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"ASSOCIATION OF ABO BLOOD TYPES AND HEPATITIS C VIRUS (HCV) INCIDENCE IN THE PAKISTANI POPULATION: A STUDY IN ISLAMABAD"

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Abstract

Background & Introduction: Karl Landsteiner made a major contribution to the history of transfusions of blood in 1900 when he first introduced the ABO blood type system. In the particular setting of the Pakistani community living in Islamabad, this study explores the connection between ABO blood types and the incidence of the hepatitis C virus (HCV).

Objectives: This study is aimto investigate association of ABO and Rh blood group system among both genders in HCV patients and to investigate which blood group is more prone to HCV in Tertiary Care Hospital Islamabad.

Methodology:
Study setting: Institute of Medical Lab Technology, Isra University Islamabad Campus in collaboration with Tertiary Care Hospital Islamabad**.**

Sample size: 12353 blood donors out of them 12284 were males and 68 females.

Study duration: 6 months from September 31st 2023 to December 31st 2023.

Data analysis: Data was analyzed using SPSS Version 22. Descriptive statistics was applied.

Results: Among 12353 volunteer donors the findings reveal that males were more prone to HCV as compared to females because, males are significant donors. This finding also reveals that individuals with blood group B positive exhibit the highest frequency of HCV, while those with AB negative blood group manifest the lowest incidence. Notably, blood groups A positive and O positive demonstrated higher frequencies than B positive, aligning with the general prevalence observed in the population.

Conclusion: In summary, while our study finds no direct link between blood group and HCV. The elevated occurrence of HCV among males' underscores gender differences in HCV distribution, aligning with existing literature. It identifies a higher prevalence in blood group B positive individuals.

Keywords: Rh, ABO, HCV

Statements and Declarations:
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4. **Data availability statement:** The data that support the findings of this study are available from the corresponding author upon reasonable request.
5. **Informed consent:** Written informed consent for participation and publication of clinical data was obtained from the families. The written informed consent was obtained from all participant families for clinical examination
6. **Ethical approval:** The study received ethical approval on September 25th, 2023, with the assigned IRB approval number (F.1/IUIC-ANMC/IRBC-263/2023).

ETHICAL CONSIDERATION

In conducting our cross-sectional study, which relied on previously collected blood samples, ensuring ethical compliance was paramount. To this end, we obtained informed consent from the hospital authority, acknowledging the importance of respecting participants' rights. Additionally, strict measures were implemented to maintain confidentiality, including anonymizing patient identities and securely storing data to mitigate privacy risks. Ethical approval was obtained from the designated authority, and throughout the study, we diligently adhered to established ethical guidelines to safeguard the well-being of all participants involved. The study received ethical approval on September 25th, 2023, with the assigned IRB approval number (F.1/IUIC-ANMC/IRBC-263/2023).

INTRODUCTION

ABO & Rh blood group system

Blood groups, determined by surface antigens on red blood cells, are essential for transfusion medicine, with Karl Landsteiner's ABO system revolutionizing blood transfusion in 1900. Understanding blood types aids geographical, genetic, and transfusion procedures, reducing illness and death rates while facilitating efficient blood bank inventory management.[1]The ABO blood group system, governed by A and B genes inheritance, plays a crucial role in determining blood group distribution and acts as potential receptors for various pathogens. ABO antigens, found in multiple bodily fluids, have been linked to infectious diseases such as malaria, cholera, and Helicobacter pylori infections.[2, 3]

Liver inflammation is a symptom of hepatitis, which can be caused on by a number of factors, such as viral infections, alcohol usage, certain medical disorders, and interactions between medications. [4]Immunological hepatitis involves antibodies attacking liver tissue, while viral hepatitis (types A, B,

C, D, and E) stems from viral infections, affecting 354 million people globally with chronic hepatitis B and C infections. Although transfusion techniques pose a risk of spreading blood-borne viruses, the chance of infections transferring across transfusion units is minimal.[5]

Healthcare systems are affected immensely by HCV infection. Acute and chronic HCV infections are the two forms. 20 to 25 % of patients experience acute infection, and 15% of those infected develop symptomatic liver diseases.[6] 75–85% of those who suffer from a prolonged acute infection go on to have a chronic HCV infection.Around 71 million people around the world deal with a chronic HCV infection, and over 2 million infections arise per year. 1.75 million HCV infections were reported world-wide in 2015.[7]

Pakistan is nation most severely affected, determining one in every 20 cases of HCV infection & rank with the second-highest victim country. However, the number of cases of HCV has reduced in the twenty-first century compared to the twentieth, the World Health Organization has set aims to prevent HCV infection globally by 2030. Theoretical links between blood types and bacterial, parasite, and viral infections have been studied in relation to the ABO blood type system. Blood types and the level of liver fibrosis in chronic hepatitis C infected patients are connected. Therefore, a study was conducted to explore the possible association of hepatitis C viremia with blood groups, Rh factors, age, and gender distribution among the Pakistani population .[8]

Blood types are important for transfusion therapy and have a big impact on genetic research, transfusion procedures, and disease connections. Numerous studies have shown that the ABO and Rh (D) blood type systems have a significant impact on illness outcomes and susceptibility. Additionally, the prevalence of hepatitis C virus infection and the difficulties it might cause make it imperative to continue researching and working toward the virus's eradication as a major worldwide health concern.

Hepatitis C virus remains a significant threat to the health of the public, allegedly to a study, with numerous outbreaks remaining unknown and untreated. Cirrhosis, fibrosis, and carcinoma of the liver may occur with ongoing HCV infection. There are currently roughly 71 million cases of active HCV globally, which equates to a 1% prevalence. It is projected that 23,720 people in Pakistan lost their lives due to complications related to hepatitis in 2016, and by July 2019, almost 10 million people there had been diagnosed with active HCV infection. Certain types of ABO blood can render people more prone to infections, according to certain studies. Individuals with blood types A and AB, for instance, may be a subjected to severe malaria, and consumers together with type O may be more resistant to some protozoan agents.[9]

Research gap

1. After studying a thorough literature review, it became evident that there exists a timely gap in research pertaining to the hepatitis C virus (HCV) among different genders and within the ABO blood group systems within the population of Islamabad.
2. Despite comprehensive studies encompassing various Transfusion Transmissible Infections (TTI), no investigation specifically addressing HCV prevalence among different genders and ABO blood groups has been undertaken within the past three years.

Material and Methodology

The study employed a cross-sectional design with retrospective proceedings and was conducted at the Institute of Medical Lab Technology, Isra University Islamabad Campus, in collaboration with a tertiary care hospital in Islamabad. It spanned six months, from September 31st, 2023, to December 31st, 2023. The sample size comprised 12,353 blood donors, predominantly males (12,284) and females (68), selected through simple random sampling. Data analysis was performed using SPSS

Version 2022, applying descriptive statistics. Inclusion criteria encompassed both genders aged 18-50 years, while excluding individuals with transfusion-transmitted infections other than HCV.

In the retrospective data collection process, various materials such as syringes, gloves, tourniquets, alcohol swabs, EDTA and gel tubes, slides, antisera A, B, and D, ICT kits, and the Mindray CL900i analyzer were utilized. For blood grouping, transparent slides were prepared and labeled A, B, and Rh, onto which three separate drops of patient blood were placed (The first drop was tested with anti-A monoclonal blood grouping antisera (Catalog No. ABO/005 Bridport, Dorset), the second drop with anti-B monoclonal blood grouping antisera (Catalog No. ABO/020R Bridport, Dorset), and the third drop with anti-D monoclonal antibodies (Catalog No. 005 Bridport, Dorset). These drops were tested with specific antisera to determine ABO blood group distribution and the Rh factor, with observations made for agglutination reactions after a 10-minute incubation period. For HCV detection via serological assay, a 3 ml blood sample was collected in a serum separating gel tube, coagulated, and then centrifuged to extract serum. The serum was transferred into labeled cups and analyzed using the Mindray kit designed to detect HCV antibodies, with the CL900i analyzer employed for the analysis. The test, performed by enzyme immune essay, yields results reported as positive or negative, with third-generation EIAs offering a sensitivity/specificity of approximately 99% in detecting HCV antibodies. Samples were meticulously verified, and the results were documented for further evaluation

RESULTS

The results of this investigation are shown in table 4.1 and 4.2. 12306 blood donations were taken to evaluate the correlation of ABO and Rh blood among HCV patients. Correlation between HCV patients gender wise also assessed. Prevalence of ABO blood group and Rh factor was determined in patients. Correlation of HCV to both genders is discussed in table 1. out of 12353 donations 12285 donors were male and 68 doners were females.

Gender Classification

In our study 12285 donors were male and 68 donors were females. Among all the donors, males were more prone to HCV as compared to females because, males are significant donors. As compared to women, they can donate more frequently because they are more likely to have high levels of iron. The platelets that are used to treat patients in critical situations when they are bleeding profusely can also be made more easily from men's blood.

Nevertheless, there are barriers that prevent women from donating blood, particularly those related to low hemoglobin concentration, which lowers the proportion of female donors. Additionally, women experience blood withdrawal more difficultly and are more prone to vasovagal reactions, which can negatively impact their experience as donors.

Table IV-1.1 Gender Classification

Gender	Donations	HCV patients
Male	12285	104
Female	68	4
Total	12353	108

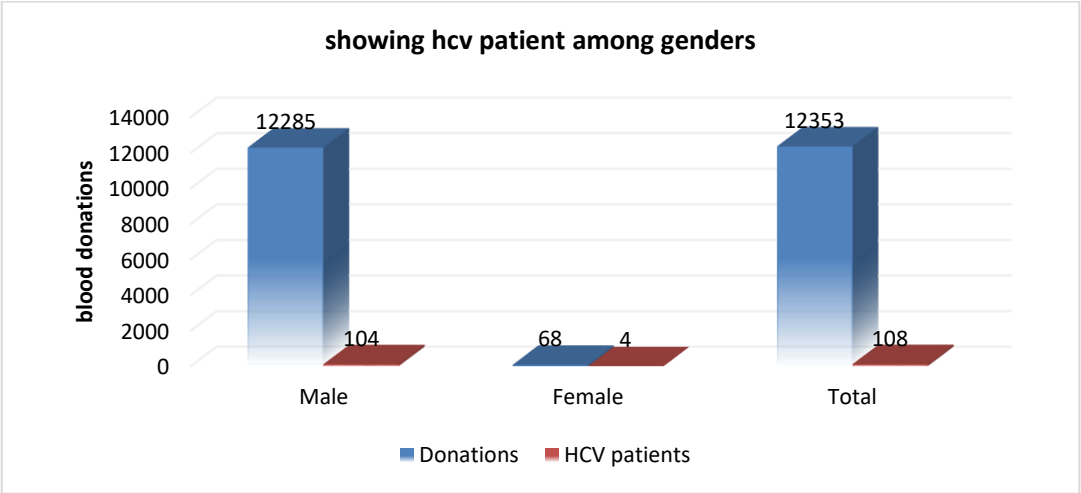

Figure 4.1.1 showing HCV patients among genders in chart

Blood Group Distribution

TableIV-2.2 showing blood group distribution in HCV patients in table

Blood groups	Donations	HCV Patients	Percentage
A Negative	284	2	0.70%
A Positive	3276	28	0.8%
AB Negative	150	1	0.66%
AB Positive	1245	9	0.72%
B Negative	390	3	0.76%
B Positive	3315	36	1.08%
O negative	563	4	0.77%
O positive	3130	25	0.79%
Total	12353	108	0.87%

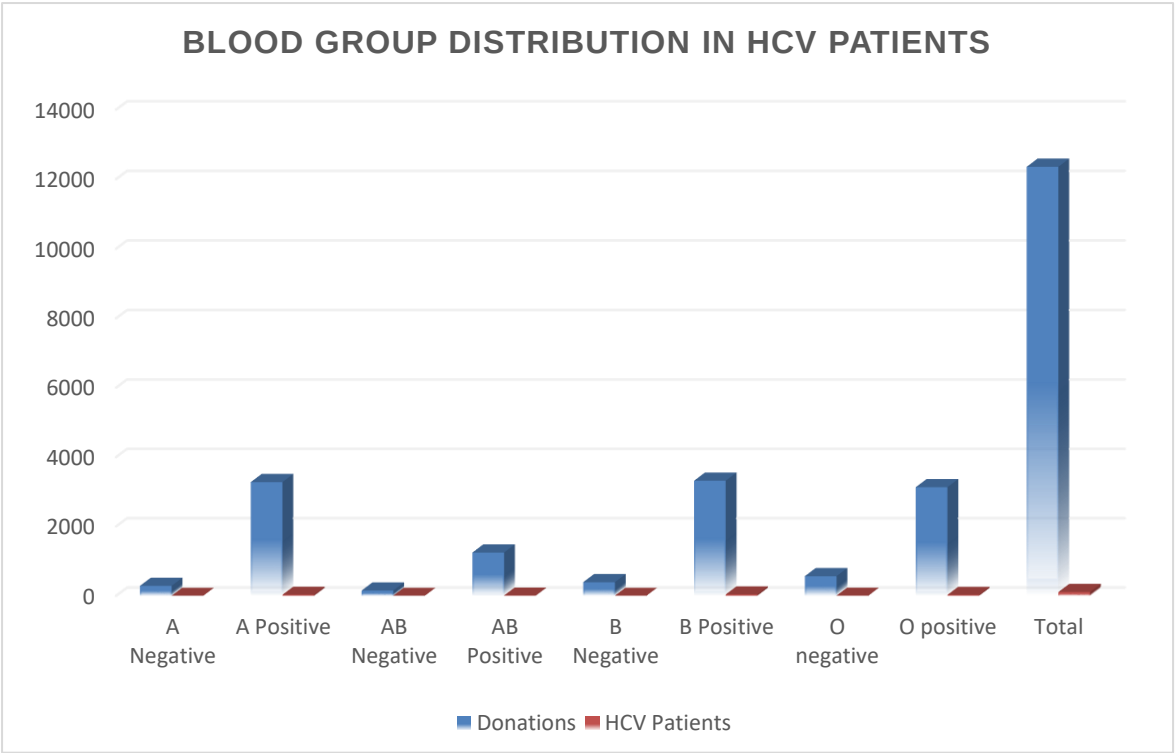

Figure 4.2.2 Blood group distribution among HCV patients in chart

Comprehensive examination was conducted on 108 Hepatitis C patients in an outpatient diagnostic setting to assess the prevalence of blood groups among individuals with Hepatitis C viremia. The objective was to ascertain any potential correlation between viral load and blood groups.

The analysis revealed that blood group B positive exhibited the highest frequency at 1.08%, while blood group AB negative was the least common, with a prevalence of 0.66% among HCV patients. The elevated occurrence of B positive blood group in HCV patients could be attributed to its widespread presence in the Pakistani population, resulting in a greater availability of blood donations from this group. This phenomenon may be influenced by various factors, including geographical prevalence of HCV, genetic predisposition, or other environmental considerations.

Furthermore, there is a noteworthy implication regarding the potential transmission of HCV. Patients with blood group B positive, due to their higher prevalence, might receive blood with less rigorous screening in cases of accidental blood loss, thereby increasing the risk of HCV transmission.

Additionally, blood groups A positive and O positive exhibited higher frequencies than B positive, accounting for 0.8% and 0.79%, respectively, in HCV patients. The reasons behind their increased prevalence may align with those of B positive, as these blood groups are also prevalent in the general population.

Conversely, O negative and AB negative blood groups demonstrated lower infection rates at 0.71% and 0.66%, respectively. These blood groups are considered rare in the population, explaining their diminished prevalence among HCV patients.

Overall, the percentage of HCV patients was relatively low across all blood groups, indicating that the blood supply is generally safe from HCV transmission. It is imperative to note that these findings may vary based on the specific population studied, regional prevalence of HCV, and other influencing factors

DISCUSSION

According to our study it was discovered that there is no direct relationship between blood group and HCV. However, blood group B positive exhibited the highest frequency at 1.08%, which means that out 12353 donors 108 were HCV patients among those 108 patients 36 were B positive. It depicts that blood group B showed higher frequency other than any blood group. This finding is also supported by [10] which showed that the most frequent blood group was B positive for HBV and HCV. 30 (0.07%) had HIV, 361 (0.90%) had syphilis, 311 (0.76%) had malaria, and 961 (2.30%) had hepatitis C out of 41033 donors. Blood group B and HIV and hepatitis B are significantly correlated. With a frequency of 0.66% among HCV patients, blood type AB negative was the least common. The elevated occurrence of B positive blood group in HCV patients could be attributed to its widespread presence in the Pakistani population, resulting in a greater availability of blood donations from this group.

Our survey also showed that O positive is the second most frequent blood group with frequency 0.79%, which means that out of 12353 donors 108 were HCV patients among those HCV patients, 25 were O positive. This finding is also supported by conducted seroprevalence of HCV was found to be higher in blood group O individuals (0·42%) and lowest in blood group AB individuals (0·04%). The proportion of the donors' blood types got in fact, as follows: AB RhD-positive (73%), O RhD-positive (73%), according to [9]. O RhD-negative (4.0%), B RhD-positive (3.0%), A RhD-negative (3.0%), AB RhD-negative (1.0%), and B RhD-negative consist of the groups. 4.1% of O RhD-positive participants, 10% of A RhD-positive subjects, and 25% of AB RhD-positive subjects were HCV-positive, based on the blood group-specific distribution of HCV positivity.[11]

Moreover, historical modes of HCV transmission, such as sharing infected needles or equipment for drawing blood, posed significant risks before the implementation of widespread screening for blood and organ donations. While the risk through these means has diminished, engaging in high-risk sexual behaviors may still contribute to HCV transmission. This survey is supported by reported that the prevalence of HCV infection in patients at a sexually transmitted disease clinic is 5 to 15

times higher than that in the general population. There is need to discourage commercial blood donation. Emphasis should be placed on voluntary donation in this part of the world in order to reduce the risk of transfusion–transmissible infections.[12]

Another important factor in our study is the distribution of HCV patients among both genders. Out of 12,353 donations, 12,285 were males, and 68 were females. Among them, 108 were HCV patients, with 104 being males and 4 being females. This finding is supported byas a whole, the viral loads in male donors were higher than in female (P=0.006). Moreover, the donors' gender and HCV genotypes are independently correlated with the measured viral loads.[13]

This study also finds that blood group O and AB negative were least affected. So this is supported by study which conclude the blood samples of 3733 donors were analyzed to determine the seroprevalence of hepatitis B and C among the blood donors in the northern region of Riyadh, Saudi Arabia. Among the total of 3733 blood donors, 3645 (97.65%) were men and 88 (2.36%) were women. Most of the donors were younger than 27 years of age (*n* = 1494). The most frequent blood group in our study was O-positive (*n* = 1534), and the least frequent was AB-negative (*n* = 29). After statistically analyzing the clinical data, we observed that 7 (0.19%), 203 (5.44%) and 260 (6.96%) donor blood samples were positive for the HBV serological markers HBsAgs, HBsAbs and HBcAbs, respectively, and 12 (0.32%) blood samples reacted positively to anti-HCV antibodies. Moreover, 10 (0.27%) and 1 (0.027%) samples were NAT-HBV positive and NAT-HCV positive, respectively.[14]

Our study also reveals that overall, the percentage of HCV patients was relatively low across all blood groups, indicating that the blood supply is generally safe from HCV transmission. It is imperative to note that these findings may vary based on the specific population studied, regional prevalence of HCV, and other influencing factors. This finding supported bystudy showed the prevalence of hepatitis B virus was higher among study participants. However, the prevalence of HCV was low compared to the study conducted in other countries in Africa, a substantial percentage of the blood donors harbor HCV infections. Therefore, it is recommended to increase awareness of people (particularly on unmarried, male and rural resident) on modes of transmission and prevention of infection could help in reducing the burden of both HBV and HCV.[15]

CONCLUSION

1. In conclusion, the elevated occurrence of HCV among males' underscores gender differences in HCV distribution, aligning with existing literature.
2. Our study reveals no direct correlation between blood group and HCV but it highlights a higher frequency of HCV patients with blood group B positive, suggesting a potential association.
3. Blood group O positive follows as the second most frequent, with a prevalence of 0.79%.
4. Notably, blood groups O negative and AB negative exhibit the least frequency.
5. Additionally, historical modes of transmission emphasize the importance of discouraging commercial blood donation and promoting voluntary donation to reduce transfusion-transmissible infections.

RECOMENDATIONS

1. Based on the findings of current study, further investigation into the potential association between HCV and blood group B positive is warranted. Future research should explore underlying mechanisms that may explain this observed trend.
2. Continued monitoring and awareness campaigns targeting individuals with blood group B positive could aid in early detection and intervention for HCV infection.
3. Given the prevalence of HCV among males, healthcare strategies should consider gender-specific approaches to screening, prevention, and treatment.
4. It will be imperative to conduct molecular level studies to elucidate the direct correlation between the Hepatitis C Virus (HCV) and various blood groups. Despite its high cost, this

methodology will emerge as the optimal technique for visualizing and understanding the intricate relationship between HCV and blood groups.

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