

ANALYSIS OF PATTERN OF ABO BLOOD GROUPS IN PEDIATRIC DIABETIC PATIENTS – AN OBSERVATIONAL STUDY

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ABSTRACT

Diabetes Mellitus (DM) is the most frequently occurring metabolic disorder, caused by inadequacy in secretion of insulin or malfunction leading to chronic hyperglycemia. Well-established corroborations have been reported in the literature suggesting association of ABO blood group with DM. The available literature focuses on adult population, with limited information of said association in children. Thus this study was aimed to determine the association of ABO blood group with Diabetes in pediatric patients having confirmed diagnosis. This was a comparative cross sectional study conducted from October 2021-January 2022 at Endocrinology Ward, Children Hospital Lahore (CHL), Pakistan. The study was approved by the local research ethics committee of CHL and conducted according to the declaration of Helsinki 2000. Blood grouping was done by forward and reverse methods. A total of 25 patients, including 18 males and 7 females were included. Frequency of blood group B (n=10;40%) was highest followed by blood group O (n=4;16%), A blood group (n=3;12%), and AB (n=1;4%) in males. In females, the blood group AB (n=3;12%) has the highest frequency followed by O (n=2;8%). Blood group A (n=1;4%) and B (n=1;4%) had the same frequency among female diabetic patients.

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INTRODUCTION

Diabetes mellitus (DM) is a chronic disorder characterized by hyperglycemia as a result of insulin dysfunction or reduced release or development of insulin resistance at cellular level. Diabetes mellitus may occur due to disturbed metabolism of carbohydrates, protein and fat which as a result of deficiency in insulin secretion or insulin malfunction or in combination (1). Pathogenesis of diabetes mellitus has a very wide range from pancreatic cell destruction due to autoimmune disorder (2). Diabetes Mellitus is comprised of two types including insulin-dependent diabetes mellitus (IDDM or Type I), which results from the reduced insulin production, and non-insulin-dependent diabetes mellitus (NIDDM or type 2) related to the insulin resistance at the peripheral level, where insulin level remains normal or sometimes even enhanced but unable to maintain blood glucose levels (3). In Type 1 diabetes mellitus the insulin-making cells in the pancreas are destroyed by the immune system. The cell of the pancreas which produce insulin are called beta cells (4). This type of diabetes

mellitus is more common in children and young people so it has another name called juvenile diabetes mellitus (5).

Type 2 DM is the most frequently reported type accounting for ~95% of all diabetic cases (6). While DM type I is commonly seen in pediatric population. On the other hand blood grouping is determined by the presence of genetic pattern inherited from mother and father. There are two fundamental systems used for blood grouping, that is ABO system based on A and B antigen i.e. A blood group: having A antigen on Red blood cells (RBC), B blood group suggest B antigen on RBC, AB blood group having both A and B antigen while O blood group have none. It is interesting that the blood group having A antigen will have anti-B antibodies and vice versa. The Rh grouping determines the presence of Rh antigen and divides each blood group of ABO system into two groups; positive and negative.

Blood grouping is a genetic determination, thus there is some disease preponderance, where some diseases are found more in one blood group than the other. Given the nature of DM in children this study was conducted to evaluate the pattern of ABO blood grouping pediatric children.

METHODS

This was a comparative cross-sectional study, conducted from October 2021 to January 2022 at endocrinology ward, Children Hospital Lahore (CHL), Pakistan. The study was approved by the ethical committee of CHL and performed according to the declaration of Helsinki 2000. Total 25 diagnosed cases of diabetes mellitus and same number for healthy (non diabetic) controls with age range 1 to 18 years were included. The samples were collected through convenient sampling from the endocrinology ward of Children Hospital Lahore. For assessment of blood group whole blood was drawn in an EDTA vial (Lavender top) and a heparinized serum vial (Yellow top). Both forward and reverse grouping was performed in the blood bank following standard procedure (7).

Statistical package for the social sciences (SPSS) version 23 was used for the analysis of the data. Frequencies were evaluated and Chi-square test was used for the association between variables. A p-value was set at 0.05, and <0.05 was considered significant.

RESULTS

Total 25 patients and equal number of healthy controls' samples were analyzed including 7 females in the study group and 18 males, while in control group 16 were males and 9 were females. The blood group B (n=11; 44%) followed by blood group O (n=6; 24%) were high in patients with diabetes mellitus. While blood group A and AB were shown to have equal frequencies (n=4; 16%). Among the healthy controls, the frequency of blood group B (11; 44%) was the highest followed by blood group A (9; 36%) and O (5; 20%). The least frequency among all the healthy control showed by blood group AB (0; 0%), as shown in Table 1. There was a significant difference in the distribution of A and O groups (p-value <0.001).

Table 1. Comparison of ABO blood groups in Diabetic pediatric patients and healthy controls

Blood group	Controls n(%)	Cases n(%)	p-value
A	9(36)	4(16)	<0.001
B	11(44)	11(44)	0.42
AB	0	4(16)	0.09
O	5(20)	6(24)	<0.001

DISCUSSION

Populations showing genetic association with diabetes mellitus are crossbreed populations comprised of the recent parenteral populations mixing in addition to the ancestral mixing. The available literature has conflicting data regarding association of blood grouping and DM, showing positive association in some studies and no significant in others. B blood group has shown more association among all blood groups.

The study on the association of the ABO blood group with diabetes mellitus in Bangladesh shows that there is no significant association between blood group distribution and diabetes mellitus, in which they studied 2,312 patient samples and 8,936 control samples (8). On the contrary, this study has shown the frequency of blood group B is highest among all, and O and AB blood groups are least. Further investigation and confirmation of my studies can be done by using a larger sample size.

In India, the study on the association of the ABO blood group has also been carried out on 511 patients with different racial distribution and 475 healthy control samples from the same geographical and socioeconomic status with the patients provided the exclusion of diseased condition (9). Another research study demonstrated that the frequency of A and O blood group is higher in healthy controls than in diabetic patients but statistical significance was still absent. For controls, the statistical significance was present in terms of racial distribution but still absent in diabetic patients (10). In current study, the prevalent blood group was B (44%) both among diabetic patients and healthy controls even having the same frequencies but there was no statistical significance p -value <0.05 . AB blood group had the least frequency both in patients and healthy controls. However, the blood group A and O have shown lower frequencies among diabetic patients 16% and 24% respectively, and the same for AB which might be protective against DM. In this study the association of gender and blood groups of both patients and control samples have also been studied, which shown a significant association in chi-square test. The frequency of male (18;72%) among 25 diabetic patients is higher than females (7;28%) so, male are at higher risk of acquiring diabetes mellitus than females. Further, among males, those having blood group B (10;40%) are at risk because its frequency is highest among all others. Among female patients AB blood group has highest percentage (3;12%) so, in females the AB blood group is at higher risk than others. In normal control sample the frequency of male (16;64%) is higher than female (9;36%) but still lower than in patients which is 72%. These results confirm the higher association of male with diabetes mellitus. However, due to limitations of time and resources and small sample size this study has not been conducted at broader level. Further investigation on this association should be done.

CONCLUSION

The results obtained from this study have shown that there is no significant association of ABO blood groups with diabetes mellitus but the frequency of blood group B is highest among all and lowest frequency of O and AB shown the lower risk of diabetes mellitus among these blood groups. Other results have shown the significant association of gender with diabetes mellitus the higher percentage of male in diabetic patients than females.

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