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Research Article

PREVALENCE OF ANTI-HCV, HBSAG, HIV AMONG MULTI-TRANSFUSED THALASSEMIC INDIVIDUALS AND THEIR SOCIO-ECONOMIC BACKGROUND IN EASTERN INDIA

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ABSTRACT

Objective: The objective was to study the serological prevalence of post-transfusion transmitted infections such as hepatitis C virus (HCV), hepatitis B virus (HBV), and HIV among multi-transfused thalassemic individuals of the Eastern India and the socio and financial difficulties faced by them.

Methods: The study was carried out from January 2012 until December 2014 involving 1711 thalassemic major individuals. Blood serum was collected from each patient to perform ELISA for the detection of HBV and HCV seroprevalence. HIV seropositivity along with their hematological and liver function parameters were obtained from the transfusion centers and the host institutions. Other socio-economic conditions were obtained by predesigned proforma of the questionnaire.

Results: 67.9% males and 32.1% females were present in our study population of which 75% were from rural area. The mean hemoglobin was found to be lower, whereas mean ferritin, bilirubin, and liver enzymes were much higher than the normal range. Only a handful of 19.76% of the fathers of thalassemic individuals had secondary education. 263 families (15.37%) were familiar with the chances of transfusion-transmitted infections (TTIs). The dominant TTI found within the population was HCV with 18.70% prevalence followed by HIV (3.74%) and HBV (3.33%). 82.93% of the affected families suffered poverty with a meager monthly income within Rs. 5000 fighting against high costs of transfusion and related treatments.

Conclusion: Our study reflects the different socio-economic and psychological burdens faced by the thalassemia patients and their families. The high rate of TTIs highlights the need for stringent screening of blood or blood products before administration.

Keywords: Thalassemia, Socio-economic, Transfusion-transmitted infections, Hepatitis C virus, Hepatitis B virus, HIV.

INTRODUCTION

Thalassemia is one of the most challenging inherited hematological disorders with no permanent cure that is prevalent in many parts of the world. The abnormalities are seen in alpha (α) or beta (β) chains of hemoglobin, resulting in reduction or no synthesis of any of those chains. There are approximately 60-80 million people affected by β-thalassemia trait alone [1]. It is estimated that approximately 1, 00,000 children with thalassemia major are born worldwide [2]. India contributes to 10% of the annual world incidence of thalassemia [3] with around 9,000-10,000 new cases adding each year [4]. In India, the various thalassemia traits varies between 3% and 17% but within certain communities such as Punjabis, Sindhis, Muslims, and Bengalis, the prevalence rate varies between 8% and 15% [5,6]. It is a chronic disease that manifests early in life leading to a burden not only on health system but also on the patients and their families, who are vulnerable to social and psychological problems.

Thalassemia major patients exclusively depend on receiving blood or blood products at regular interval. The aim of regular blood transfusions is to eliminate the primary complications of severe thalassemia by ameliorating anemia and suppressing erythropoiesis [7]. Transfusion, although prolongs the lifespan of the patients but has inescapable side effects, particularly iron overload causing transfusional hemosiderosis which might prove to be fatal [8]. Regular blood transfusion with lifelong treatment includes splenectomy and management of iron overload with iron chelation [9]. The disease is usually severe with several health problems such as enlarged spleen, bone deformities, fatigue, endocrine, and cardiac dysfunction and post-transfusion transmitted infections (TTIs) such as HIV, hepatitis B virus (HBV), and hepatitis C virus (HCV) [10-12]. Despite the progress made in preventing TTIs over the last few years, it continues to be a problem in many parts of the world. The problem of TTIs is directly proportional to the prevalence of infection in the blood donor community [13]. In India, HCV seroprevalence in thalassemic patients varies from 11% to 30% [11,14-18]. Previous studies showed about 9% thalassemia patients to be anti-HIV positive by ELISA [19] while HBsAg seropositivity in thalassemic patients varied from 1.04% to 3.66% [20-22]. HBV vaccination reduced its prevalence in a great extent and HIV transmission through blood has become rare due to stringent and mandatory blood screening process [19].

The cost of lifelong treatment with its associated management is a big burden for the patients and their families. The cost includes regular blood transfusions, iron chelation therapies, associated diagnostic tests with follow-ups, and frequent hospitalizations. Besides, there exist some indirect costs as well, like travel expenses to transfusion centers or hospitals, loss of productivity by their parents, or caregivers. According to the World Health Organization, around $8000 worth of the drugs are needed for each patient annually to fulfill the recommended standards [2].

Most of the thalassemic patients are from backward or rural areas, so financial resources are a major problem for their long-term treatment. The treatment of the patients is executed sub-optimally due to the financial crisis. Besides, the psychological and psychosocial stresses are additional challenges to disrupt the quality of life [23]. Thus, preventing the birth of thalassemic major children by prenatal diagnosis and genetic counseling are the best option in India and other developing countries.

Thalassemic children are at high risk of developing behavioral and psychosocial problems such as opposition, passiveness, anxiety, phobias, and depression, which affect their self-confidence, giving rise to emotions and thoughts that negatively affect their quality of life and compliance to therapy [24]. Thalassemic children have more of negative self-concept when compared to their normal counterparts. Many of the thalassemic children experience fear related to intravenous line insertion and subcutaneous infusion pumps [25]. The majority of thalassemia patients are illiterate with only 1.6% having higher education. To cope with the situation, efforts to increase the literacy rate and awareness of the disease are urgently required [26].

The clinical burden along with the psychological stress affects not only the patient or his family but also on the country itself. Availability of transfusion facilities, vaccinations, diagnostic tests, medicines, etc., at the Government sponsored camps either free or at low costs increases the economic burden of the country, especially for a developing country like India. So, emphasis should shift from treatment to pre-counseling of thalassemia carrier parents. In India, medical management outweighs the psychosocial supervision. The increasing prevalence of the disease and low awareness among the people ensures that the socio-economic counseling is overlooked in the pressure of treating the disease [2,27]. This leads to poor quality of life for the patients, as well as drain out the medical resources and manpower of the country [23].

Very few systematic studies on the socio-economic and emotional disorders of the thalassemics and their families of West Bengal, India have been reported [2,27]. This study aims on exploring among various thalassemia major individuals with the following objectives: (1) To study the socio-economic as well as different demographic variables in this group, (2) to assess the financial difficulties for the treatment and associated problems for the patients, and (3) to study the anti-HCV, HBsAg, and HIV prevalence as well as provide useful inputs to the society to prevent this deadly disease.

METHODS

Ethical statement

This study was designed according to the ethical guidelines of the 1975 declaration of Helsinki and was approved by "The Institutional Ethical Committee." Written, as well as informed consent, was taken prior to the inclusion of the individuals.

Study design

2384 thalassemia patients were registered with our collaborating thalassemia clinics from different hospitals and NGOs of West Bengal. 1711 thalassemic major individuals consented to our inquiries for the study from January 2012 until December 2014. Blood samples were collected by venipuncture, followed by demographic data collection with an elaborate questionnaire.

Inclusion criteria

Thalassemia major individuals aged 2 years and above were included in the study.

Exclusion criteria

Thalassemia major individuals aged <2 years and those were unwilling to respond our study questionnaire were excluded from the study.

Determination of hematological and liver function parameters

Hemoglobin (Hb) level and serum ferritin level are performed very frequently for transfusion and treatment purpose. Hb and serum ferritin levels along with their bilirubin and liver enzymes alanine transaminase (ALT) and aspartate transaminase (AST) profile of all 1711 individuals were collected from the transfusion centers and the host institutions.

Screening of TTIs

The HIV seroreactive data were obtained from the host institutions. HBV and HCV seroprevalence were detected with thalassemic patients' blood serum by ELISA according to the manufacturer's protocol (HEPALISA for HBsAg, J. Mitra and Co. Pvt. Ltd. and MONOLISA Version 2 for HCV, BioRad, respectively).

Statistical analysis

Categorical variables are expressed as numbers and percentages. The statistical analysis was performed using Student's *t*-test.

RESULTS

Demographic nature of the individuals

Out of 1711 thalassemic major individuals, 67.9% (n=1162) were males and the rest were females (n=549, 32.1%). Their ages ranged from 2 to 30 years. In our study, we came upon 3.97% (n=68) of the patients who were ≥2 but ≤5 years, while a major 64.47% (n=1103) of them were between 6 and 10 years followed by patients between 11 and 20 years comprising 30.92% (n=529) and 0.64% (n=11) between 20 and 30 years (Table 1a). None was found to be above 30 years of age. The participants were categorized into 3 different groups according to their ages (2-5 years, 6-15 years, and 16-30 years). Their body weight ranged from 6.5 kg to 51.6 kg and height ranged from 65 cm to 170 cm (Table 1b). Out of the 1711 patients, 1283 (75%) were from the rural areas and the rest 25% (n=428) from urban areas. All the patients were diagnosed as thalassemic within 6 months to 2 years of age. Most of the individuals undergo transfusion of 1-3 units of blood per month depending on their need. 649 individuals (37.93%) had splenectomy as a part of their clinical management (Table 1a).

Hematological and liver function parameters

The mean Hb level of the individuals within 2-5 years of age were found to be 8.06±2.07 g/dL while in the age group 6-15 years it was lower (7.8±1.94 g/dL) followed by age group 16-30 years (7.1±1.22 g/dL). Mean ferritin level was found to be 1787.09±798.34 ng/mL ranging from as high as 4248.1 ng/mL to as low as 169 ng/mL when the normal level ranges from 12 to 150 and 300 ng/mL for females and males, respectively. The mean liver enzyme levels were found to be higher than the normal range (Normal range of ALT: 7-56 IU/L; Normal range of AST: 5-40 IU/L) in all the three age groups. Bilirubin ranged from 0.7 to 9.3 mg/dL with a mean value of 2.84±1.66 mg/dL (Table 1b).

Table 1: (a) Socio-demographic data of thalassemia major patients and their family

Socio-demographic variables	N (%)
Sex	
Male	1162 (67.9)
Female	549 (32.1)
Residence	
Rural	1283 (75)
Urban	428 (25)
Age groups (years)	
2-5	68 (3.97)
6-15	1103 (64.47)
16-30	540 (31.56)
>30	0
Underwent splenectomy	
Yes	649 (37.93)
No	1062 (62.07)
Economic status (Rs)	
<1500	158 (9.23)
1500-3000	968 (56.58)
3000-5000	293 (17.12)
>5000	45 (2.63)
Undisclosed	247 (14.44)
Education status of parents	
Fathers illiterate	68 (3.97)
Fathers having primary education	945 (55.23)
Fathers having middle school education	360 (21.04)
Fathers having secondary and above	338 (19.76)

Note: n=1711. Data are no. (%) unless otherwise specified

Education and economic profile

The psychosocial problems and the family's adjustment to the effects of the illness were compared. Father's low education level and the presence of major medical complications were predictors of poor family adjustment. As seen from our observations, many of the parents were illiterate (3.97%, n=68) besides 55.23% (n=945) primarily educated until standard IV and 21.04% (n=360) of whom were middle school goers. Only 19.76% (n=338) of the fathers had a secondary education (Fig. 1). The responses of the families when asked about thalassemia related questionnaire revealed 78.43% (n=1342) knew about thalassemia symptoms while only 48.8% (n=835) knew it was inherited. 60.9% (n=1042) of the families did not know about thalassemia carriers. Only a handful of 263 families out of 1711 (15.37%) knew about the chances of TTIs that can befall multi-transfused thalassemia patients. The responses are summarized in Table 2.

Another important factor in the management and treatment of thalassemia are the high costs of transfusion, iron chelation therapy, and other post-transfusion treatments, which puts it out of reach of the affected individuals. Our survey highlighted the monthly family income of the thalassemia patients. 14.44% (n=247) of the family did not disclose their income. Of the rest, 9.23% (n=158) of the families earned less than a meager amount of Rs. 1500, 56.58% (n=968) had a monthly income within Rs. 3000. 17.12% (n=293) and 2.63% (n=45) earned within and more than 5000 rupees, respectively (Fig. 2).

TTIs in thalassemia patients

Out of all the thalassemia individuals, the common TTIs found were HIV, HBV, and HCV. The dominant of them was HCV with 18.70% (320 out of 1711) followed by HIV with 3.74% (n=64) and HBV 3.33% (n=57), respectively (Fig. 3).

DISCUSSION

Thalassemia is one of the most challenging diseases faced by the society with a high prevalence in certain parts of the world, especially in developing countries, including India. Out of our studied 1711 individuals, 1162 were males and 549 females. Irrespective of gender, the process of physical aging is accompanied by a mental maturation that is reflected in an individual's psychological development. Social stigma faced by the thalassemia patients is associated with poor prognosis. Besides, different complications and high rate of mortality make the childhood to adulthood transition challenging. Thalassemia major is inherited through symptomless carriers in a Mendelian recessive manner, which remains unexplained due to lack of education, causing parental guilt and family social stigma. Research results reported in the literature indicated previously that children with thalassemia show a higher rate of psychiatric disorders

Table 1: (b) Hematological and liver function parameters of the individuals

Parameters	Age groups (years) (mean±SD)		
	2-5	6-15	16-30
Height (cm)	91.88±14.55	110.46±7.82	135.1±42.55
Weight (kg)	13.04±2.98	20.09±3.04	32.15±10.95
Hb (g/dL)	8.06±2.07	7.8±1.94	7.1±1.22
Ferritin (ng/mL)	1801.68±565.26	1898.31±858.09	1787.09±819.13
ALT (IU/L)	100.88±103.53	148.64±74.35	110.48±56.17
AST (IU/L)	67.63±31.22	121.64±64.13	113.98±62.51
Bilirubin (mg/dL)	1.83±0.68	2.56±1.47	3.25±1.81

Hb: Hemoglobin, ALT: Alanine aminotransferase, AST: Aspartate aminotransferase, SD: Standard deviation

Table 2: Responses of the families to thalassemia questionnaire

Questions asked	Response	
	Yes	No
Do you know about symptoms of Thalassemia?	1342 (78.4)	369 (21.6)
Do you know it is an inherited blood disorder?	835 (48.8)	876 (51.2)
Do you know about Thalassemia carrier?	669 (39.1)	1042 (60.9)
Do you know Thalassemia is not curable but treatable?	1134 (66.3)	577 (33.7)
Do you know about TTIs like HIV, HCV, or HBV?	263 (15.4)	1448 (84.6)

Note: N=1711. Data are no. (%), HCV: Hepatitis C virus, HBV: Hepatitis B virus

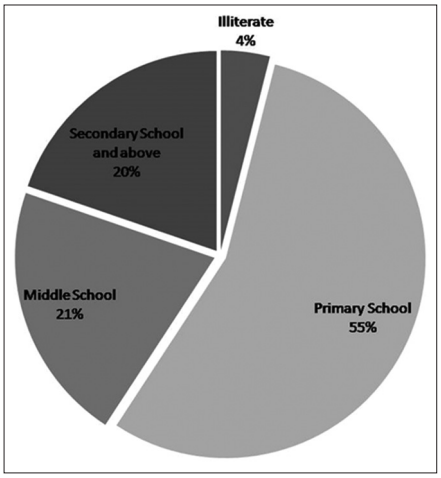

Fig. 1: Education status of the fathers of thalassemic individuals

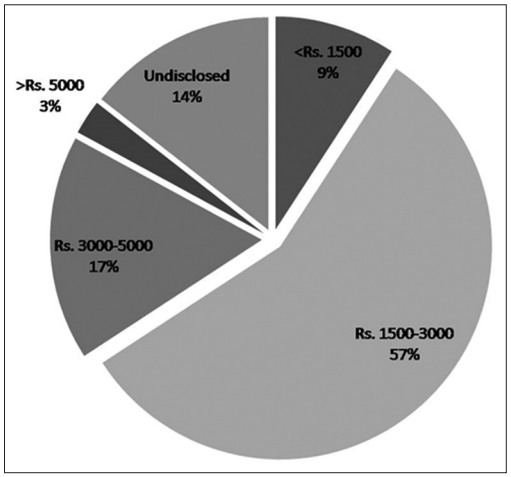

Fig. 2: Monthly income of the thalassemia affected family

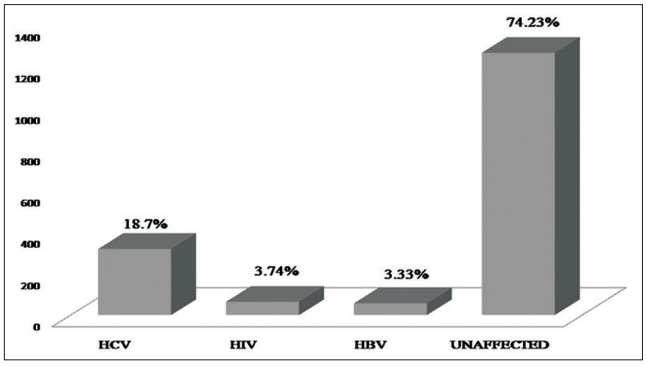

Fig. 3: Prevalence of transfusion-transmitted infection in thalassemia patients

than children with other diseases. The most diagnosed are depressions, anxiety, psychosomatic and conduct disorders, social isolations, and dependency on parents. Along these, there may be feelings of fear, denial, and shame. Dealing these is a painful, lifelong, and expensive process that can affect the family's adaptation patterns to the disease.

Economic conditions of the people, furthermore add to their social burden. Most of the families in our study belonged to the rural areas having little or no education. Only 25% of them were urban based. The earning members of most of the families were daily wage-earners with a meager monthly income. The treatment for this deadly disease includes regular blood transfusions, medication, iron chelation therapy, and other indirect costs such as travel, accommodation, and loss of productivity [28]. The cost of treatment of an average 4-year-old varies from about the US $100-500 annually [2]. From our findings, the monthly income of most of the families was found to be within 5000 rupees (US $76) that makes it difficult for them to meet the cost of treatment. The demanding nature of the treatment routine leads to non-compliance from these families. The declining nature may be the reason for iron overload, which is one of the principle causes of death among adolescents and young adults with thalassemia. The high ferritin level (1787.09±798.34 ng/mL), as opposed to the normal range (12-300 ng/mL), was observed along with the high value of bilirubin, ALT, and AST. Our study showed most patients to be within 15 years of age. Out of 1711 patients, 1171 were under 10, while 540 were between 11 and 30 years and none was found to be more than 30 years of age in our study. This observation supports the fact that children suffering from this disease are unable to grow normally. They are not able to thrive and have chronic fatigue. Patients suffer from frequent fevers and bacterial infections. Besides, thyroid dysfunction, iron overload, bone deformities, and Calcium deficiencies are also very common among this group of individuals [9]. Without regular blood transfusions, there is a possibility of death before the age of 10 years and transitioning to adulthood becomes difficult.

One of the greatest challenges is a lack of awareness on thalassemia. In our study population, although 78.4% (n=1342) families knew about thalassemia symptoms, most of them were ignorant about thalassemia carrier (60.9%, n=1042) and TTIs (84.6%, n=1448) (Table 2). 68 of the patients' fathers were illiterate while 945 of them were primarily educated up to standard IV. From our study, it is evident that lack of education is one of the principle reasons behind this ignorance. It is highly recommended to increase population education and making the premarital screening for thalassemia compulsory. There is a need to increase the number of centers in India able to perform prenatal diagnosis. Offering selective abortion of pregnancy provides a practical option for reducing birth of new thalassemia patients, although organizing a program of this kind might prove to be difficult especially due to religious boundaries [28]. There is also a need to provide subsidized or free treatment for those unable to meet the high cost of treatment. Overprotective nature, negligence or hostility of parents, uncompassionate peers and society along with the burden of the disease complications hamper the maturity and development of the children. The loss of working days hampers the patient's education and careers. It can be said that research should focus on the needs of patients with thalassemia and help them cope with the society.

The sociological impact of adequate health care system of our country is visible in our study. Low doctor-patient ratio increases various complications of the patients [27]. For example, about 25.77% of the thalassemia patients that comprised about 441 individuals suffered from TTIs especially HCV with a majority of 18.70% followed by HIV (3.74%) and HBV (3.33%) (Fig. 3). The proper screening of blood is compromised due to lack of standard detection process [11,18,29] which is the major reason for the high prevalence of TTIs. HBV infection can be controlled with proper vaccination, and HIV is controlled to a great extent as the Government has undertaken adequate measures for stringent detection. HIV-infected thalassemics needs ART treatment, which is available in the Government settings. However, having no immunization until date makes the controlling of HCV infection in multi-transfused patients difficult and the cost of interferon treatment is out of reach of socio-economically backward families [17]. This pressure on the health professionals, in turn, disturbs the relationship with the patients and their families and may also negatively affect the family's adjustment to the consequences of the illness. Furthermore, staff-patient ratio, psychologists, availability of blood may upset the family's acclimatization [30].

CONCLUSION

Our study reflects the different social and economic difficulties along with the clinical and psychological burdens faced by the thalassemia patients and their families. The high rate of TTIs leading to the poor prognosis of the affected individuals highlights the need for stringent screening of blood or blood products before administrating to the patients [12,31-33]. It is well-evident that counseling can be an important part of their lives to abate the problems.

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