Distribution of ABO and Rh (D) Allele Frequency Among the Type 2 Diabetes Mellitus Patients

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Abstract: The aim of the present study was to study the distribution of ABO and Rh (D) blood groups in type 2 diabetes mellitus (T2DM) patients. We evaluated 106 T2DM patients and 58 control subjects. Samples were tested for ABO and Rh (D) blood groups and allele frequencies were calculated. The blood group O (43.40%) was distributed with highest frequency among T2DM patients while AB (6.60%) was least frequent. Frequency of O allele (0.549) was the highest among T2DM patients. Chi-square values were found to be highly significant for ABO blood groups.

Keywords: Type 2 Diabetes Mellitus, ABO, Rh blood groups, allele frequency.

I. Introduction

T2DM is an emerging problem worldwide. According to ICMR-INDIAB national study, there are 62.4 million people with T2DM and 77 million people with pre-diabetes in India [1] and the numbers are expected to increase to 101 million by year 2030 [2]. Correlation between ABO blood groups and certain diseases like pancreatic cancer have been reported in past studies [3]-[5]. Thus, aim of the present study was to evaluate the distribution of ABO blood groups in T2DM patients and controls.

II. Subjects

A total of 164 individuals were evaluated. Out of which 106 were T2DM patients and 58 were healthy individuals matched for age, gender, socio-economic status etc. The study was from June to December 2013. The study was approved by Institutional Ethics Committee, Kurukshetra University, Kurukshetra. Written informed consent was obtained from all individuals.

III. Materials and Methods

The blood samples were collected by veni-puncture in 4 ml K\(_2\)EDTA vacutainers, labeled and transported to laboratory for determination of blood groups. ABO and Rh (D) blood grouping was performed simultaneously. Slide agglutination method was followed. Standard technique of serology and manufacturer’s directions enclosed with the different blood grouping reagents was followed.

IV. Statistical analysis

Chi-square test was applied to estimate the probability of difference distributions occurring by chance. p<0.005 was considered to be significant. The allele frequencies of A, B and O alleles were calculated according to Yasuda (1984) [6]. Square root method was used to evaluate d allele frequency.

V. Result

Phenotype and allele frequencies of ABO and Rh (D) blood groups in T2DM patients and control subjects are depicted in table 1. T2DM patients with blood group B (43.40%) and O (30.19%) were more numerous than controls and least frequent blood group was AB (6.60%). Blood group A (25.86%) and AB (12.07%) were more common in controls than in T2DM patients. Allele frequency for diabetics were in order O>B>A. A allele
frequency (0.477) was found to be highest and B allele frequency (0.317) was lowest in controls. The frequency of D allele was higher in T2DM patients (0.755) than in controls (0.679). d allele frequency was found to be higher in controls (0.321) than T2DM patients (0.245). Table 2 shows chi-square values of ABO blood group in T2DM patients and controls. A chi-square value for ABO blood groups was found to be highly significant in both T2DM patients and control subjects.

Table 1: Phenotype and allele frequency of ABO and Rh (D) blood groups among T2DM patients and controls.

<table>
<thead>
<tr>
<th>Group</th>
<th>Phenotype frequency</th>
<th>Allele frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>A</td>
<td>B</td>
</tr>
<tr>
<td>T2DM</td>
<td>n (%)</td>
<td>21</td>
</tr>
<tr>
<td>(106)</td>
<td></td>
<td>(19.81)</td>
</tr>
<tr>
<td>Controls</td>
<td>n (%)</td>
<td>15</td>
</tr>
<tr>
<td>(58)</td>
<td></td>
<td>(25.86)</td>
</tr>
</tbody>
</table>

The value in parenthesis shows the number observed.

Table 2: Chi-square values for ABO blood group in T2DM patients and controls.

<table>
<thead>
<tr>
<th>Group</th>
<th>df</th>
<th>$\chi^2$</th>
<th>Probability</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>T2DM patients</td>
<td>4</td>
<td>31.352</td>
<td>P&lt;0.005</td>
<td>Significant</td>
</tr>
<tr>
<td>Controls</td>
<td>4</td>
<td>20.640</td>
<td>P&lt;0.005</td>
<td>Significant</td>
</tr>
</tbody>
</table>

VI. Discussion

Data on association between the distribution of the ABO and Rh (D) blood types and disease is conflicting. Despite the fact that blood groups play important role in certain diseases, for example, peptic ulcers and gastric cancer [7]. Few studies showed no association between diabetes mellitus and ABO blood groups [8]-[10]. While others suggested that there is an association between ABO blood group and certain diseases [11], [12]. In past studies, increased frequency of blood group B among diabetics was reported [13]-[15]. The same is found in our study. The type B and type O blood group individuals show greater risk of obesity related diabetes due to carbohydrate intolerance as they are not able to dispose off insulin displacing lectins. Lectins cause insulin resistance, hypoglycemia, and obesity leading to T2DM [16]. Individuals with O blood group have about 25% less clotting factor VIII and von willebrand factor in their plasma [17]. These factors have relationship with hypercholesterolemia which in turn has a relationship with diabetes [18]-[20].

VII. References


Conflict of interest

There are no conflicts of interest.

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