Research Article

Study of prevalence of seropositivity in multi-transfused thalassemia patients – A hospital based study

Neerja H Shah[1], Atul Shrivastav[2], Ukti Bhavsar[1], Ashok S Agnihotri[1]

[1]Department of Pathology, C U Shah Medical College, Surendranagar, Gujarat, India.
[2]Department of Pathology, GMERS Medical College, Himmatnagar, Gujarat, India.
Correspondence to: Neerja H Shah, E-mail: shahneerja@yahoo.com

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Abstract

Background: Thalassemia is an inherited hemoglobinopathy for which blood transfusion is an obligatory treatment. However, blood transfusion has its own adverse effects among which transfusion transmitted infections (TTIs) are major threat to the patients.

Objective: To evaluate the seroprevalence of various TTIs in thalassemia patients. It also aims to correlate age group and prevalence of TTIs.

Materials and Methods: In this study, a total of 55 beta thalassemia major patients attending C U Shah Medical College, Surendranagar, Gujarat, India, were screened for human immunodeficiency virus (HIV)-1 and HIV-2 IgG and IgM antibodies, hepatitis C virus (HCV) IgG antibody, HBs Ag antigen, andIgG antibodies against *Treponemapallidum* using National AIDS Control Organization approved third generation enzyme-linked immunosorbent assay (ELISA) kits. Selected clinical, sociodemographic, and other characteristics were also recorded to understand the determinants of risks of these infections.

Result: It was observed that of the total 55 patients, 2 (3.63%) were HIV reactive, 20 (36.36%) were HCV reactive, and none was found to be hepatitis B virusor venereal disease research laboratoryreactive.

Conclusion: To reduce the incidence of TTIs, especially HCV and HIV, stringent screening of donor should be done with fourth generation ELISA methods, polymerase chain reaction, or nucleic acid amplification techniques.

KEY WORDS: Thalassemia, blood donors, transfusion transmitted infections, ELISA

Introduction

Transfusion of blood and blood products are saving innumerable lives each day in world around.

India is the second most populous nation in the world. The Indian subcontinent is classified as an intermediate hepatitis B virus (HBV) endemic zone where HbsAg carrier rate is 2%–7%.[1] About 2.5 million human immunodeficiency virus (HIV) positive, 43 million HBV positive,and 15 million hepatitis C virus (HCV) positive persons are present in India.[1]

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Thalassemia is an inherited hemoglobinopathy disorder.[2,3] Blood transfusion is absolute necessity as a treatment modality for these patients. Among the undesirable complications arising of transfusion, transmission of certain transfusion transmitted infections (TTIs) such as HIV, hepatitis B (Hep B), and hepatitis C (Hep C) are the most significant ones to keep in mind while looking for detrimental side effects on long term.[4]

Among the blood transmissible diseases, Hep B and Hep C (both caused by viruses of the family Hepadnaviridae), HIV, and syphilis (caused by *Treponemapallidum* subsp. *pallidum*) are major public health problems inIndia and other developing nations. Hep B is transmitted by bloodborne routes, vertically or parenterally and is responsible for both symptomatic and asymptomatic hepatic disease. Hep C, newly emerging, has become a major cause of chronic hepatitic diseases and also hepatic malignancy. In HIV patients, the main cause of cellular death is mitochondrial dysfunction in the infected cells.

A survey of blood transfusion practices noted that testing for TTIs is not good enough and badly managedin most blood banks, both private and government, all over India.[5]

The study is chiefly done aiming to evaluate the seroprevalence of HCV, HBV, HIV, andvenereal disease research laboratory (VDRL) infections among multi-transfused thalassemia patients in Surendranagar district. It also has an objective of correlating number of transfusions and seropositivity status. The problem statement is compared with other similar studies.

Materials and Methods

In this retrospective study, a total of 53 beta thalassemia major patients visiting bloodbank of C U Shah Medical College, Surendranagar, Gujarat, India, were screened for HIV-1 and HIV-2IgG and IgM antibodies, HCV IgG antibody, HBsAg antigen,and IgG antibodies against *T. pallidum* using National AIDS Control Organization approved third generation ELISA kits in a period of 6 months (from January 2014 to June 2014).

Inclusion Criteria

All patients who had received more than two transfusions and were previously recorded to be nonreactive for HIV, HBsAg, and HCV were included in this study.

All thalassemic patients were being treated by hypertransfusion regimen which comprises regular transfusion with packed RBCs at about 3 weeks interval. Before testing for TTIs, an informed consent from the guardians was obtained regarding the testing that would be performed on the blood samples. A detailed history regarding previous transfusions and age of starting transfusion was elicited from the patients. A record of socioeconomic, demographic parameters was also made to get an idea for determinants of risk factors of these infections. The data for socioeconomic status were analyzed using Modified Kuppuswamy scale.[6]

Patients were receiving transfusions from the hospital-based blood bank and also from private blood banks, which were accredited by the State Blood Transfusion Council. The samples were collected from peripheral vein just before starting the transfusion. Under strict aseptic precautions, 5 mL of venous blood sample was collected. Blood was allowed to clot, and then separation of serum was done by centrifuging the sample at 2,500 rpm for 15 min.

Reactive samples were retested twice for confirmation using same kit, and one more time using kit from another manufacturer.

Consent for conducting the study was obtained from institutional ethics committee before commencing the study. All information and test results were kept confidential.

Result

Of total 55 patients under study, 19 were female and 36 male subjects [Figure 1].

The mean age of patients was 7.14 years. All the patients were residents of Gujarat and belonged to the Surendranagar district. Socioeconomic class of most patients (93%) was class III–V. Of 55 patients, 12 patients (21.82%) gave history of consanguineous marriage. The mean age at diagnosis of thalassemia major was 1 year. On blood group analysis, it was observed that 9 (16.36%), 21 (38.18%), 24 (43.64%), and 1 (1.82%) patients were of blood groups A, B, O, and AB, respectively; only one patient was Rh negative.

A total of 55 beta thalassemia patients were screened, of which none was Hbs Ag or VDRL reactive (0%), 2 patients were HIV reactive (3.63%), and 20 patients were HCV reactive(36.63%) [Table 1].

Of two patients found to be HIV reactive, both (100%) were male. Of 20 patients found to be HCV reactive, 13 (65%) were male and 7 (35%) patients were female subjects.

In 0–3 years, of 12 patients, none was HBV, HIV, or VDRL reactive, and 2 (16.66%) were HCV reactive.

In 4–6 years age group, of 15 patients, none was HBV, HIV, or VDRL reactive, and 4 (26.66%) patients were HCV reactive.

In 7–9 years age group,of 14 patients, none was HBV or VDRL reactive, 1 (7.14%) patient was HIV reactive, and 8 (57.14%) patients were HCV reactive.

In >10 years age group, of 14 patients, none was HBV or VDRL reactive, 1 (7.14%) patient was HIV reactive, and 6 (42.85%) patients were HCV reactive [Table 2].

Figure 2 shows the age wise distribution of prevalence of Hep B, Hep C,and HIV in multi-transfused thalassemia patients.

From Table 2, it is observed that prevalence of TTIs is increasing with age because of increasing number of transfusions. In >10 years age group, the trend is decreasing chiefly because large number of thalassemia patients drop out or pass away owing to some complication by that age.

Discussion

It has been observed in this study that the highest prevalence is that of Hep C infection by transfusion. Moreover, there is increase in prevalence as age increases correlating with number of transfusions. Incidence of thalassemia was seen highest in group B blood group patients.

We compared this study to another study done by Sangita et al.[7] at B J Medical College, Ahmedabad, in 2011 in which, among 210 beta thalassemia patients screened, prevalence

Table 1: Prevalence of Hep B, Hep C, and HIV in multi-transfused thalassemia patients

Disease	No. of reactive patients	%
Hep B	0	0
HIV	2	3.63
Hep C	20	36.63
VDRL	0	0

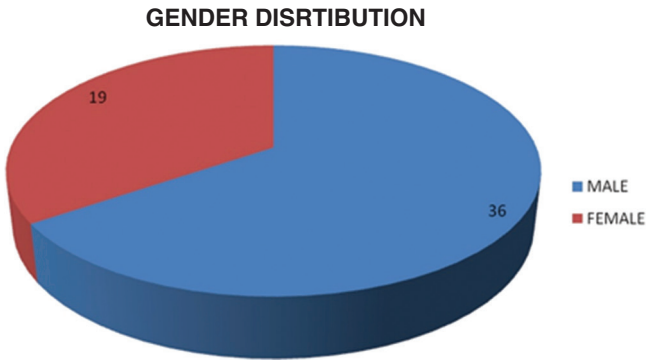

Figure 1: Distribution of gender

Table 2: Prevalence of Hep B, Hep C, and HIV in multi-transfused thalassemia patients—age wise distribution

	Age group (years)			
	0–3	4–6	7–9	>10
HBV reactive	0	0	0	0
HIV reactive	0	0	1	1
HCV reactive	2	4	8	6
VDRL reactive	0	0	0	0

of Hep B was 0.47%, that of HIV was 2.85%, and of HCV was 29.52%[7] [Table 3]. In a study conducted by Goyal et al.,[8] prevalence of HBV was 1.26% and that of HIV was 3.37 % in multi-transfused beta thalassemia major patients[8] [Table 3]. In another study by Al-Sheyyab et al.,[9] among 145 multi-transfused patients studied, the prevalence of HBV, HCV,and HIV was 3.5%, 40.5%,and 0.0%, respectively[9] [Table 3]. Another study by Mirmomen et al.[10] showed prevalence of 1.5%, 19.3%, and 0.0% of HBV, HCV,and HIV, respectively, among 732 multi-transfused thalassemia patients studied.[10] As shown in Table 3, there is a substantially high prevalence of transfusion transmitted diseases, especially Hep C.

The strength of the study lies in the positive correlation found between prevalence of TTIs and transfusions. However, a few false negative cases may have been missed because of limitations of diagnostic techniques used in this study leading to failure to detect the window period cases.

With every unit of blood, there is 1% chance of transfusion associated problems including TTI.[1] Over the last couple of decades, the risk of TTI has declined dramatically in high income developed nations, but it is not the same for the developing countries.[1] All patients having transfusion-dependent diseases are more vulnerable to acquiring various TTIs such as HBV, HCV, HIV, syphilis, and many more.[11] However, HBV and HIV except blood transfusion, can also be transmitted from person to person.[12,13] HCV is by far, known to

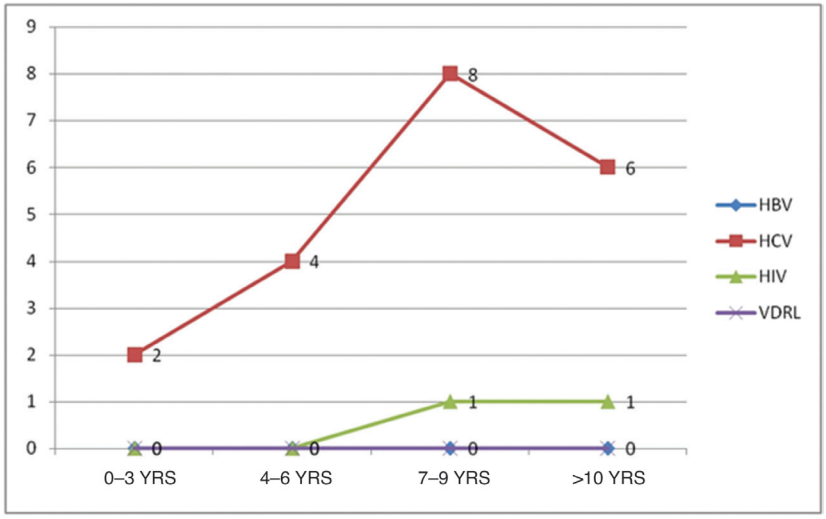

Figure 2: Agewise distribution of prevalence of Hep B, Hep C, and HIV in multi-transfused thalassemia patients

Table 3: Comparison of various studies

Prevalence of TTIs	This study (%)	Shah et al.[7] (%)	Goyal et al.[8] (%)	Al-Sheyyab et al.[9] (%)	Mirmomen et al.[10] (%)
Hep B	0.00	0.47	1.26	3.5	1.5
Hep C	37.74	29.52	–	40.5	19.3
HIV	3.77	2.85	3.37	0.0	0.0

be transmitted only by parenteral routes—either blood borne or by use of contaminated needles. There is little evidence for sexual or perinatal transmission of HCV, and the natural routes of transmission are yet to be identified.[14]

Because of considerable awareness in general population for HIV, its trend seems to be reducing. The increasing trend of Hep C poses a serious health threat to society. On comparison of the seroprevalence rates for the past 7 years, HCV appears to be more of a public health challenge, even more than HIV or HBV. Among hepatitis infections, Hep B is vaccine preventable, but there is no vaccine for Hep C infection.

Inspite of stringent donor screening and usage of latest screening tests, there is a definite residual risk because of:

1. Blood donations done in marker negative windowphase,
2. Immune variant viral strains that are not tested and detected in routine screening methods,
3. Donation by immunologically silent carriers (antibody negative) and
4. Inherent technical andprocedural testing errors.[15,16]

Therefore, TTIs continue to be a serious problem.

Regular transfusions make multi-transfused thalassemia patients a highly susceptible target in acquiring transfusion transmitted diseases. The probability shows a direct correlation with number of units transfused, increasing chance with each unit.

As all these infections are transmitted mostly by blood and blood products and especially Hep C which is transmitted only by blood and its components, it is very important to conduct proper donor recruitment and selection. As we have seen that the prevalence of Hep C infection is increasing gradually at a very alarming rate,its high incidence in thalassemia patients should be taken seriously, and appropriate steps should be taken.

To reduce the incidence of HCV and all other TTIs, donor recruitment, selection, and awareness of donor for risk of these infections should be strengthened. Moreover, fourth generation ELISA kits should be used for screening of donors. This will reduce the window period and thereby reduce prevalence of infection in thalassemia patients.

It is because of introduction of nucleic acid amplification techniques (NAAT) as a part of screening in detection of these infections, the rate of TTIs have reduced in developed nations to a significant extent. However, its use in developing nations such as ours is limited by high cost. To decrease the burden of disease, and to ensure a safe donation, apart from NAAT, other parameters such as awareness in population, motivational programs to increase voluntary donations, and increased vigilance on part of blood banks is also of immense importance.

Conclusion

The prevalence of TTIs is significant in our study. It is high time that we realize the alarming prevalence of transfusion transmitted diseases and their detrimental effects on thalassemia patients as these add to their comorbidities. Stringent donor screening, use of modern advents such as NAAT and PCR for screening of blood bags, and bringing awareness in community will surely help in reducing the problem statement. At present, majority of blood banks including ours in this country are not using NAAT owing to the cost, which is five to six times when compared with ELISA. We think it is a nationwide issue and needs urgent attention. The government should take measures to cut down the cost of NAAT and make it mandatory for all blood banks in this country so that a patient requiring chronic transfusion will have a minimum risk of TTI. Multi-transfused patients must be regularly tested and monitored as a part to ensure safe blood transfusion practices. Blood banks should also participate in hemovigilance programs to ensure a certain standard of transfusion trends.

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