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Bioscience Research

Print ISSN: 1811-9506 Online ISSN: 2218-3973

Journal by Innovative Scientific Information & Services Network

RESEARCH ARTICLE BIOSCIENCE RESEARCH, 202219(4):1919-1922. **OPEN ACCESS**

Prevalence of Viral Hepatitis in Beta Thalassemia major patients in Lahore city of Pakistan

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Thalassemia patients are at higher risk of blood-borne viral infections such as Hepatitis B virus (HBV) and hepatitis C virus (HCV) infections as they require a regular blood transfusion to stay alive. The current research is aimed at the seroprevalence of HCV and HBV, along with blood groups, hemoglobin (Hb), and ferritin concentrations in β-thalassemia major (β-TM) patients receiving regular blood transfusions in Lahore, Pakistan. In the current study, a total of 300 multi-transfused β-TM patients were screened for HBV and HCV infections. Moreover, Hb and ferritin levels were also assessed. The overall prevalence of HCV and HBV infections in β-TM patients was found to be 17.6% and 4.3%, respectively. Male patients and patients with blood groups B and AB were more prone to HBV and HCV infections, respectively. Viral infections in β-TM patients caused a reduction in Hb level but increased ferritin level was observed. Public awareness programs, improved surveillance, and strict uniform screening are the measures that are needed to be adopted immediately to limit the spread of viral infections.

Keywords: β-thalassemia major, Hepatitis B, Hepatitis C, Blood Groups, Blood Transfusion

INTRODUCTION

Thalassemia is a genetic disorder that occurs due to the formation of abnormal hemoglobin in the body. It is estimated that every year about 50,000 infants are born with critical forms of thalassemia globally (Organization, 2016). Thalassemia is categorized into beta-thalassemia (βT) and alpha-thalassemia (αT), depending upon the defect in genes (Lohani et al. 2018). Beta-thalassemia major (β-TM) is the foremost predominant hereditary blood disorder in Pakistan with 5000-9000 annual birth of children suffering from β-TM and around 9 million carriers (Colah et al. 2010). Regular blood transfusions are necessary for β-TM patients to stay alive (Mettananda et al. 2019). Given the fact that the life expectancy of β-TM patients has increased up to the fifth decade in the world but it is still 10-12 years in Pakistan due to blood-borne infections attributed to limited resources and unsafe blood transfusion (Weatherall, 2011). HBV and HCV infections are the most common transfusion-transmitted infections (TTI) and may lead to serious liver diseases including hepatocellular carcinoma and end-stage liver disease associated with cirrhosis. The World Health Organization (WHO) estimates that hepatitis B and C cause annual 366,000 and 563,000 deaths, respectively (Shahriar et al. 2021). β-TM patients are at greater risk of TTIs including HBV and HCV infections due to multiple transfusions. Epidemiological surveillance for blood-born viral infections is essential since vaccines are unavailable for several viral infections such as HCV. There is a paucity of authentic data pertaining to the prevalence of HBV and HCV infections in β-TM. The current research is aimed at the seroprevalence of HBV and HCV, and various clinical parameters in β-TM patients receiving regular blood transfusions in Lahore, Pakistan.

MATERIALS AND METHODS

This retrospective multicentre study was carried out from December 2020 to October 2021. A total of 300 confirmed β-TM patients were recruited for the study from Ganga Ram hospital, Children's Hospital, and Farooq hospital, Lahore. Only β-TM patients with at least 10 transfusions were included in the study after obtaining written consent from the patients/guardians. The study was approved by the inter-review board of the university (IRB-UG-21297). The study was carried out as per the guidelines of the declaration of the Helsinki code of

conduct. The patients with alpha/minor thalassemia were excluded. Demographic variables (age and gender) and the patient's blood group were recorded from the medical history or interview. A blood sample (five ml) was collected from patients aseptically to estimate the hemoglobin (Hb) concentration in the red blood cells by Hb electrophoresis. The ferritin levels of blood samples were checked by a hematology analyzer (Cobas e601 Rochi HITECH). The serological screening was performed by using Biocheck HCV and Labmen HBsAg kits to determine the presence of Anti-HCV antibodies and hepatitis B surface antigens (HBsAg), respectively in the blood samples. SPSS (V25) was used for data analysis. A Chi-square test was applied to compare categorical variables while continuous variables were compared by a Student's t-test.

RESULTS

A total of 300 β-TM patients were tested for HBsAg and anti-HCV antibodies. There were 135 (44.9%) males and 165 (54.8%) females (Table 1). The age range of the patients was 8 months to 25 years with a mean age of 12.1±6.9 years. Moreover, 13 patients (4.3%) were positive for HBsAg antibodies including 7 (5.2%) males and 6 (3.6%) females, whereas, 53 (17.6%) patients were found positive for anti-HCV antibodies.

A cross-tabulation of HBV and HCV positive β-TM patients with the age and gender of the patients revealed that male patients and patients in the age range of 6-15 years were more prone to viral infections. Furthermore, an association of blood groups with viral infection in β-TM patients was evaluated. The results showed that HBV and HCV infections were more prevalent in the patients with the blood group B and AB, respectively.

Ferritin and Hb levels were evaluated in β-TM patients in association with HBV and HCV infections and the results unveiled high ferritin levels in all the β-TM patients. Moreover, ferritin level was found further increased in patients suffering from HBV and HCV infections. Conversely, the Hb level was observed low in all β-TM patients and the HBV and HCV infections caused a further reduction in Hb level (Table 1).

A logistic regression analysis was carried out to assess patients' age, gender, and blood groups as potential risk factors for HBV (Table 2) and HCV (Table 3) infections in β-TM patients which demonstrated no statistically significant association of these parameters with the viral infections in β-TM patients.

Table 1: Demographic features of β-TM patients and prevalence of HBV and HCV infections

Variables	Total Cohort (n=300)	HBV Positive (n=13)	HCV Positive (n=53)	*P*
Age (Mean±SD)	12.2±6.9	11.1±1.8	12.3±0.9	--
Age Groups n (%)				
≥5	72 (24)	3 (4.2)	12 (16.7)	
6-10	56 (18.7)	3 (5.4)	10 (17.9)	0.01
11-15	64 (21.3)	3 (4.7)	13 (20.3)	
16-20	66 (22.0)	3 (4.5)	10 (15.2)	
21-25	42 (14.0)	1 (2.4)	8 (19.0)	
Gender n (%)				
Male	135 (44.9)	7 (5.2)	26 (19.3)	<0.001
Female	165 (54.8)	6 (3.6)	27 (16.4)	
Blood Groups n (%)				
A	41 (13.7)	1 (2.4)	7 (17.1)	NS*
B	100 (33.3)	5 (5)	17 (17.0)	
AB	116 (38.7)	5 (4.3)	23 (19.8)	
O	43 (14.3)	2 (4.7)	6 (14.0)	
Ferritin (µg/L)	409.6±5.87	660.1±5.6	709.8±6.1	0.02
HB (g/dl)	5.1±1.7	3.9±1.1	3.5±0.8	0.05

*NS=Non- significant

Table 2: Univariate logistic regression analysis to predict the risk factors associated with HBV infections in β-TM patients.

Variables	OR	95% C.I.	*P*
Age	0.81	0.53-1.21	0.30
Gender	0.69	0.22-2.11	0.51
Blood Groups	1.11	0.58-2.08	0.75

OR=Odd Ratio. C.I. = Confidence Interval

Table 3: Univariate logistic regression analysis to predict the risk factors associated with HCV infections in β-TM patients.

Variables	OR	95% C.I.	*P*
Age	1.01	0.96-1.05	0.82
Gender	0.82	0.45-1.48	0.51
Blood Groups	0.98	0.70-1.36	0.90

OR=Odd Ratio. C.I. = Confidence Interval

DISCUSSION

Patients with thalassemia major commonly develop post-transfusion hepatitis from HBV and HCV. Globally, the infection poses a huge burden, especially for developing economies with low HDIs (human development indices). It is important to study how HBV and HCV interact with thalassemia patients, how they cause chronic liver disease, specifically hepatocellular carcinoma, and how they affect therapy since this enables us to understand the transmission of HBV and HCV around the world (Farooq et al. 2018).

HCV infection had been reported as more prevalent in Pakistan, Iran, and India than HBV (Ehsan et al. 2020). This is just because of the viability of vaccines in developing countries. Our findings showed a higher incidence of HCV among β-TM patients (n=53, 17.6%). Variable infection rates have been reported in different ethnic groups and geographical regions of Pakistan (Kumar et al. 2020). Prevalence frequency placement of the infection with hepatitis B was recorded to be lower in females (3.6%) compared to males (5.2%). Our study indicates that the male society acquires HBV infection faster and higher as a result of optimizing visibility to the outside environment as opposed to females who most of the times stay in their homes (Harbertson et al. 2015). Barber shaving, homosexuality (male to male copulation), heterosexuality (male to female copulation), and drug use are very common in these regions, which are consistent with the statements for such larger HBV in males (Akhtar et al. 2018). Equally, a higher prevalence of HBV in males preceded by females was detected when risk factors were observed for hepatitis B and C infection in the liver and stomach in Karachi (Butt et al. 2019).

Certain diseases like HCV may be associated with blood groups due to gene-environment interactions. Carbohydrate molecules make up blood groups, which function as receptors or ligands for bacteria, viruses, and parasites present on red blood cells (Ewald and Sumner, 2016). A variety of contagious and non-infectious diseases have been linked to these molecules. The current study described the high prevalence of HCV infection in patients with blood group AB while HBV infection was more prevalent in patients with blood group B. A study conducted in Al-Najaf Al-Ashraf governorate found that patients with O blood group were more likely to be seropositive to anti-HCV (Al-Shabany et al. 2016). A study conducted in Baghdad revealed a high prevalence of HCV infection in patients with blood group B followed by O and by A blood groups (Jafroodi et al. 2015).

The results suggested that ferritin level was high in all the HBV and HCV-infected patients. The most common method of assessing iron overload in clinical practice is to measure serum ferritin levels. Ferritin is an acute phase reactant, which is why it is used in this way to interpret serum ferritin levels (Pinto and Forni, 2020). Inflammation in the body, such as chronic viral hepatitis, can increase ferritin levels. We found that serum ferritin levels were significantly affected by viral hepatitis in our study of thalassemia patients, which was consistent with previous findings. It was found that thalassemia patients infected by HBV and HCV had a significant difference in serum ferritin levels. The virus replication in liver cells may have increased ferritin levels by enhancing ferritin synthesis and increasing ferritin concentrations in cells. Further, liver cell damage and leakage may have caused ferritin levels to rise (Rujeerapaiboon et al. 2021).

CONCLUSION

The current investigation has demonstrated a high prevalence of HBV and HCV infections in β-TM patients in Lahore which represent an urgent need to improve surveillance and blood screening before transfusion to limit/prevent co-viral infections in β-TM patients.

CONFLICT OF INTEREST

The authors declared that the present study was performed in absence of any conflict of interest.

ACKNOWLEDGEMENT

We acknowledge the nursing staff in the hospitals to facilitate blood collection and the laboratory technicians for providing technical assistance during sample processing in the laboratory.

AUTHOR CONTRIBUTIONS

HI and KZ performed the experiments in the lab. MAL and SG wrote the manuscript. FS analyzed the data and performed the statistical analysis. ZK conceived and designed the study and reviewed the manuscript. All authors read and approved the final version.

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