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DISTRIBUTION OF ABO AND RH (D) ALLELE FREQUENCY AMONG ASTHMATIC PATIENTS

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ABSTRACT

The present study was undertaken to investigate the association of ABO and Rh (D) allele frequency with asthma. A total of 180 subjects (120 asthmatics and 60 controls) were analyzed for ABO and Rh (D) blood typing. Blood group O (42.5%) was found to be more frequent in asthmatics as compared to controls (15%). Allele frequency of O was highest in asthmatics (0.652) followed by B (0.247) and A (0.101). Chi- square value for ABO blood group was significant ($p<0.05$) in case of asthmatics while non-significant ($p>0.05$) in controls. In both asthmatics as well as healthy subjects Rh $(D)^+$ phenotype was more abundant (87.5% and 88.33% respectively) than Rh $(D)^-$ phenotype. D allele was more frequent in both the groups (0.647 in asthmatics and 0.658 in controls).

KEYWORDS: Asthma, ABO Blood Group, Allele Frequency

INTRODUCTION

Asthma is a chronic disorder of the airways affecting 300 million people globally. Raising incidences of asthma in urban population has become a serious problem worldwide (WHO, 2008). There are 25-30 million people affected with asthma in India and the prevalence of asthma is higher in the rural areas than in urban areas (CDC, 2012). The ABO blood group system is an important feature of a population. Earlier studies have reported that the ABO blood group distribution varies in different geographical and ethnic groups, and socio-economic groups (Beardmore *et al.*, 1983). In India, the frequency for B ranges from 6% in Negritos of Andamans to 48% in Birijas of Bihar while group A is 20-30% in Western and Eastern Himalayas (Barua, 2002).

The blood group frequency in North India is B >O>A>AB (Bhasin *et al.*, 1992). Since the discovery of blood groups there have been many studies reporting the association of various diseases with particular blood groups. The distribution of the ABO blood group in peptic ulcer and gastric cancer patients was studied by Airid *et al.* (1954), Clarke *et al.* (1955, 1959), Buckwalter *et al.* (1956), Brown *et al.* (1956), Doll *et al.* (1960), Beasley (1960), and Sharara *et al.* (2006). People with blood group A have been reported to be more prone to gall stones, colitis and tumors of salivary glands, pancreas as well as ovary (Jesch *et al.*, 2007). The present study is an attempt to study the distribution of ABO and Rh allele frequency among the asthmatic patients and healthy individuals.

MATERIALS AND METHODS

Subjects

For the present study 120 asthmatic patients were chosen randomly for ABO and Rh blood typing. For comparison 60 age, sex and socio-economic status matched healthy individuals were selected randomly from the same area. An informed consent was taken from each individual before sampling. Ethical clearance was obtained from Institutional Ethics Committee, Kurukshetra University, Kurukshetra prior sampling.

Sampling and Laboratory Analysis

The blood samples were taken directly from the vein with the help of a medical supervisor. The samples were collected in K_2EDTA vials and brought to the laboratory for analysis. ABO and Rh blood grouping was performed simultaneously. Red blood cell agglutination method was used for analysis of blood group. A drop of each antisera-A, antisera-B and antisera-D was placed on to a clean, labeled glass slide and a drop of blood was added and mixed immediately. Agglutination with antisera-A showed A blood group, with antisera-B showed B blood group and with both A and B showed AB and with neither of these showed O blood group. Agglutination of blood with D showed positive test for D antigen.

Statistical Analysis

Allele frequencies of ABO blood group system were calculated according to Yasuda (1984) and d allele frequency was calculated by square root method. Statistical calculations were done using chi-square test.

RESULTS

The phenotype and allele frequency of ABO blood group of asthmatics and controls have been illustrated in table 1. In asthmatics the phenotype frequency of blood group O was highest (42.5%) while among the controls blood group B was found to be highest (51.66%). The allele frequency of O allele was highest in the asthmatics (0.652) followed by allele B (0.247) and allele A (0.101) whereas in healthy subjects there was very less difference observed between the frequencies of allele B and O (0.381 and 0.387 respectively) while the frequency of allele A was higher in comparison to asthmatics. Table 2 shows the chi- square values of the ABO blood groups among the asthmatics and healthy controls. The chi square value was observed to be significant ($p<0.05$) in the asthmatics showing heterogeneous distribution while in controls the chi square value was non-significant ($p>0.05$) showing homogenous distribution among the healthy population. In case of Rh (D) blood groups, 87.5% asthmatics were Rh $(D)^+$ while only 12.5% were Rh $(D)^-$. Allele frequency for D allele was 0.647 in asthmatics and 0.658 among controls hence very less difference was observed in case of Rh (D) allele (Table 3).

Table 1: Phenotype and Allele Frequency of ABO Blood Groups among Asthmatic Subjects and Healthy Controls

Population Group	N	ABO Phenotype					ABO Allele Frequency		
			A	B	AB	O	O	A	B
Asthmatics	120	Obs. Exp.	17(14.17) 17.04	39(32.5) 45.96	13(10.83) 5.98	51(42.5) 51.01	0.652	0.101	0.247
Controls	60	Obs. Exp.	14(23.33) 13.98	31(51.66) 26.39	6(10) 10.6	9(15) 8.98	0.387	0.232	0.381

Values in parenthesis show the percent frequency

Table 2: Chi- Square Value of ABO Blood Groups among Asthmatic Subjects and Healthy Controls

Population Group	df	Chi-Square Value	Probability	Remarks
Asthmatics	3	9.269	$p<0.05$	Significant
Controls	3	2.801	$p>0.05$	Non-significant

Table 3: Phenotype and Allele Frequency of Rh (D) Blood Groups among Asthmatic Subjects and Healthy Controls

Population Group	Rh (D) Phenotype		Rh (D) Allele Frequency	
	$Rh(D)^+$	$Rh(D)^-$	D	D
Asthmatics	105 87.5	15 12.5	0.647	0.353
Control	53 88.33	7 11.66	0.658	0.342

DISCUSSIONS

Data on association of ABO blood group frequency with asthma has been inconsistent. Some earlier workers have reported no association of the ABO blood group frequencies with asthma. Our results are in disagreement with the studies which reported no association of ABO blood typing with asthma (Denborough *et al.,* 1968; Brachtel *et al.,* 1979; Bijanzadeh *et al.,* 2009). De la Vega and co- workers (1976) have reported significant difference in the distribution of blood group A and O between the asthmatics and controls. Studies have reported that people with blood group O are more susceptible to lung disorders than other blood groups. Despite the above mentioned differences, the results of present study are in agreement, at least in part, with those reporting an association between the O blood group and asthma in Italian (Ronchetti *et al.*, 2001) and Taiwanese children (Chen *et al*., 2005) and European adults (Kauffmann *et al*., 1996) and in Najaf population (Al-shamma *et al*., 2008) Lower lung function and higher prevalence of wheezing and asthma were observed in people with O blood group (Kauffmann *et al.*, 1996).

In the present study we found higher frequency of blood group O among asthmatics. Less difference was observed between blood group A and AB among the asthmatic patients. The ABO blood group system is characterized by the expression of carbohydrate antigens in different tissues (Oriol, 1995). The glycosyltransferase coded by the ABO genes modifies the glycoconjugate expression. The terminal structure of the glycoconjugates expressed in the O blood group differs from those expressed in the other ABO phenotypes (Oriol, 1995; Schenkel-Brunner, 2000). The differences between distinct glycoconjugate profiles create different binding sites on the terminal structure of the oligosaccharide chains (Henry, 2001). Since these glycoconjugates act as potential receptors for microorganisms, those expressed in the O blood group may bind allergens and influence the immune response (Karlsson *et al.*, 1992; Henry, 2001; Linden *et al.*, 2008).

CONCLUSIONS

The present study indicated that there is a possible association between blood group O and asthma prevalence. The study revealed the importance of ABO blood typing in the demonstration of atopic diseases like asthma.

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CONFLICT OF INTERESTS

The authors state that there were no conflicts of interests.

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