

Relationship of ABO and Rh blood groups with history of gastritis in the undergraduate medical and dental students: a cross-sectional study

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ABSTRACT

Background & Objectives: The various ABO and Rh blood groups with different distribution frequencies in the general population have been found to be associated with different diseases, most notably gastritis. Many studies have claimed Rh groups to be indifferent to such association. Nonetheless, ABO group is found to be linked with chronic gastritis. The aim of this study was to estimate the frequencies of ABO and Rh blood groups and the gastritis amongst the first and second year undergraduate medical and dental students; and to study their relationships. **Materials & Methods:** In a descriptive, cross-sectional study, 247 study participants were enrolled. After procuring clearance from the institutional review committee and the informed and written consent from the study participants, data collection was done on the variables, year of study (first or second year), gender, blood groups (ABO and Rh) and history of gastritis (present or absent). **Results:** Blood group O was the commonest (n=99; 40.1%) followed by group B (n=77; 31.2%). Similarly, 239 (96.8%) participants were Rh-positive as compared to 8 (3.2%) Rh-negative. Interestingly, 46 (18.6%) of the participants reported positive history of gastritis. Participants with blood group O had the greatest odds (OR=1.64) of having history of gastritis compared with those with other blood groups combined. Distribution of study participants based on gender and history of gastritis in either systems of blood grouping showed no significant difference in their proportions ($p>0.05$). **Conclusion:** In light of the above findings, further longitudinal studies can be designed to better assess the relationship.

Key words: Blood groups; ABO groups, Rh groups; gastritis

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INTRODUCTION

Blood group antigens, A, B, and D present on the membrane of red blood cells account for the ABO and Rh blood group systems, respectively.¹ These antigens are permanent, fixed and lifelong biological markers of any individual, as unique as fingerprints.^{2,3} In ABO system, blood group A contains A-antigen and anti-B-antibody; group B contains B-antigen and anti-B-antibody; AB contains both A- and B-antigens and no antibodies whereas O blood group contains no antigens and both anti-A and anti-B antibodies. In this system, all blood groups have H-antigen, a complex

oligosaccharide with a terminal fucose. Group A has terminal N-acetylgalactosamine on H-antigen; B has terminal galactose and whereas blood group AB has both, O group has neither apart from the H-antigen. In Rh system, the most antigenic D is the characteristic antigen.¹

The distribution of the ABO blood groups varies in populations throughout the world.⁴ In well documented studies, O blood group has been found to have a frequency of about 45%, A-group about 41%, whereas B is 10% and Ab only 4%. Similarly, in the Asian population, it has been found that more than 99% are D-positive, in addition to prevalence of

ABO blood groups as (A: 25%; B: 25%; AB: 5% and O: 45%).¹

Apart from the associated clinical significance in transfusion, it is becoming increasingly apparent that ABO antigens are of biological significance and may be associated with predisposition to, or protection from many diseases.² Evidence from several studies suggests that the individuals with various blood groups (as per the ABO and Rh systems) are differently susceptible to certain diseases.¹

Many studies have rightly reported the higher prevalences of gastric ailments like gastric and duodenal ulcers in individuals with blood group O. Although many such evidences fail to back up the association with sufficient explanations, it has been a common notion amongst them that increased colonization of the gastric and duodenal mucosal cells of group O subjects with *H. pylori*, the most significant infectious agent for such conditions, accounts for such observations. Nonetheless, many studies have found that individuals with blood group A have also been found to be at increased risk for the development of gastric carcinoma, *H. pylori* being the possible link.

Undergraduate Medical and Dental students, unlike other professionals, are under relentless mental hassle to live up to their academic errands. Psychological stress, one of the significant risk factors for the development of gastric ailments like gastric and duodenal ulcers, cannot be unheeded in such individuals. Therefore, we conducted the present study to estimate the frequencies of blood groups (ABO and Rh) and the gastric problems amongst the first and second year undergraduate medical and dental students; and to study their relationships in these study participants.

MATERIALS AND METHODS

The study was conducted in the department of Physiology, College of Medical Sciences and Teaching Hospital from June 2017 to July 2017 after procuring permission from the institutional review committee (IRC). Using a descriptive, cross-sectional design, data collection was done on variables, year of study, gender, blood groups (ABO and Rh) and history of gastritis in the study participants i.e., first and second year medical and dental students after obtaining written and informed consent. All the students willing to participate were included in the study. History of gastritis was assessed in the form of absence or presence (diagnosed or undiagnosed) of history of gastritis.

Blood groups (ABO and Rh) of the participants were collected from their official records in the institution. Any participant without any record of the blood group or not willing to participate was excluded from the study. A total of 247 students were enrolled in the study as the study participants. Initial entry of the collected data was done in Microsoft Office EXCEL 2016 software. After refining, the data was finally analysed using Statistical Package for Social Science (SPSS) software version 16. The different variables used in the study were categorical, i.e., year of study (first or second year), gender (male or female), ABO blood groups (A, B, AB or O), Rh blood groups (positive or negative) and history of gastritis (yes or no). Frequencies with percentages were used to represent the summary measures of the variables. To test the difference in the proportions of different relevant variables, chi-squared (χ^2) test was used. Additionally, odds ratio (OR) with 95% confidence interval (CI) was used to assess the relationship between the different blood groups and the presence of absence of the history of gastritis. The statistical significance was set at $p < 0.05$.

RESULTS

The total number of study participants initially considered in the study was 290 (140 from first year and 150 from second year). After excluding the students using the set criteria, a total of 247 were enrolled as the final study participants (129; 52.2% from first year and 118; 47.8% from second year). Of the total 247 study participants, 146 (59.1%) were male and 101 (40.9%; female). Blood group O was the commonest one amongst the various ABO blood groups (99; 40.1%) followed by group B (77; 31.2%). Similarly, 239 (96.8%) students had Rh-positive blood groups as compared to 8 (3.2%) Rh-negative. Interestingly, 46 (18.6%) of the participants reported history of gastritis. (Table 1) As depicted in table 2, blood group O was the most prevalent one in both Rh positive and negative individuals (40.2% in Rh positive and 37.5% in Rh negative). The second prevalent group was group B in Rh positive and both group A and B in Rh negative individuals (31.4% in Rh positive and 25.0% in Rh negative).

Table 3 illustrates the distribution of the participants with two systems of blood groups (ABO and Rh), based on gender and history of gastritis. Blood group O was the most prevalent in both male and female students (40.4%; males and

Table 1: Frequency distribution of the study participants for the different categorical variables used in the study

Variable	Frequency	%
Year of Study		
First Year	129	52.2
Second Year	118	47.8
Gender		
Male	146	59.1
Female	101	40.9
Blood Group (ABO)		
Group A	48	19.4
Group B	77	31.2
Group AB	23	9.3
Group O	99	40.1
Blood Group (Rh)		
Rh Positive	239	96.8
Rh Negative	8	3.2
History of Gastritis		
Yes	46	18.6
No	201	81.4

39.6%; females) followed by group B (30.8%; males and 31.7%; females). Similarly, most of them (both males and females) were Rh positive (96.6%; males and 97%; females). Gender-wise distribution of participants in either systems of blood group showed no significant difference between their proportions ($p>0.05$; χ^2 -Test). Next, the prevalence of positive history of gastritis was the maximum in participants with blood group O (23.2%) followed by group A (20.8%). Similarly, 25.0% of the Rh negative individuals reported such history. Distribution of participants based on history of gastritis in either system of blood groupings also showed no significant difference between their proportions ($p>0.05$; χ^2 -Test). Finally, as depicted in table 4, participants with blood group ‘‘O’’ had the greatest odds (OR,1.64; 95%CI, 0.86-3.13) i.e., 1.64 times greater odds of having history of gastritis compared with those with other blood groups combined. This was followed by the participants of ‘‘A’’ blood group (OR, 1.19; 95% CI, 0.54-2.61). Similarly, table 4 also shows that individuals with Rh negative blood groups had 1.48 times greater odds of having history of gastritis as

Table 2: Frequency distribution of ABO blood groups in participants with Rh positive and negative groups

Blood Group (Rh)	Blood Group (ABO)			
	Group A	Group B	Group AB	Group O
Rh Positive	46 (95.8%) ^a (19.2%) ^b	75 (97.4%) ^a (31.4%) ^b	22 (95.7%) ^a (9.2%) ^b	96 (97.0%) ^a (40.2%) ^b
Rh Negative	2 (4.2%) ^a (25.0%) ^b	2 (2.6%) ^a (25.0%) ^b	1 (4.3%) ^a (12.5%) ^b	3 (3.0%) ^a (37.5%) ^b

a: Occurrence (percentage) along a column
 b: Occurrence (Percentage) along a row

Table 3: Frequency distribution of ABO blood groups according to gender and history of gastritis

Variable	Blood Group (ABO)				Blood Group (Rh)	
	Group A	Group B	Group AB	Group O	Rh (+)	Rh (-)
Gender						
Prevalence (%) across the total of rows						
Male (n=146)	28 (19.2%)	45 (30.8%)	14 (9.6%)	59 (40.4%)	141 (96.6%)	5 (3.4%)
Female (n=101)	20 (19.8%)	32 (31.7%)	9 (8.9%)	40 (39.6%)	98 (97.0%)	3 (3.0%)
Significance (p)	p = 0.996 (χ^2 -Test)				p = 0.843 (χ^2 -Test)	
History of Gastritis						
Prevalence (%) across the total of columns						
Yes (n=46)	10 (20.8%)	10 (13.0%)	3 (13.0%)	23 (23.2%)	44 (18.4%)	2 (25.0%)
No (n=201)	38 (79.2%)	67 (87.0%)	20 (87.0%)	76 (76.8%)	195 (81.6%)	6 (75.0%)
Significance (p)	p = 0.304 (χ^2 -Test)				p = 0.181 (χ^2 -Test)	

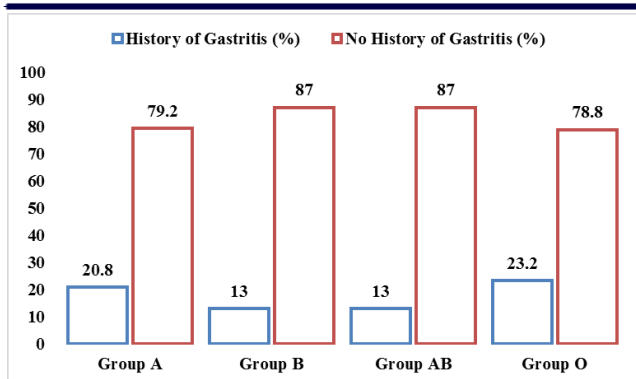


Figure 1: Distribution of participants based on history of gastritis (%) and different ABO blood groups

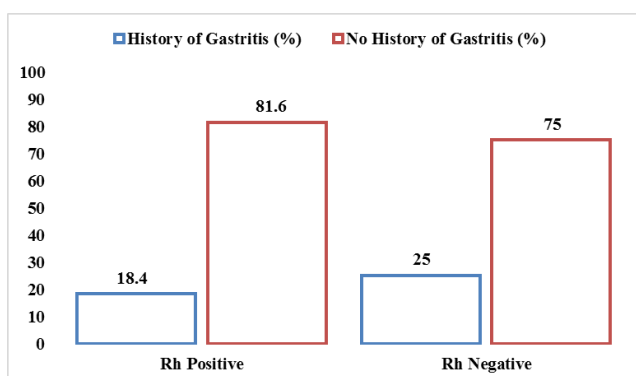


Figure 2: Distribution of participants based on history of gastritis (%) and two Rh blood groups

DISCUSSION

The two major systems of blood groups, i.e., ABO and Rh systems are uniquely related to many diseases, most importantly the gastritis. Differences in the prevalences of the different groups under each system in the population and their susceptibility to the gastric problems prompted us to conduct our study in first and second year medical and dental students.

In our study, we recruited 247 students as the study participants (129; 52.2% from first year and 118; 47.8% from the second year). Of them, 59.1% (n=146) were male and 40.9% (n=101) were

female. Amongst the various ABO blood groups, maximum participants had blood group O (n=99; 40.1%), followed by group B (n=77; 31.2%). Likewise, 239 (96.8%) students had Rh-positive blood groups as compared to 8 (3.2%) Rh-negative. (Table 1) Blood group O was the most prevalent one in both Rh positive and negative individuals (40.2%; Rh positive and 37.5%; Rh negative). This was followed by blood group B in Rh positive (31.4%) and both groups A and B in Rh negative individuals (25.0%) (Table 2). Blood group O was the most prevalent in both male and female students (40.4%; males and 39.6%; females) followed by group B (30.8%; males and 31.7%; females). Similarly, most of them (both males and females) were Rh positive (96.6%; males and 97%; females). Gender-wise distribution of participants in either systems of blood group showed no significant difference between their proportions (p>0.05; χ^2 -Test), (Table 3).

A remarkable 18.6% (n=46) of the participants recounted the history of gastritis. (Table 1). Next, the prevalence of positive history of gastritis was the maximum in participants with blood group O (23.2%) followed by group A (20.8%). Similarly, 25.0% of the Rh negative individuals reported such history. Distribution of participants based on history of gastritis also showed no significant difference between their proportions (p>0.05; χ^2 -Test), (Table 3). Participants with blood group “O” had the greatest odds (OR,1.64; 95%CI, 0.86-3.13) i.e., 1.64 times greater odds of having history of gastritis compared to those with other blood groups combined. This was followed by the participants of “A” blood group (OR, 1.19; 95% CI, 0.54-2.61). Similarly, individuals with Rh negative blood groups had 1.48 times greater odds of having history of gastritis as compared to those with Rh positive group, (Table 4).

Plethora of studies have demonstrated that

Table 4: ABO and Rh blood groups and history of gastritis; odds ratios with 95% CI

Blood Group	Total	History of Gastritis		Odds Ratio (OR)	
		Yes	No	OR	95% CI
ABO System	247				
Group A	48	10	38	1.19	0.54 – 2.61
Group B	77	10	67	0.56	0.26 – 1.19
Group AB	23	3	20	0.63	0.18 – 2.22
Group O	99	23	76	1.64	0.86 – 3.13
Rh System	247				
Rh Positive	239	44	195	0.68	0.13 – 3.47
Rh Negative	8	2	6	1.48	0.29 – 7.57

individuals with blood group O have a higher risk of developing duodenal ulcers and also a higher incidence of gastric ulcers.⁵ In separate studies, the ABO phenotype has been linked with stomach ulcers, which are more common in individuals with blood group O.⁶

Many authors report an association between blood group O and *H. pylori* infection.⁷⁻¹⁰ Epidemiological studies have reported increased frequency of peptic (gastric and duodenal) ulcers in population with blood group O, with higher density of colonization of *H. pylori* onto the epithelial cells of subjects with this group.^{8,11-13} It has been demonstrated that the epithelial cells of persons of group O bound significantly more *H. pylori* than did cells of persons of other blood groups.^{7,8}

Similarly, the increased susceptibility to peptic ulceration among persons with blood group O was due to density of colonization of epithelial cells and higher inflammatory responses to *H. pylori*.¹³ *H. pylori* expresses lipopolysaccharides on its outer membrane including blood group antigen-binding adhesion A (BabA adhesion) which causes adhesion of bacteria to gastric epithelium and allow persistent colonization.¹⁴ Additionally, the study by Petrovic et al.,¹⁵ has shown that the presence of *H. pylori* did not relate to Rh factor.

Notwithstanding, many studies have failed to find an association between ABO blood groups and peptic ulcer disease. Many other studies have also failed to find any association between blood group and *H. pylori* infection.¹⁶⁻¹⁸ Still other studies have also demonstrated that the O blood group did not represent a risk factor for *H. pylori* infection.^{19,20}

The apparent inadequacy of the present study is the small number of study participants and the inclusion of students (of a particular age group) only. The result obtained can be better generalized if large number of participants with varied age groups are taken. Moreover, in our study, we had to rely on students' recall of the history of gastric problems which could have been misleading many a times. This could have been better supplemented with an examination of the participants to elicit the status of their gastric problems. The ABO and Rh blood groups of the participants were collected from their official records; reliance on such source could be a source of error. Additionally, important serological and other biomarkers of *H. pylori* infection were not used in our study to characterize the infection. Finally, the descriptive cross-sectional design of the study could have been replaced with a

longitudinal study to better elicit the causal relationships between the variables of interest in the study.

Despite many shortcomings, the findings in our study were in agreement with many other similar studies that clearly accounts for its generalisability. As such, the findings of our study provided considerable scope for performing further studies to elucidate the association more clearly. Lastly, the study participants were the first and second year. Hence, there was lesser chance of other important causes of gastritis to have already set in; in addition to the obvious benefit the students can gain from such study findings to bring about modification in their personal lifestyles.

CONCLUSION

In light of the findings suggesting the highest frequency of the history of gastritis in participants with blood group O, further longitudinal studies can be planned to better assess the relationship between blood groups and gastric problems.

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