which has reasonably good results across countries. The ABO blood group is important not just for cardiovascular disease, blood transfusions, neonatal erythroblastosis, and organ transplantation, but it is also one of the most effective interpreters of country-specific rates of suicide and obesity genetic markers. In Egypt and India, blood group O is the most common, while in the Russian Federation, blood group A is the most common. In Australia, the most common groups are A and O, while in Africa, the most common group is B. In south India, blood group O was noticed to be the most familiar (38.75%), followed by blood group B (32.69%).

Our research observed a moderate correlation between diabetes mellitus type 2 and the ABO blood group. It is likely that ethnic and regional influences play a role in the genetic expression of this disorder, which would explain the contradictory results. Furthermore, the majority of the research that have been performed have a limited sample size. A solution to this moral dilemma would most likely come from larger-scale research and a meta-analysis of previous work.
CONCLUSION
This study concludes that there is moderate correlation between ABO blood group and Diabetes Mellitus Type 2 (p>0.05). According to our observations, people with age group 25-50 years are at higher risk of developing DM type 2. Also, distribution of B- blood group was found to be the highest amongst this particular age group. Thus, People within the age group of 25-50 years with B- blood group and other risk factors like Family history of Diabetes Mellitus or Coronary Artery Diseases (Non-modifiable), Male Gender (Non-modifiable), Smoking and Alcoholic (Modifiable); are at a greater risk of developing Diabetes Mellitus type 2.
Diabetes Mellitus is a major issue worldwide. These observations might helpful to physicians and haematologists in the management of their patients and early diagnosis of diabetes mellitus while able to pre-empt the possibility of occurrence.

LIMITATION OF THE STUDY
There are two major limitations of this study that were inevitable and can be addressed in further studies. Primarily, due to the Pandemic, observational study was preferred over Interventional study. Secondly; due to time constraints only limited responses were collected.

FUTURE SCOPE
Looking forward, a more detailed Interventional study can be conducted to eliminate the response bias to address the association between diabetes mellitus and ABO blood group. A longitudinal study can be planned for a more statistically significant result and to overcome the aforementioned limitations of the study. Also, different geographical locations can be included for more statistically sound results.

REFERENCE


Mohamed University 5. 2018 pp 144.

How To Cite This Article:

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Conflict of Interest: None declared

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