

Association of ABO Blood group phenotypes with FEV1/FVC values among students of Aziz Fatima Medical and Dental College

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Abstract

Objective: To find the frequency of obstructive and restrictive lung disease in various blood groups in young students of Aziz Fatimah Medical and dental college.

Methods: This cross-sectional analytical study was conducted at Aziz Fatima Medical and Dental College, Faisalabad from 1st January to 31st March 2022. It included 80 participants of first-year MBBS comprising both genders between 18 to 22 years. Ethical approval was taken from the institutional ethical committee of the institute. After fulfilling inclusion and exclusion criteria blood grouping was done by conventional slide method and Spirometry was performed to access lung function parameters to determine obstructive and restrictive lung diseases. Data was analyzed by using SPSS version 26.

Results: The study population included 36 males (45%) and 44 females (55%). Mean \pm SD age of participants was 20 ± 1.07 years. The most frequent blood group was B followed by O, A and AB. Restrictive lung disease (FEV1/FVC ratio ≥ 0.8) was found in 19(23.8%) participants while obstructive lung disease (FEV1/FVC ratio < 0.8) was found in 46(57.5%) participants. Obstructive lung diseases were more frequently found in subjects with blood group AB while restrictive lung diseases were more commonly noticed in subjects with blood group O. Mean \pm SD of FEV1/FVC% of subjects with obstructive and restrictive lung diseases were 45.15 ± 19.04 and 81.79 ± 8.25 respectively.

Conclusion: Blood group AB is more prone to have Obstructive lung disease with decreased FEV1/FVC ratio. Restrictive lung disease was more commonly seen in blood group O.

Keywords: ABO blood group, Spirometry, Forced Expiratory Volume.

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1. Introduction

The discovery of the ABO system of blood groups leads to the possible role of blood groups in infectious disease. Blood groups are commonly being investigated in epidemiological studies since blood groups have polymorphic expressions among people and populations due to their genetically determination.¹ They serve as receptors for bacteria, toxins and parasites as they aid in colonization, invasion or evasion of host defence mechanisms. ABO trait is associated with several other traits like risk to COVID-19 infection and its related morbidity and mortality, ischemic stroke, myocardial infarction, coronary artery disease, type 2 diabetes, von Willebrand diseases and venous thromboembolism.² Some researchers have found significant role of blood group and cancers like renal, pancreatic and gastric carcinomas.³ Air pollution is a major risk factor for respiratory diseases and many studies conducted in South Asian countries have proven the high level of air pollution in major cities

leads to chronic respiratory diseases like chronic obstructive pulmonary disease, emphysema, chronic bronchitis, upper and lower respiratory tract infections and respiratory distress.⁴ Especially industrial cities like Faisalabad in Pakistan have increased rates of air pollution which has crossed safe limits, leading to serious health problems.⁵

ABO system is studied in COVID-19 patients and analysis reveals increasing infection rates in people with blood group A and least susceptibility to infection and severity of disease to persons having blood group O. Blood group AB leads to increased susceptibility to severity of disease and also risk of death.⁴ Asthma is a very well-known and common respiratory disease and studies have found its relation with ABO system. Additionally, smoking is another contributing factor and major health concern in our society and it is estimated that 36% of adult males and 9% of females are involved in smoking.⁵ Respiratory disease prevalence has been increasing in Pakistan for the past few decades but without updated latest



estimated figures and is not well documented especially in light of epidemiological data.⁵ Smoking and COPD are well evidenced interlinked to each other and COPD is diagnosed on GOLD criteria that is % of FEV1 and FEV1/FVC ratio that is estimated by use of Spirometry.⁶ Strong evidence are available in previous literature showing the correlation of COPD with ABO and Rh system.⁷ ABO system is studied in COVID-19 patients, predominantly affecting the pulmonary system, reveals increasing infection rates in people with blood group A and least susceptibility to infection and severity of disease to persons having blood group O.⁸ However blood group AB leads to increased susceptibility to severity of disease and also risk of death.⁸ Asthma is a very well-known and common respiratory disease and studies have found its relation with ABO system. Strong evidences are available showing that blood group B is mostly associated with bronchial asthma then group A, group O and at last group AB. More Rh positives are found with asthma than Rh negatives.⁹ This study aimed to explore the frequency of obstructive and restrictive lung diseases by using spirometry and to find its association with the blood group. This study will help to identify young adults residing in industrial cities, who are at risk for respiratory diseases so that preventive measures could be taken to reduce the burden of respiratory diseases in society and quality of life will be improved in our community. It will also create awareness among the population.

2. Materials & Methods

This cross-sectional analytical study was conducted at Aziz Fatima Medical and Dental College, Faisalabad from 1st January to 31st March 2022. All medical students of first-year MBBS class aged between 18 to 22 years were included in the study and approached but only 80 males and females were given consent to participate in the study and were recruited by using a convenient sampling technique after fulfilling inclusion criteria. Subjects with known chronic obstructive lung diseases, tuberculosis, smokers, and cardio-respiratory diseases were excluded. The students who refused to participate were also excluded. A brief history was taken and recorded on a structured questionnaire. The blood group was determined using the conventional slide

method. Lung functions i.e. FEV1, FVC and FEV1/FVC ratio measured by using a digital spirometer (Cardio-touch 3000) according to the guidelines recommended by the European Respiratory Society (ERS) and American Thoracic Society (ATS).¹⁰ It was performed by sitting students in an upright position, putting a nose clip and inhaling and exhaling through a mouthpiece to record normal tidal volume initially then the subject was directed to inhale and exhale forcefully to record FEV1 and FVC. The procedure was repeated three times and the average was given by spirometer which we used for data analysis.¹¹ Confidentiality and anonymity were assured to all participants.

3. Results

The total number of participants in the study was 80. There were 36 males (45%) and 44 females (55%). The mean age of participants was 20 ± 1.07 years. The distribution of various Blood groups among the study population is presented in Table 1. The most frequent blood group was B followed by O, A and AB. 86.2% of the study population was Rh +ve. Restrictive lung disease was found in 19(23.8%) participants while obstructive lung disease was found in 46(57.5%) participants; subjects having normal FEV1/FVC ratio was 15 (18.8%) with significant p-values of 0.000. Obstructive lung diseases were more frequently found in subjects with blood group AB while restrictive lung diseases were more commonly noticed in subjects with blood group O. However, chi-square test did not show a significant association between blood groups and lung diseases (P-value= 0.627) (Table 1).

Table 1: Frequency of various Blood groups in study population (N=80)

ABO Blood group	Frequency	Percentage (%)
A	18	22.5
B	34	42.5
AB	7	8.8
O	21	26.3
Rh Blood group	Frequency	Percentage (%)
Rh +ve	69	86.2
Rh -ve	11	13.8

Obstructive lung diseases were more commonly found in subjects with the Rh +ve blood group while restrictive lung diseases were more commonly noticed in subjects

with the Rh -ve blood group. However, the difference in the proportion of lung disease among the Rhesus blood groups was not significant (p -value=0.555) (Table 2). Table 3 is showing significant differences in mean, FEV1, FVC and FEV1/FVC ratio among subjects with normal lung function, obstructive and restrictive lung diseases in our study population.

A test of normality was performed to check the distribution of data and the results are as follows:

Table 2: Distribution of lung disease in various Blood groups (N

ABO Blood group	Lung disease FEV1/FVC %	Frequency	Percentage (%)
A	Restrictive lung disease FEV1/FVC > 80	3	16.7
	obstructive lung disease FEV1/FVC < 80	11	61.1
	Normal FEV1/FVC FEV1/FVC 70-80	4	22.2
B	Restrictive lung disease FEV1/FVC > 80	9	26.5
	obstructive lung disease FEV1/FVC < 80	17	50.0
	Normal FEV1/FVC 70-80	8	23.5
AB	Restrictive lung disease FEV1/FVC > 80	1	14.3
	obstructive lung disease FEV1/FVC < 80	6	85.7
	Normal FEV1/FVC 70-80	0	0
O	Restrictive lung disease FEV1/FVC > 80	6	28.6
	obstructive lung disease FEV1/FVC < 80	12	57.1
	Normal FEV1/FVC 70-80	3	14.3
p-value			0.627
Rh Blood group	Lung disease	Frequency	Percentage (%)
Rh +ve	Restrictive lung disease FEV1/FVC > 80	15	21.7
	obstructive lung disease FEV1/FVC < 80	41	59.4
	Normal FEV1/FVC 70-80	13	18.8
Rh -ve	Restrictive lung disease FEV1/FVC > 80	4	36.4
	obstructive lung disease FEV1/FVC < 80	5	45.5
	Normal FEV1/FVC 70-80	2	18.2
p-value			0.555

NS = Non-significant ($P > 0.05$); * = Significant ($P < 0.05$); ** = Highly significant ($P < 0.01$)

Table 3: Lung Function Test in Lung Diseases(N=80)

Lung function tests	Obstructive lung disease		Restrictive lung disease		Normal lung function	p-value	
	Reduced FEV1/FVC		Increased FEV1/FVC				
	Mean ±SD	Median (IQR)	Mean± SD	Median (IQR)	Mean ±SD	Median (IQR)	
FEV1 (L)	1.26 ±0.71	1.29 (1.09)	1.51±0.55	1.43 (0.53)	2.33 ±0.33	2.22 (0.60)	<0.001*
FVC (L)	2.66 ±0.83	2.64 (1.18)	1.84±0.64	1.74 (0.77)	2.42 ±0.33	2.26 (0.65)	<0.001*
FEV1/FVC ratio	45.15 ± 19.04	46.74 (33.76)	81.79± 8.25	79.84 (8.58)	92.64 ± 5.38	92.91 (10.98)	<0.001*

NS = Non-significant ($P > 0.05$); * = Significant ($P < 0.05$); ** = Highly significant ($P < 0.01$)

4. Discussion

We conducted this study to investigate the correlation between ABO blood group system phenotypes and FEV1%, FVC and FEV1%/FVC with help of spirometry in subjects since only few studies are available on this topic and this type of research was never conducted on Pakistan.

In this study, most of the study population comprised of females as compared to males (55% versus 45%). In contrast to our study, Petričević et al documented the relation of blood groups with COPD comprised of a majority of the male population.⁷ Blood group B was the most frequent blood group followed by O, A and AB in the population. Our results are aligned with previous studies conducted in Faisalabad and other regions of Punjab.^{12,13}

The current study found a high frequency of obstructive lung diseases in subjects having blood group AB as eighty-five percent of the population had obstructive lung diseases. Comparable to the current study, the highest frequency of chronic obstructive pulmonary disease was reported in blood group A and the least in blood group B by Petričević B et al.⁷ An older study conducted on the relationship of chronic obstructive pulmonary disease also documented discordant results reveals that blood group O persons had lower lung functions.¹⁴

We have found out significant relationship between obstructive and restrictive lung disease and overall there was an obvious number of obstructive lung disease

patients as compared to restrictive lung disease and normal subjects.

Current study results showed obstructive lung disease is least common in blood group B but these results are not by a study done by Abbas et al, as they found blood group B to be more prevalent in obstructive lung disease. 9 Mroczek et al, have found blood group A more prevalent in patients having obstructive lung disease as compared to the current study results in which the AB blood group is more common.¹⁴

A group of researchers also concluded results that mostly blood group A and then non-O blood groups have increased frequency of COPD along with lower average values of spirometry in comparison to blood group O6. In this study, we have found statistically insignificant lowest values of FEV1 and FEV1/FVC ratio for blood group AB which can be due to the small sample size. While a study conducted by Abbas RS et al., on asthmatic patients shows lower lung function in blood group O.9 However Lampalo M et al., found no statistically significant relationship between allergic and non-allergic asthma based on ABO blood group system and they have found not any significant difference of FEV1 and FEV1/FVC ratio between cases and controls.¹⁴ The same results were also found in a study conducted in India by Bijanzadeh M et al.,¹⁶

Regarding the rhesus (Rh) group, we have found more Rh +ve (86.2%) subjects as compared to Rh -ve (13.8%). These results are by Sabir et al., who have found more Rh-positive in their study population.¹¹ These results are also observed within our country like in Islamabad, Sialkot, Peshawar, Lahore, Multan and Karachi while considering internationally in Turkey, Saudi Arabia, Bahrain, Iran, Palestine, India, Nigeria and Bangladesh.¹¹

We have found most of the Obstructive lung disease in the Rh +ve population and Restrictive lung disease in mostly the Rh-ve blood group. These findings are in coherence with García-Río et al., who found more Rh+ve people with asthma.¹⁷

Up to date, there is no study available that provides frequencies of FEV1, FVC and FEV1/FVC ratio in different ABO blood group systems and provides risk of obstructive and restrictive lung disease frequency in various blood groups. There is a need for further investigation on this topic as very limited data is available.

5. Conclusion

Obstructive and Restrictive lung diseases were seen in blood groups AB and O respectively. Subjects with Obstructive lung Disease have decreased FEV1/FVC ratio.

INSTITUTIONAL REVIEW BOARD

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Contributions:

H.Z, A.R, S.Z, S.J, B.A - Conception of study

H.Z - Experimentation/Study Conduction

H.Z, A.R, S.Z, S.R, S.J, B.A -

Analysis/Interpretation/Discussion

H.Z, A.R, S.Z, S.R - Manuscript Writing

H.Z, S.R, S.J, B.A - Critical Review

- Facilitation and Material analysis

All authors approved the final version to be published & agreed to be accountable for all aspects of the work.

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