



EXPLORING THE RELATIONSHIP BETWEEN BLOOD GROUPS AND CHOLELITHIASIS: A COMPREHENSIVE RETROSPECTIVE STUDY

General Surgery

Dr. D Vaibhavi Junior Resident, Department of General Surgery, SDUAHER

Dr. Ravikiran H R Associate Professor, Department of General Surgery, SDUAHER

Dr. P N Sreeramulu Professor, Department of General Surgery, SDUAHER

Dr. Neha Ullalkar Junior Resident, Department of General Surgery, SDUAHER

ABSTRACT

Introduction: Gallstones are hardened structures that can form in the gallbladder and are composed of solidified bile, the digestive fluid. The distribution of blood groups differs across various regions and communities in India. In North India, the predominant blood group is B, succeeded by O, A, and AB. Conversely, in South India, the most prevalent blood group is O, followed by B, A, and AB. The present study aims to explore the relationship between ABO blood groups and the occurrence of gallstone disease. **Materials and Methods:** This research involved 400 participants, divided into two groups. The study group comprised 200 individuals diagnosed with Cholelithiasis from surgical patients treated in the Department of General Surgery, while the Control group consisted of 200 individuals without Cholelithiasis at Sri Devaraj Urs Medical College. The study was conducted over a one-year period, from January 2023 to January 2024. **Results:** The study involved two groups with similar mean ages (study group: 52.5 ± 6.18 years, control group: 51.6 ± 4.12 years), showing no significant age difference ($p > 0.05$). In the study group, 44.5% were males, and the O blood group was the most prevalent (37%), followed by B (30.5%), A (21%), and AB (11.5%). Conversely, the control group had 51.5% males, with the B blood group being the most common (41%), followed by O (31.5%), A (17%), and AB (9.5%). **Conclusion:** The study suggests that A and B antigens could be potential risk factors for gallstone disease, noting a higher incidence in O blood group individuals, highlighting a potential link between ABO blood groups and susceptibility to gallstone formation.

KEYWORDS

Cholelithiasis, ABO Blood Group

INTRODUCTION

Gallstones are solidified formations of bile, the digestive fluid, which can develop within the gallbladder. The formation of gallstones arises from an uneven distribution of chemical elements in bile, leading to the precipitation of one or more components.¹ The prevalence of gallbladder stones varies across different regions globally. In India, the incidence is estimated to be around 4%, whereas in Western countries, it is higher at approximately 10%.² Gallstones are often incidentally detected through procedures such as ultrasonography, computed tomography scans, abdominal radiography, or laparotomy, especially in individuals without apparent biliary symptoms. Annually, about 3% of those without symptoms eventually develop symptoms. Across a period of two decades, nearly 66% of asymptomatic individuals with gallstones continue to remain free of symptoms.³

The ABO blood type antigens in humans display different phenotypes and genetically determined glycoconjugate structures. These structures are situated on the surface of red blood cells and actively contribute to the physiological and pathological processes of the cells.^{4,5} The identification of the ABO blood group in 1900 and the discovery of the Rh factor in 1940 by Karl Landsteiner marked a pivotal moment in the field of blood banking and transfusion medicine. Since then, extensive data have been gathered, highlighting the varied prevalence of blood groups worldwide, shaped by factors such as geographical location, ethnicity, and socioeconomic conditions.⁶⁻¹²

Blood group distribution varies among different regions and communities in India. In North India, blood group B is the most prevalent, followed by O, A, and AB. However, in South India, the O blood group is the most common, followed by B, A, and AB.¹²⁻¹⁴

Several study findings have shown link between stomach carcinoma with the B blood group, also peptic ulcer with the O blood group.^{15,16} This paved the way for exploring connections between blood groups and common diseases. Research has established relationships between blood groups and diseases such as nasopharyngeal carcinoma, duodenal ulcer, epistaxis, anemia, cardiovascular diseases.¹⁷⁻²⁰ The presence or absence of blood antigens in certain groups induces morphological and functional changes in blood membranes.

The current study seeks to investigate the correlation between ABO blood groups and gallstone disease. The objective is to identify any associations and potential risk factors among specific blood groups. The goal is to facilitate the implementation of preventive measures for individuals belonging to blood groups identified as having an elevated risk of gallstone disease.

METHODS:

Study Design, Sample Size and Source of Data:

This was a study carried out on 400 participants. A Study group with 200 individuals diagnosed with Cholelithiasis from surgical patients treated in the Department of General Surgery and a Control group consisting of 200 individuals without Cholelithiasis at Sri Devaraj Urs Medical College over period of one year from January 2023 to January 2024. Ethical committee approval was obtained from the Institutional Ethics Committee.

Inclusion Criteria

1. Both sexes with age between 18-65 years.
2. Individuals diagnosed with cholelithiasis (Study group) based on imaging studies such as ultrasound, CT scans, or clinical assessments and without cholelithiasis (Control group).
3. Individuals with documented ABO blood group information.
4. Those who are willing to give written informed consent.

Exclusion Criteria

1. Pregnant, lactating women and menopausal women.
2. Those who have severe comorbidities.
3. Individuals who have undergone gallbladder surgery.
4. Participants with serious medical conditions.
5. Individuals with known blood disorders.

Method of Data Collection

After obtaining approval from the Institutional Ethical Committee (IEC), scientific committee and informed written consent from the study participants the study was conducted in the department of general surgery. Based on the simple random sampling the participants were selected who were diagnosed and admitted in the hospital with cholelithiasis for the study group. Similarly for the control group the participants were selected according to the inclusion and exclusion criteria. All the demographic details were collected from the participants.

For determining ABO blood group, a clean and dry glass slide was divided into two sections using a glass marking pencil, labelled as anti-A and anti-B to identify the antisera. One drop of anti-A serum and one drop of anti-B serum were placed in the centre of the corresponding sections. Antiserum was added first. Subsequently, one drop of the blood sample to be tested was added to each drop of antiserum.

The antiserum and blood were mixed by using a separate stick or a designated corner of the slide for each section, covering an area about 1 inch in diameter. After exactly two minutes, the slide was tilted backward and forward to examine for agglutination. Positive results

(+) were indicated by the presence of little clumps of red cells floating in a clear liquid, while negative results (–) showed red cells floating homogeneously in a uniform suspension.

The two clean slides were labelled with the unique ID of the patient. Subsequently, 50/50 μL (one-one drop) of the patient's blood was pipetted onto the first slide, with two drops placed in the corners and one drop in the centre of the remaining slide. Following this, one drop of A, B, and Rh antisera was added to each slide, and the mixtures were thoroughly mixed using clean sticks or a clean glass slide. The glass slide was then tilted back and forth for up to 2 minutes. Agglutination was observed in each slide, and for the Rh factor, the presence or absence of agglutination determined the Rh status, reported as either Rh positive or Rh negative, as indicated in the result interpretation table.

Statistical Analysis

The data collected was analysed using JAMovi version 2.3.10. Normality of the data was assessed by Kolmogorov Smirnov test. Variables were analysed in terms of mean, standard deviation (SD), frequency (n) and percentage (%). Student t test was used to compare continuous variables. Chi-square test was used to test association between ABO blood group and cholelithiasis. $P < 0.05$ was considered as statistically significant. Data results were represented in the form of tables.

RESULTS

In this study 400 patients were included. There were two groups, Study group (n=200) and Control group (n=200). The mean age of the study group and the control group was 52.5 ± 6.18 years and 51.6 ± 4.12 years respectively. There was no significant difference in age between two groups ($p > 0.05$). Among Study group, 89 (44.5%) were males and 113 (56.5%) were females. Among Control group, 103 (51.5%) were males and 97 (58.5%) were females. There was no significant difference in gender between two groups ($p > 0.05$) as shown in table-1.

Table-1: Comparison of Sociodemographic Characteristics

Variables	Study group, n (%)	Control group, n (%)	p-value
Age, (in years)	52.5 ± 6.18	51.6 ± 4.12	0.09
Gender, n (%)			
Male	89 (44.5%)	103 (51.5%)	0.14
Female	113 (56.5%)	97 (58.5%)	

The study revealed that the O blood group is the most prevalent, constituting 37%, followed by Group B at 30.5%, Group A at 21%, and Group AB at 11.5% in the investigated population. In contrast, the control group exhibited a different distribution, with B group being the most common at 41%, followed by O at 31.5%, A at 17%, and AB at 9.5%. Table 2 illustrates that both the ABO blood group significantly differ between the study and control groups ($P < 0.05$).

Table-2: Comparison of Blood Groups

Blood group	Study group (n=200)	Control group (n=200)	p-value
A	42 (21%)	30 (15%)	0.04*
B	61 (30.5%)	82 (41%)	
AB	23 (11.5%)	30 (15%)	
O	74 (37%)	58 (29%)	
Rh (+)	190 (95%)	196 (98%)	0.18
Rh (-)	10 (5%)	4 (2%)	

*P is statistically significant at < 0.05 .

DISCUSSION

This study provides valuable insights into the relationship between cholelithiasis and blood groups. The inclusion of subjects with overall good general health ensures a comprehensive assessment of blood groups, facilitating accurate evaluation and classification. Given the diverse and expansive nature of India, there is a significant variation in the prevalence of cholelithiasis. Moreover, the distribution of ABO blood groups exhibits regional, ethnic, and population-specific variations. The study acknowledges the complexity of these factors, contributing to a more nuanced understanding of the association between blood groups and cholelithiasis in the context of the diverse Indian population.

Previous studies have explored the potential links between specific blood groups, Rhesus typing, and conditions such as cholelithiasis and metabolic processes, particularly cholesterol metabolism.²¹ The

findings from these reports vary, with some suggesting associations with blood group A, others with blood group AB, and a few asserting no definitive relationship between cholelithiasis and any blood group.²² Among the numerous studies on this topic, many are inconclusive, leading to different conclusions by various authors. For instance, a study by Chakravorti and Chakravorti²², involving 321 patients and 688 controls, suggested that individuals with blood group A may face a higher risk of gallstone disease. On the other hand, Kratzer et al.²³ studied 1030 blood donors, found that the AB blood group was the most prevalent (12.1%) in their series.

In a study on 171 conservative patients with symptomatic gallstones, Juvonen T and Niemelä O²⁴ observed a predominance of blood group A (44%), followed by blood groups O (31%) and B (17%). They noted that individuals with blood group A tended to have more stones with less than 25% cholesterol or no cholesterol compared to those with other blood groups.

The current study indicates a higher prevalence of gallstone disease in individuals with blood group O compared to those without gallstones. Conversely, other blood groups (A, O and AB) demonstrate a relative resistance to gallstone occurrence. Specifically, gallstones are found in 21% of blood group A in study group compared to 15% in control group, 37% of blood group O in study group compared to 29% in control group, and 11.5% of blood group AB in study group compared to 15% in control group. These findings align with previous studies. In essence, the study suggests a relationship between ABO antigens and the occurrence of gallbladder stones, with gallstone prevalence being higher in individuals with blood group B and lower in those with blood group AB.

CONCLUSION

The study proposes that the presence of A and B antigens may pose a potential risk factor for the development of gallstone disease. It observes a higher incidence of gallstones in individuals with blood group O, indicating a possible association between ABO blood groups and the susceptibility to gallstone formation.

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