Int.J.Curr.Microbiol.App.Sci (2021) *10*(03): 1339-1346

International Journal of Current Microbiology and Applied Sciences
***ISSN: 2319-7706* Volume 10 Number 03 (2021)**
Journal homepage: http://www.ijcmas.com

Original Research Article https://doi.org/10.20546/ijcmas.2021.1003.164

Seroprevalence of Hepatitis B and Hepatitis C Viral Infections in Thalassemia Patients Undergoing Multiple Blood Transfusions in a Tertiary Care Hospital

Anupriya Yadav*, Rameshwari Bithu, Manju Yadav and Rakesh K. Maheshwari

Department of Microbiology, Sawai Man Singh Medical College and Attached Hospitals, Jaipur, Rajasthan, India

**Corresponding author*

A B S T R A C T

Thalassemia is one of commonest hereditary disease worldwide, prevalent in humid climates and affects all races. The Transfusion Dependent Thalassemias require regular blood transfusion to survive. The thalassemia patients require lifelong blood transfusion on regular basis- usually administered every 2 to 5 weeks. Due to regular blood transfusion, transfusion transmitted disease e.g. Hepatitis B Virus (HBV), Hepatitis C virus (HCV) and Human Immunodeficiency Virus (HIV) infections can occur. Aim of the study is to evaluate the prevalence of Hepatitis B & C viral infections transmitted by blood transfusion among thalassemia patients. Observational study conducted over a period of one year, a total of 118 thalassemia patients were studied. Patients were screened for Hepatitis B and Hepatitis C viral infections by rapid test kits and the conformation was done by ELISA. Out of 118 thalassemia patients, 74 (62.7%) were male and 44 (37.3%) were females. Out of them 36 (30.5%) patients were anti–HCV reactive and none was reactive for HBsAg. Multi transfused patients must be regularly tested and monitored to ensure safe blood transfusion practices. The patients should be encouraged to stick to one thalassemia management centre. Stringent donor screening, use of modern advents such as NAAT (nucleic acid amplification test) and PCR for screening of blood bags for HBV and HCV infection and bringing awareness in community will help in reducing the problem statement.

Keywords
Hepatitis B and Hepatitis C Viral Infections, Seroprevalence

Article Info

Accepted:
12 February 2021
Available Online:
10 March 2021

Introduction

Thalassemia is one of commonest hereditary disease worldwide, generally prevalent in humid climates but affects all races (Belayet Hossain *et al.*, 2017). This disease causes morbidity, mortality, lot of financial and emotional miseries to the family. Thalassemia refers to a group of blood disease characterised by decreased or absent synthesis of normal globin chain in blood due to defect in chromosome 11 (Cappellini *et al.*, 2014). According to the chain whose synthesis is impaired, thalassemia are called α,β,γ and δ thalassemia. β thalassemia is then divided into major and minor depending on severity of symptoms and requirement of blood transfusion. Thalassemia major is inherited in an autosomal recessive pattern (chromosome 11) and thalassemia minor is inherited in

autosomal dominant pattern. Regular blood transfusion is required in beta thalassemia major (Standards of care guidelines for Thalassemia. 2012).

Thalassaemia is a major problem in the countries around the Mediterranean Sea, the Middle East and Trans-Caucasus, India, and the Far East (Kheya Mukherjee *et al.,* 2017). India is second most populous nation in world and carry approx. 30 million cases of thalassemia. Maldives (18%), Cyprus (14%), Sardinia (10.3%) and Southeast Asia (3-5%) have the highest number of carriers (Flint J. *et al*., 1998). Due to regular blood transfusion, a series of complications like iron toxicity, hypersplenism, venous thrombosis, osteoporosis and transfusion transmitted disease e.g. Hepatitis B Virus (HBV), Hepatitis C virus (HCV) and Human Immunodeficiency Virus (HIV) infections can occur (Neeraj H. Shah *et al.,* 2016)

The decision to transfuse patients chronically should include a plan for blood administration and for evaluation of its efficacy and safety. Only in this way does the patient receive maximal benefit from the use of precious and limited human resource. In India the infections for which effective screening of blood products are currently mandatory are HIV, HBV, HCV, Syphillis and Malaria (Narayan, 2001).

The viral agents transmitted by blood transfusion share certain characteristics and hall mark is persistence of infection:

Long incubation period
Carrier or latent state
Asymptomatic sub clinical infection
Viability in stored blood

These characteristics enable viruses such as HBV, HCV and HIV to be transmitted by blood transfusions (Margolis HS et al 1991). Transfusion transmitted disease (TTD) is a major challenge to the transfusion services all over the world. Hepatitis B and Hepatitis C infection carrier rate is about 1-5% and 1% respectively, so post transfusion Hepatitis is a major problem in India.

Hepatitis B has a worldwide distribution with marked geographical variation in prevalence. Current estimates suggest that 300-400 million people worldwide have HBV infection leading to 250000 deaths per year (Willium *et al.,* 1992). It is estimated that about 2billion people have serological evidence of current or past HBV infection worldwide, of which more than 350million have chronic HBV and 1.2 million die annually from chronic hepatitis, cirrhosis and hepatocellular carcinoma (Lavanchy *et al.,* 2004). Global prevalence of HBV range from 2% to more than 8% (Burnett *et al.,* 2005). HbsAg carrier rate in India is 2%-7%. Approx. 43million people are HBV positive in India and the number of HBV carrier is estimated to be 50million (Martin C *et al.,* 2001). Seroprevalence of HBV in Thalassemia patients in India is 3.38% (Kheya Mukherjee *et al.,* 2017). The distribution patterns of HBV genotype and mutants is characteristically distinct in eastern part as compared to other part of India, where in addition to HBV genotype A and D, genotype C is also present in comparable proportion (Sibnarayan Datta, 2008)

Natural infection occurs in humans only and carriers maintain the virus in their blood. HBV infection is transmitted by parenteral, sexual and perinatal modes.

Blood transfusion is responsible for majority of the cases of hepatitis C, it is a major source of preventable cause in post transfusion cases. Nearly 180 million people are infected with hepatitis C worldwide (Simmonds P *et al.,* 1994). Out of 6 main groups of sequence

variants (type 1-6), genotype 3 is most prevalent genotype in north and central India (Goyal *et al.,* 2006). Hepatitis C virus is a major cause of post transfusion hepatitis infection which leads to long term complications like cirrhosis and hepatocellular carcinoma. Prevalence of HCV in beta thalassemia patients ranges from 3-67% (Emothal, 2007). Approximately 15million people are HCV positive in India. Seroprevalence of HCV in India is 0.9% and among blood donor is 0.7%. HCV infection has gained importance as one of major complications in multiple transfused patients, specially in countries where HCV is more prevalent in general population and also amongst blood donors (Hamid Hussain *et al.*, 2008). Seropositivity of HCV increases with the number of transfusions. However, since no vaccine is available against hepatitis C, the only effective measure against the virus is provision of HCV negative blood for transfusion in thalassemia patients. HCV hepatitis is more threatening than HBV hepatitis due to greater risk of chronic liver disease (Satia *et al.,* 2016).

Materials and Methods

It was a retrospective study conducted over a period of one year (June 2019 to June 2020) in the Department of Microbiology, SMS Medical College and attached Hospitals. The study population included the thalassemia patients of age less than 18 years and received more than 6 blood transfusion. The blood from 118 multiple transfused Thalassemic patients is collected in plain vial and tested by rapid test and then confirmed by ELISA for antibodies to HCV and HBs Antigen.5ml blood sample of Thalassemia patients will be collected under aseptic precautions by a clean venipuncture. The blood will be allowed to clot. Serum will be separated by centrifugation at 2500rpm for 15min.Test for both Hepatitis B surface antigen and HCV antibodies will be performed in a batch along with two negative and two positive controls by Rapid tests and by third generation ELISA kits. Tests will be performed according to the directions given in kit insert. The demographic variables were recorded on a predesigned proforma. It included name, age, sex, address, blood group, Rh factor, no. of transfusion, age of starting transfusion, Hepatitis B immunization.

Results and Discussion

In our study, conducted on 118 Thalassemia patients, we evaluated the seroprevalence of Hepatitis B and Hepatitis C in thalassemia patients. The important observations in the study were as follow:

In our study males (62.7%) were affected more as compared to females (37.3%). Mean age of study population was 7.31±4.09 years and median age was 7 years.

Out of total 118 patients of thalassemia, 36(30.5%) patients were positive for anti-HCV and 82(69.5%) negative for anti-HCV by rapid screening method -TRIDOT. None of the thalassemia patients was HBsAg positive. Out of 36 anti-HCV positive patients, 24 (66.7%) patients were males and 12(33.3%) patients were females. In 0 -5 year age group-2(8.3%) patients were anti-HCV positive males. In 5.1-10 years age group-9(37.5%) patients were male and 5(41.7%) patients were anti- HCV positive females. In 10.1-14 years age group- 8(33.3%) and 6(50%) patients were anti-HCV positive males and females respectively. In 14.1-18 years age group- 5(20.8%) and 1(8.3%) patients were anti-HCV positive males and females respectively (p -value<0.001 Highly significant) (Table 1).

The mean no. of transfusion in thalassemia patients was 72.29±52.02. The mean age of

starting transfusion in thalassemic patients was 13.69±15.93 months and median was 7years. The mean number of blood transfusion in HCV positive patients=101.39±51.15 (p- value<0.001, highly significant).The mean age of starting blood transfusion in anti -HCV positive patients =17.47±17.47 months (p-value=0.087, not significant).None of the patients was anti- HCV positive upto 6- 25 blood transfusion. As the no. of transfusion increases, the positivity of HCV infection also increases as shown in table 2. HBsAg infection was not even seen in patients getting blood transfusion >100.

Mean hemoglobin level of study population was 8.19±1.30 gm% and median was 8.25gm%.

Rural population (77.1%) was more affected than urban population (22.9%).63.9% (n=23) anti- HCV patients were from rural area and 36.1% (n=13) from urban area with p -value 0.023, which is significant at 5%. Out of all anti-HCV positive patients 8.3% (n=3) patients had splenomegaly.

In our study 82.2% patients were immunized with Hepatitis B vaccine, 16.9% patients were not immunized.1 (0.8%) patient was of unknown immunization status. Infection of HBV was not seen in any patient, not even in unimmunized patients. Majority of patients were immunized because of vast coverage of Hep B vaccination by National immunization Programme (Table 3).

Out of total 118 thalassemia patients, the majority of patients 36.4% belong to B+ ve blood group, followed by 32.2% O+ ve blood group,19.4% A+ ve blood group, 5.9% AB+ ve blood group, 4.2% O- ve blood group and 0.8% A- ve blood group, 0.8% B- ve blood group respectively. Out of 23 A+ ve thalassemia patient, 4 (13.7%) patients were anti- HCV positive. Out of 43 B+ ve thalassemia patients, 13 (30.2%) patients were anti-HCV positive (Table 4).

All thalassemia patients (1) of B- ve blood group were anti- HCV(1) positive. Out of 38 O+ ve thalassemia patients, 15 (39.5%) patients were anti-HCV positive. Out of 5 O- ve thalassemia patients, 3 (60%) patients were anti- HCV positive.

p- value for anti – HCV positive patients of various blood group =0.048, significant at 5%.

Table.1 Association of anti- HCV and HBsAg seroprevalence with age interval

		Sex							
		Male(24)				Female(12)			
		anti- HCV by Positive		HBsAg Positive		anti- HCV by Positive		HBsAg Positive	
		N	%	N	%	N	%	N	%
Age intervals	0 to 5 years(42)	2	8.3%	0	0%	0	0%	0	0%
	5.1 to 10 years(46)	9	37.5%	0	0%	5	41.7%	0	0%
	10.1 to 14 years(22)	8	33.3%	0	0%	6	50.0%	0	0%
	14.1 to 18 years(8)	5	20.8%	0	0%	1	8.3%	0	0%

Table.2 Association of blood transfusion with HCV infection

		Anti- HCV Positive N=36	HbsAg Positive N=0
No of Transfusion	6-25	0	0
		0%	0%
	26-50	5	0
		13.9%	0%
	51-75	8	0
		22.2%	0%
	76-100	8	0
		22.2%	0%
	Above 100	15	0
		41.7%	0%
Total		36	0
		100.0%	0%

Table.3 Association of Hepatitis B immunization with HBV infection

Hep B immunization	Total Thalassemia patients	Anti HCV Positive		HBsAg Positive	
		N	%	N	%
Yes	**97(82.2%)**	**29**	**80.6**	**0**	**0**
No	**20(16.9%)**	**6**	**16.7**	**0**	**0**
Don't know	**1(0.8%)**	**1**	**2.8**	**0**	**0**

Table.4 Association of blood group with thalassemia and anti-HCV patients

Blood group	Rh factor	Total Thalassemia patients	Anti HCV Positive N=36		HBsAg Positive N=0	
			No.	%	No.	%
A	**+ve**	**23(19.4%)**	**4**	**13.7**	**0**	**0**
	-ve	**1(0.8%)**	**0**	**0**	**0**	**0**
AB	**+ve**	**7(5.9%)**	**0**	**0**	**0**	**0**
	-ve	**0**	**0**	**0**	**0**	**0**
B	**+ve**	**43(36.4%)**	**13**	**30.2**	**0**	**0**
	-ve	**1(0.8%)**	**1**	**100**	**0**	**0**
O	**+ve**	**38(32.2%)**	**15**	**39.5**	**0**	**0**
	-ve	**5(4.2%)**	**3**	**60**	**0**	**0**

Table.5 Complete profile of thalassemia patients having anti-HCV and HBsAg infection

	anti- HCV by Tridot				p-value
	Positive		Negative		
	Mean	SD	Mean	SD	
Age (in years)	10.58	3.33	5.87	3.54	**<0.001**
No. of Transfusion	101.39	51.15	59.51	47.28	**<0.001**
Age of starting Transfusion (in months)	17.47	17.74	12.02	14.89	0.087
Hb at present(gm%)	8.02	.99	8.26	1.42	0.358
No. of Siblings	1.50	1.03	1.40	.99	0.628

Applied unpaired t test for significance

Table.6

		anti- HCV by Tridot				p-value
		Positive		Negative		
		N	%	N	%	
Sex	Male	24	66.7%	50	61.0%	0.556
	Female	12	33.3%	32	39.0%	
Age intervals	0 to 5 years	2	5.6%	40	48.8%	**<0.001***
	5.1 to 10 years	14	38.9%	32	39.0%	
	10.1 to 14 years	14	38.9%	8	9.8%	
	14.1 to 18 years	6	16.7%	2	2.4%	
Residence	Urban	13	36.1%	14	17.1%	**0.023***
	Rural	23	63.9%	68	82.9%	
Blood Group	A	4	11.1%	20	24.4%	**0.048***
	AB	0	.0%	7	8.5%	
	B	14	38.9%	30	36.6%	
	O	18	50.0%	25	30.5%	
Rh Factor	Positive	32	88.9%	79	96.3%	0.198
	Negative	4	11.1%	3	3.7%	
Hep B immunization	Yes	29	80.6%	68	82.9%	0.317
	No	6	16.7%	14	17.1%	
	Don't know	1	2.8%	0	.0%	
No. of siblings affected by Thalassemia	No	27	75.0%	66	80.5%	0.580
	Yes	9	25.0%	15	18.3%	
	Don't know	0	.0%	1	1.2%	
Spleen Enlargement	Yes	3	8.3%	3	3.7%	0.367
	No	33	91.7%	79	96.3%	

Applied $\chi 2$ test/ Fisher exact test as appropriate. *Significant

The mean age of anti- HCV positive patients was 10.58±3.33 years which is highly significant (p- value < 0.001). Mean number of transfusion in these patients was 101.39±51.15 which is highly significant (p-value <0.001).

Despite blood screening of blood donors, post transfusion viral infections i.e. HBV and HCV are still badly occurring (Table 5 and 6). Patients with transfusion dependent Thalassemia are prone to HCV and possibility of developing liver disease is very high. Stringent donor screening, use of modern advents such as NAAT (nucleic acid amplification test) and PCR for screening of blood bags for HBV and HCV infection and bringing awareness in community will help in reducing the problem statement. Multi transfused patients must be regularly tested and monitored as a part to ensure safe blood transfusion practices. The patients should be encouraged to stick to one thalassemia management centre. In our study lower prevalence of HBV might be due to regular strict law for vaccination, free availability of Hepatitis B vaccine, better understanding of parents about HBV vaccination and inclusion of hepatitis B vaccine in national immunization programme where first dose of hepatitis B vaccine is given at birth.

In our study high prevalence of HCV was observed. As there is no vaccine available for Hepatitis C, the only way of reducing the prevalence of HCV in multiple transfused patients is by effective and regular screening of blood by NAAT.

References

Belayet Hossain, Selimuzzaman, W A Khan, Muhammad Tawfique, Fazlur Rahman. Prevalence of Hepatitis C Virus Infection in Multi-transfused Thalassaemia Patients in Bangladesh. Journal of Enam Medical College 2017; 10.3329/v8i1.3543

Burnett R, Francois G, Kew M, Leroux-Loels G, Meheus A, Moosen A, et al. Hepatitis B virus and human immune deficiency virus coinfection in sub Saharan Africa, a call for further investigation. Liver Int. 2005; 25(2): 201-24.

Cappellini MD, Cohen A, Porter J, Taher A, Viprakasit V. Guidelines for the management of transfusion dependent thalassaemia (TDT). 3rd Edition.2014

Emothal R ivistaItaliana di Medicinadell' Adolescenza - Volume 5, n. 3, 2007

Flint J, Harding RM, Boyce AJ, Clegg JB. The population genetics of the hemoglobinopathies. Bailliere's Clinical Hematol. 1998; 11: 1-50.

Hamid Hussain, Rashid Iqbal, Muhammad Hussain Khan, BushraIftikhar, Sabina Aziz, Fayaz Khan Burki, JunaidSethi, Mumtaz Hassan, Yasir Bin Nisar, Jai Krishan Prevalence Of Hepatitis C In Beta Thalassaemia Major Gomal Journal Of Medical Sciences., July December 2008; 6(2)

Hissar SS, Goyal A, Kumar M, Pandey C, Suneetha PV, Sood A, et al. Hepatitis C virus genotype 3 predominates in North and Central India and is associated with significant histopathologic liver disease. J Med Virol 2006;78:452-8.

Lavanchy D. Hepatitis B virus epidemiology, disease burden, treatment, and current and emerging prevention and control measures. J Viral Hepat. 2004; 11: 97-101.

Margolis HS, Alter MJ and Hadler SC. Hepatitis B:Evolving epidemiology and implications for control . Seminars in Liver Disease 1991; 11: 84-92

Martin C, Lilian H, Irma E, Ibarra R, Irma H, Fernandez G, et al. Prevalence of HBV infection and risk factors in a rural community of Mexico. Am J Trop Med Hyg. 2001; 65(6): 759-63.

Mukherjee K, Bhattacharjee D, Chakraborti G. Prevalence of hepatitis B and hepatitis C virus infection in repeatedly transfused thalassemics in a tertiary care hospital in eastern India. Int J Res Med Sci 2017; 5: 4558-6.

Narayan S. Microbes and blood transfusion. Indian J Med Microbiol.2001;19:119-26. 24. Sen S, Mishra NM, Giri T. AIDS in multitransfused children with thalassemia. Indian Pediatr. 1993; 30: 455-60.

Neerja h Shah, Atul Shrivastav , Ukti Bhavsar, Ashok S Agnihotri. Study of prevalence of seropositivity in multi-transfused thalassemia patients-A hospital based study. International Journal of Medical Science and Public Health 2016; Vci 5, issue 10.

Satia et al., seroprevalence of hepatitis b and hepatitis c among thalassemia Patients at a tertiary care hospital in north indiaejpmr, 2016, 3(8), 608-611.

Sibnarayan Datta. An overview of molecular epidemiology of hepatitis B virus (HBV) in India. Virol J. 2008; 5: 156.

Simmonds P, Alberti A, Alter HJ, Bonino F, Bradley DW, Brechot C, et al. A proposed system for the nomenclature of Hepatitis C viral genotypes. Hepatol. 1994; 19: 1321-4.

Standards of care guidelines for Thalassemia. 2012.

William TN, Wonke B, Donohue SM. A study of hepatitis B and C. Prevalence and liver function in multiply transfused thalassemics and their parents. Ind Pediatr. 1992; 29(9): 1119-24.

How to cite this article:

Anupriya Yadav, Rameshwari Bithu, Manju Yadav and Rakesh K. Maheshwari. 2021. Seroprevalence of Hepatitis B and Hepatitis C Viral Infections in Thalassemia Patients Undergoing Multiple Blood Transfusions in a Tertiary Care Hospital. *Int.J.Curr.Microbiol.App.Sci.* 10(03): 1339-1346.
doi: https://doi.org/10.20546/ijcmas.2021.1003.164