Original Research Article

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A cross sectional study on adequacy of blood transfusion and transfusion related infections in thalassemic patients attending a medical college hospital, West Bengal

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ABSTRACT

Background: Thalassemia is more prevalent in India. The main treatment of Thalassemia is blood transfusion. But the transfusion of blood has many side effects like iron overload, transfusion related infections etc. The objectives of the study were to assess the adequacy of blood transfusion for thalassemic patients and to determine the magnitude of transfusion transmitted infections among those patients.

Methods: A cross sectional study was conducted in Murshidabad Medical College and Hospital, West Bengal for 1 month with the sample size of 116. The blood samples from the patients were taken from the patients attending for blood transfusion in transfusion centre of Murshidabad Medical College and Hospital for two weeks dated from 24.04.2017 to 05.05.2017 to check for the hemoglobin, ferritin level and hepatitis B, C and HIV infection.

Results: Among the 116 patients, even after transfusion, 94% of the study participants have their hemoglobin levels below 7 gm/dl. Only 2 individuals got their hemoglobin levels more than 9 gm/dl and only 1 patient got HIV infection post transfusion which accounts for 0.9% of study population.

Conclusions: Frequent Hb estimation will help to maintain the adequacy of blood transfusion and proper screening of the blood before transfusion can help in reducing these transfusion transmitted infections.

Keywords: Thalassemia, Ferritin level, Transfusion related infections

INTRODUCTION

Thalassemia is an autosomal recessive disorder, characterized by a group of disorders which is caused by inherited mutations that decreases the synthesis of either the α – globin or β – globin chains that comprises the adult hemoglobin ($\alpha_2\beta_2$) which leads to sequelae of conditions like anemia, tissue hypoxia, and red cell hemolysis. According to the type of hemoglobin affected, the symptoms varies. Mutations in α gene located on

chromosome number 16 results in α thalassemia and in beta gene located on chromosome 11 results beta thalassemia. This leads to deficient production of respective chains and high number of abnormal hemoglobin. The severity depends upon the number of genes affected, out of four for alpha globin and two for beta globin genes. Unaffected chains are formed in normal quantities, since the complementary chains are deficient so normal chains are free and gets precipitated within the red cell causing red cell membrane damage

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and hemolysis. According to the severity of the disease thalassemia is of 3 types thalassemia major, thalassemia intermedia and thalassemia minor.

Hemoglobinopathies are more prevalent in certain malaria prone parts of world like India. Every year at least 50000 are diagnosed with thalassemia. South Asia contributes to at least 23% of the world hemoglobinopathies. Thalassemia is one of the commonest single gene disorder in India. The beta thalassemia carriers ranges between 2.78 to 4% in India.

Treatment of thalassemia includes blood transfusion, iron chelation, folic acid supplementation. Bone marrow transplantation can also be done. Chelation is done by using deferasirox and deferoxamine. The main mode of treatment, blood transfusion also presents with various side effects like iron overload, and increased risk of blood borne infections transmission like HIV, Hepatitis B, C etc. Ferritin levels are checked after blood transfusion to see whether ferritin levels are normal or not (normal- 15-250 ng/ml) and chelation therapy is administered if ferritin levels are found to be high. Viral hepatitis has shown to increase the morbidity among thalassemic patients. With this background this study was conducted with the objective i) To assess the adequacy of blood transfusion for thalassemic patients and ii) To determine the magnitude of transfusion transmitted infections among those patients.

METHODS

Study design

This was a cross sectional study conducted in Transfusion center in thalassemia clinic of Murshidabad Medical College and Hospital among all the patients attending the thalassemia clinic for blood transfusion during the study period

Study duration

The study was conducted for 1 month from 15th April to 16th May.

Sampling method

Complete enumeration of all the patients attending the thalassemia clinic for blood transfusion within the study duration were included and the sample size came out to be 116.

Collection procedure

After obtaining informed consent, blood samples were taken from the patients attending for blood transfusion in transfusion centre of Murshidabad Medical College and Hospital for two weeks dated from 24.04.2017 to

05.05.2017 to check for the hemoglobin, ferritin level and hepatitis B, C and HIV infection.

Statistical analysis

Data was entered in Microsoft Excel spread sheet and analyzed in Statistical Package for Social Sciences (SPSS -IBM) software version 21.

Ethical consideration and confidentiality

Institutional Ethical Committee approval was obtained before starting of the study. Confidentiality of study participants was maintained in all the phases of the study.

RESULTS

Totally 116 participants were studied. Majority (35.3%) were in the age group of 5-9 years and 52.6% were males.

Table 1: Socio demographic profile of study participants (n=116).

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S. no.	Variable	Frequency	%		
1	Age (in completed years				
	0-4	18	15.5		
	5-9	41	35.3		
	10-14	31	26.7		
	15-19	9	7.8		
	20-24	5	4.3		
	Above 25	12	10.4		
	Sex				
2	Male	61	52.6		
	Female	55	47.4		
	Religion				
3.	Hindu	26	22.5		
	Muslim	90	77.5		
	Consanguinity with disease				
4.	Present	10	8.6		
	Absent	106	91.4		
	Socio economic class				
	Upper	3	2.58		
_	Upper middle	12	10.34		
5.	Lower middle	37	31.89		
	Upper lower	43	37.06		
	Lower	21	18.13		
6.	Blood group				
	A+ve	26	22.4		
	B+ve	43	37.1		
	B-ve	1	0.9		
	AB+ve	4	3.4		
	O+ve	42	36.2		

Among the 116 study participants, around 76.7% had Ebeta thalassemia.

Table 2: Distribution of study participants according to the thalassemia types and hemoglobin levels (n=116).

	Types of hemoglobin (Average levels)	Hb A	Hb F	Hb A2/A2+E
Types of thalassemia	N (%)	%	%	%
Beta thalassemia major	27 (23.30)	39.78	44.57	5.56
E- beta thalassemia	89 (76.70)	18.85	19.63	37.43

Adequacy is not reached in study population after the transfusion and chelation therapy as shown below in table. Even after transfusion 94% of the study participants have their hemoglobin levels below 7 gm/dl. Only 2 individuals got their hemoglobin levels more than 9 gm/dl. Only 5.17% of the study participants have ferritin levels less than or equal to 250 ng/ml.

Table 3: Adequacy by mean hemoglobin and ferritin levels of study participants (n=116).

S.No.	Mean hemoglobin and ferritin levels	N (%)	
1.	Mean hemoglobin levels for last one year (gm/dl)		
	Less than 7	109 (94)	
	7-9	5 (4.5)	
	More than 9	2 (1.5)	
2.	Average ferritin levels (ng/ml)		
	Less than and equals 250	6 (5.17)	
	251-1000	47 (40.52)	
	More than 1000	63 (54.3)	

Out if 116 study participants only 1 individual got HIV infection post transfusion which accounts for 0.9% of study population.

Table 4: Transfusion transmitted infections among study population (n=116).

Transfusion transmitted infections	N (%)
Hepatitis B	0 (0)
Hepatitis C	0 (0)
HIV	1 (0.9)
No transmission	115 (0.9)

DISCUSSION

The hemoglobinopathies are prevalent genetic disorders worldwide. Thalassemia, Hb E trait, sickle cell are common among them. The primary objective of this hospital based study is to determine the frequency of the disease as well as adequacy of transfusion. There are several studies conducted on thalassemia. The general incidence of thalassemia trait in India varies between 3-17% based on the study conducted by Balgir et al in India. There are around 65000 cases of beta thalassemia in India to which 9000 cases are added every year based on the study by Verma et al in 1992 on prevention of thalassemia, a necessity for India. 6

Adequacy is assessed by hemoglobin levels and serum ferritin levels after the transfusion. According to the study by Brittenham et al on efficacy of deferoxamine in 1994, the patients without chelation after blood transfusion suffer more and has less life expectancy than the ones who get chelation therapy. Based on the studies by Thalassemia International Federation, 2004 and Gatterman guidelines on iron chelation therapy, 2007, it is seen that adequacy of transfusion is achieved when hemoglobin levels will reach above 9 gm/dl and serum ferritin should be below 1000 ng/ml after first 10-20 transfusion or in child of 2-3 years of age. 8.9

While in our study only 1.5% of the patients acquired the hemoglobin levels above 9 gm/dl and 45.7% of the study population has ferritin levels below 1000 ng/ml which shows the adequacy is not achieved. Compared to other study conducted by Shah et al on effectiveness of transfusion program in thalassemia major patients receiving multiple blood transfusions at a transfusion centre in Western India showed that only 6.3% of the patients receiving multiple blood transfusions have the average ferritin level below 1000 ng/ml which is much lower from our study. This study also reveals that 53.5% of study subjects have hemoglobin less than 9 gm/dl which is less than our study (98.5%).

Mandatory screening of HCV, HBV, HIV were introduced in India in 2002. Based on various studies like Garg et al in western India, Sing et al, Makroo et al on trends of HIV infection in Delhi, Srikrisna et al shows that the prevalence of transfusion transmitted HCV, HBV and HIV are 0.12-4%, 1.2-3.5% and 0.51-3.87% respectively. In the study conducted by Shah et al prevalence came out 45% for HCV, 2% for HBV and 2% for HIV in blood transfusion receiving thalassemics. Compared to our study in which prevalence was 0% for both HCV and HBV and 0.9% for HIV. On comparing this data with WHO's data on transfusion transmitted infections, we are still lagging behind to reach the safety on blood transfusions.

In summary we can say

- Nearly 98.5% of the patients are undertransfused as their hemoglobin levels didn't reach the expected values.
- Adequate regimen for chelation therapy is required since 54.3% of study population has high iron overload.

- Moreover 17 patients of those who have received multiple transfusion did not have chelation records, so chelation is not appropriate.
- Looking at the high prevalence of HIV transmission on blood transfusion, it is necessary to screen the blood before transfusion for its effectiveness.

CONCLUSION

Proper screening of the blood before transfusion can help in reducing these transfusion transmitted infections. For its effective screening, prenatal testing to be performed in early days of childhood to prevent anymore worsening of the condition. Non invasive prenatal diagnosis (NIPD) is recently developed technique for the detection of defective inherited genes. MCV, MCH, Hb values and NESTROFT also helps in screening. For making people aware of this disease it can be screened in every community. Proper health education can act as an important factor in preventing disease. Adequate sensitization to individual and his family can also come under preventive measures. Healthy environment, maintaining healthy socio economic conditions, better public health and medical care can also prevent thalassemia. Better prophylaxis of persons suffering from thalassemia or hemoglobinopathies with adequate medical care, nutrition, physical activity also plays a role.

A lot of research is to be carried out to know unknown mutations causing this disease. The medical cure of this disease implies to reduce the suffering of the patient and alleviating his life. It is a great challenge to be met and needs a well organized plan for action.

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Ethical approval: The study was approved by the

Institutional Ethics Committee

REFERENCES

- 1. Hossain MS, Raheem E, Sultana TA, Ferdous S, Nahar N, Islam S, et al. Thalassemias in South Asia: clinical lessons learnt from Bangladesh. Orphanet journal of rare diseases. 2017;12(1):93.
- Central Intelligence Agency. The World Factbook 2016. Washington, DC: Central Intelligence Agency; 2016. Available at: https://www.cia.gov/ library/publications/resources/the-worldfactbook/geos/gt.html.
- Grow K, Vashist M, Abrol P, Sharma S, Yadav R. Beta thalassemia in India: current status and the

- challenges ahead. Int J Pharm Pharm Sci. 2014;6(4):28-33.
- Mohanty D, Colah RB, Gorakshakar AC, Patel RZ, Master DC, Mahanta J, et al. Prevalence of betathalassemia and other haemoglobinopathies in six cities in India: a multicentre study. J Community Genet. 2013;4(1):33-42.
- 5. Balgir RS. The burden of hemoglobinopathies in India and the challenges ahead. Curr Sci. 2000;79:1536-47.
- Verma IC, Choudhury VP, Jain PK. Prevention of thalassemia: A necessity in India. Indian J Pediatr. 1992;59:649-54.
- Brittenham GM, Griffith PM, Nienhuis AW, McLaren CE, Young NS, Tucker EE, et al. Efficacy of deferoxamine in preventing complications of iron overload in patients with thalassemia major. N Engl J Med. 1994;331:567-73.
- 8. Thalassemia International Federation: Guidelines for the clinical management of thalassemia. Available at: http://www.thalassaemia.org.cy/Publications.htm. Accessed on 23 September 2004.
- Gattermann N. Guidelines on iron chelation therapy in patients with myelodysplastic syndromes and transfusional iron overload. Leuk Res. 2007;31:S10-5.
- Shah N, Mishra A, Chauhan D, Vora C, Shah NR. Study on effectiveness of transfusion program in thalassemia major patients receiving multiple blood transfusions at a transfusion centre in Western India. Asian J Transfus Sci. 2010;4(2):94-8.
- 11. Garg S, Mathur DR, Garg DK. Comparison of seropositivity of HIV. HBV, HCV and syphilis in replacement and voluntary blood donors in western India, Indian J Pathol Microbiol. 2001:44:409-12.
- 12. Sing B, Verma M, Verma K. Markers for transfusion associated hepatitis in north Indian blood donors: prevalence and trends. Jpn J Infect Dis. 2004;57:49-51.
- 13. Makroo RN, Sahil P, Vashist RP, Lal S. Trends of HIV infection in blood donors of Delhi. Indian J Pathol Microbiol. 1996;39:139-42.
- 14. Srikrishna A, Sitalaxmi S, Prema Damodar S. How safe are our safe donors? Indian J Pathol Microbiol. 1999;42:411-6.

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