

Evaluation of hepatitis C, hepatitis B, and HIV virus Serology pandemic in thalassemia patients of Shahid Mohammadi Hospital of Bandar Abbas, IranMohammad Aminianfar¹, Farrokh Khani², Iman Ghasemzadeh³¹M.D., Department of Infectious and Tropical Disease, AJA University of Medical Sciences, Tehran, Iran² M.D., General Physician, Infectious and Tropical Diseases Research Center, Hormozgan Health Institute, Hormozgan University of Medical Sciences, Bandar Abbas, Iran³M.D., HIV/STI Surveillance Research Center, and W.H.O. Collaborating Center for HIV Surveillance, Institute for Futures Studies in Health, Kerman University of Medical Sciences, Kerman, Iran**Type of article:** Original**Abstract****Introduction:** Thalassemia patients are prone to the hepatitis C, B, and HIV virus, due to their constant need to receive blood transfusions. Therefore, this research was aimed to determine the epidemic of the aforementioned diseases in thalassemia patients of Shahid Mohammadi Hospital of Bandar Abbas, Iran.**Methods:** This cross-sectional study was carried out on thalassemia patients visiting the Thalassemia Hospital of Bandar Abbas from March 21, 2014, to March 22, 2015. Checklists were used to collect the data. HBS-Ag, HCV-Ab, and HIV-Ab tests have been registered for hepatitis B, hepatitis C, and HIV virus, respectively. The data were analyzed using SPSS 19 by Mann-Whitney U test, chi-square test, and independent samples t-test.**Results:** Among 587 records administered into the research, 280 individuals (47.7 %) were men and (52.3 %) were female. The average age of participants was 18.01 ± 9.31 years. The youngest was 1 years old, and the oldest was 46 years old. Four patients under the study (0.7 %) were positive for HBV; 60 (10.2 %) were HCV positive. However, no one in the study was diagnosed HIV positive. In the case of spread, there was no significant difference regarding age and sex in HBV patients. However, in HCV patients, significant differences were found ($p=0.044$ for gender and $p=0.001$ for age).**Conclusion:** In thalassemia, hepatitis C had the highest rate of spread. According to the screening, it was much anticipated that the trend should be falling, but the results show the contrary. Hence, it is recommended that more precise methods such as PCR be used.**Keywords:** Thalassemia, Hepatitis C, Hepatitis B, HIV**1. Introduction**

Thalassemia is the most pandemic blood-induced illness across the globe. The highest rate of spread of this disease in Iran is in the southern and northern regions. A regular blood transfusion in thalassemia patients is necessary to improve a patient's overall survival (1). On the other hand, this has led to improving the quality of life and life expectancy in these patients. However, the chance of getting infections has increased as a result (2). The most common infections are HBV, HCV, and HIV, which are transmitted mainly by exposure to infected blood or blood products and infected medical equipment (3). Mentioned viruses are distributed in thalassemic patients worldwide with a prevalence varying in different countries from 0.2 up to 80% (4, 5). Although the odds of getting an infection have been lowered in recent years, due to primary screening in the transfusion centers, the transfer of such infections through blood products is still a crucial problem in developing countries such as Iran (6). According to previous studies, the prevalence of blood-borne infections is higher in developing countries than in developed countries. For example, the prevalence of HBV in Africa has been reported to be 25.2%, while in Asia and Europe, it was 8.4% and 4.6%, respectively (7, 8). In addition, the prevalence of HCV viremia among hemodialysis patients was high in

Corresponding author:Dr. Iman Ghasemzadeh, Institute for Futures Studies in Health, Kerman University of Medical Sciences, Kerman, Iran. Tel: +98.9122900572, Email: Imanghasem@gmail.com

Received: June 14, 2016, Accepted: August 30, 2016, Published: March 2017

iThenticate screening: August 21, 2016, English editing: October 19, 2016, Quality control: December 18, 2016

© 2017 The Authors. This is an open access article under the terms of the Creative Commons Attribution-NonCommercial-NoDerivs License, which permits use and distribution in any medium, provided the original work is properly cited, the use is non-commercial and no modifications or adaptations are made.

Palestine (22%) and Yemen (62.7%) as compared with France (7.7%) (9, 10). Despite there being several documents on the topic of the prevalence of hepatitis viruses in the hemodialysis patients in the Iranian population, most of those studies are restricted to specific geographic locations or provinces, and there is a lack of mentioned reports in the south of Iran, especially in the Hormozgan province, in recent years (11, 12). Hence, this study was carried out, aiming to determine the prevalence of hepatitis C, hepatitis B, and HIV serology in thalassemia patients visiting Shahid Mohammadi Hospital of Bandar Abbas.

2. Material and Methods

The project was carried out using descriptive–retrospective methods. First, from the archive office of Shahid Mohammadi Hospital for medical records, we collected the names and codes of patients diagnosed with thalassemia. In the next step, the information for patients from March 21, 2014, to March 22, 2015, was analyzed. In the medical records, HBS-Ag, HCV-Ab, and HIV-Ab tests have been registered for hepatitis B, hepatitis C, and HIV virus, respectively. To carry out the tests, ELISA third generation has been used. To collect the data, a two-part checklist was used. The first section included the demographic information of patients such as name, sex, age, etc. The second section included such information as positive or negative results of infections and the duration of being infected with virus. All the records that existed in the center were put into the study. Medical records that lacked enough demographic information did not have regular registering for virus tests or were incomplete; in any case, they were eliminated. The data were analyzed using SPSS 19 (SPSS Inc., Chicago, Illinois, USA). To analyze the data, descriptive statistics methods such as mean score, standard deviation, frequency, and percentage were used. Mann-Whitney U test, Chi-square test, and independent samples t-test also were used for detection of correlations. A p-value of less than 0.05 was considered at significant levels. Moreover, the confidentiality of the records was maintained and observed by the researchers.

3. Results

The research was carried out on 836 records where 249 were eliminated due to lack of enough information. The remaining (587 cases) records were put to research, in which 280 patients (47.7%) were male and 307 patients (52.3%) were female. The mean age was 31, and standard deviation was 18.01 ± 9 , with an age range of 1 to 46. Among this population, 64 cases (10.9%) were infected with one of the evaluated viruses, and others (524; 89.1%) were healthy. As shown in Table 1, in the whole study, four patients (0.68%) had B hepatitis tested as positive, among which only one was male and the others (75%) were female. In fact, 0.4% of the whole men and 1% of the whole women under the study had B hepatitis tested as positive. According to Fisher test and p-value, there was no difference in sex for getting the virus ($p=0.625$).

Table 1. Frequencies and percentage of HBV-positive patients in accordance to gender

Variables			HBs-Ag		Total	p-value
			Positive	Negative		
Gender	Male	n	1	279	280	0.625
		% in gender	0.4	99.6	100	
		% in HBs-Ag	27	47.9	47.7	
	Female	n	3	304	307	
		% in gender	1	99	100	
		% in HBs-Ag	75	52.1	52.3	
Total	n	4	583	587		
	% in gender	0.7	99.3	100		
	% in HBs-Ag	100	100	100		

According to Table 2, from all patients under the study, 60 (10.2%) had hepatitis C tested as positive, among which 36 patients were male and others (40%) were female. In fact, 12.9% were male and 7.8% were women in the study who had C hepatitis. There was a significant difference between the sexes in getting the infection ($p=0.044$). The mean age of patients who were hepatitis C positive was 23.72 years with the standard deviation of 6.44, and the mean age of negative patients was 17.36 years with standard deviation of 9.36. According to Mann-Whitney U test, significant associations were found between positive and negative results in that age range ($p=0.001$). It is noteworthy to mention that, due to age distribution being normal, a Mann-Whitney non-parameter test was used for the evaluation of relations. According to Table 3, all the patients under the study were HIV negative. Due to not having frequency in the group of HIV positive, it was not possible to do statistical tests in this field. In addition,

based on Table 4, we can observe a mean score and SD of patients with each of HCV, HBV, and HIV regarding age, in which, according to Mann-Whitney and p-value, there was no significant difference between two groups of positive and negative in age ($p=0.556$). However, in regards to HCV positive and negative patients, there were significant relations ($p\leq 0.001$). According to the date of incidence of infection (available in the records), frequency and percentage of patients who had HBV and HCV and its separation are recorded. Among the Hbs-Ag positive patients, one was infected in the last two years, and three have been infected in the last year. On the other hand, the incidence of HCV-Ab positive cases showed an increase from 2007. The longest duration for hepatitis C was 12 years.

Table 2. Frequencies and percentage of HCV-positive patients in accordance to gender

Variables			HCV-Ab		Total	p-value
			Positive	Negative		
Gender	Male	n	36	244	280	0.044
		% in gender	12.9	87.1	100	
		% in HCV-Ab	60	46.3	47.7	
	Female	n	24	283	307	
		% in gender	7.8	92.2	100	
		% in HCV-Ab	40	53.7	52.3	
Total	n		60	527	587	
	% in gender		10.2	89.8	100	
	% in HCV-Ab		100	100	100	

Table 3. Frequency and percentage of HIV-positive patients in accordance to gender

Variables			HIV-Ab		Total
			Positive	Negative	
Gender	Male	n	0	280	280
		% in gender	0	100	100
		% in HIV-Ab	0	47.7	47.7
	Female	n	0	307	307
		% in gender	0	100	100
		% in HIV-Ab	0	52.3	52.3
Total	n		0	587	587
	% in gender		0	100	100
	% in HIV-Ab		0	100	100

Table 4. Frequency, mean, and standard deviation of patients

Variables		n	Age (year); Mean \pm SD	Mann-Whitney U test	p-value
HBs-Ag	Positive	4	20.75 \pm 6.29	-0.590	0.556
	Negative	584	17.99 \pm 9.34		
HCV-Ab	Positive	60	23.72 \pm 6.44	-5.398	<0.001
	Negative	528	17.36 \pm 9.38		
HIV-Ab	Positive	0	-	-	-
	Negative	588	18.1 \pm 9.32		

4. Discussion

Thalassemia patients needing constant transfusion of blood are prone to infectious illness contraction. In this study, the highest rate of hepatitis was in patients diagnosed with HCV with 60 patients (10.2%). At the next rates are HBV with four patients (0.68%) and HIV positive with 0%. In some research, such as that of Yaghobi (HCV: 18.86%), Ansari (HCV: 13.1%), Manisha (HCV: 18%), and Gene (HCV: 25%), the prevalence of HCV serology was higher than in our study (12-14). On the other hand, in research performed by Ataie (HCV: 18%), Calderon (HCV: 1.7%), Vidga (HCV: 2%), Chakrabarti (HCV: 2%), and Aza (HCV: 7.8%), the spread was lower than in our study (15-18). In relation to HBV, the prevalence of HBV serology was higher than in our study in the following studies: Ansari (HBV: 1.25), Riyaz (HBV: 5.1), Chakrabarti (HBV: 2%), Vidga (HBV: 2%), and Calderon (HBV: 7%). Further, the

following studies had lower serology than in our study: Ataie Aza (HBV: 0.5), Remsar (HBV: 0.2) (15, 21). Therefore, wide ranges of prevalence were observed in relation to HBV and HCV in different studies. Various factors determine the prevalence of infections in thalassemia patients, including the frequency of such disease in those population and screening methods (22). However, coincidental with our survey, the mentioned values were totally higher in HCV patients. The low rate of Hbs Ag was caused due to immunity made through vaccination. All the patients should have received a hepatitis B vaccination before contraction of disease starts (23). The incidence of HCV is high in thalassemia patients due to not receiving vaccination. On the other side, an HCV virus causes chronic illness of liver after years, which supports the results obtained from our study. An additional probable reason is the better management and sufficiency of screening methods used for HBV detection in transfusion centers compared with HCV (24). In addition, HIV prevalence of serology was zero in some studies such as Ansari and Riyaz; in some, such as Manisha (HIV: 1.5), Aza (HIV: 3.1), Vidga (HIV: 3%), Calderon (HIV: 1.7), and Remasar (HIV: 1.2%), the prevalence was higher (16-20). In general, the prevalence of HIV has been reduced due to screening of blood samples obtained from donors. In addition, similar to other infection disease, the prevalence of HIV in thalassemia patients in each population, depends on multiple factors, such as screening methods, the frequency of intravenous drug abusers, and other social factors affecting the total prevalence of HIV in those population (25, 26). None of the research participants were diagnosed with more than one disease simultaneously. In the case of spread, there was significant difference according to age and sex between two groups of hepatitis C patients. In fact, the mean age of patients who were hepatitis C positive was significantly more than in negative patients. This can be mainly due to the fact that older patients commonly experienced more blood transfusion sessions, which are an infection risk factor (27). In addition, the prevalence of HCV infection was higher in males, which may be due to the more developed immunity system of females. However, there was no significant difference according to age and sex between two groups of hepatitis B (28). In this study, we divided patients according to the duration of contraction. From among four patients of Hbs Ag, one was infected in the last two years, and three have been infected in the last year. The longest duration for hepatitis C was 12 years, which had undergone fluctuations during the years. It is noteworthy to say that, after 2007, the spread deteriorated. Several reasons can be mentioned for this, including laboratory errors such as personnel errors, kits that do not abide by standards, and ample errors done by an Iranian blood transfusion center, which needs further exploration (29). Moreover, regarding the fact that in the study serological methods have been used, and the methods are not precise, it is highly suggested that, for hepatitis C, we use more precise methods such as PCR (30). Some critique and issues in regards to this study, among other things, is the fact that patients visiting the center had various thalassemia syndromes whose need, age of incidence, date, and time of blood transfusion were different consequently due to incompleteness of records; thus, we were not able to use them.

5. Conclusions

We can conclude that, in thalassemia patients, hepatitis C had the highest prevalence. According to screenings, it was much anticipated that the trend would be lowering; however, the findings indicate the contrary. Hence, it is suggested that more precise assays such as PCR be used.

Acknowledgments:

The authors would like to thank the Student Research Committee of Hormozgan University of Medical Sciences for their help and support.

Conflict of Interest:

There is no conflict of interest to be declared.

Authors' contributions:

All authors contributed to this project and article equally. All authors read and approved the final manuscript.

References:

- 1) Ansar MM, Kooloobandi A. Prevalence of hepatitis C virus infection in thalassemia and haemodialysis patients in north Iran - Rasht. *J Viral Hepat.* 2002; 9(5): 390-2. doi: 10.1046/j.1365-2893.2002.00368.x. PMID: 12225335.
- 2) Mirmomen S, Alavian SM, Hajarizadeh B, Kafae J, Yektaparast B, Zahedi MJ, et al. Epidemiology of hepatitis B, hepatitis C, and human immunodeficiency virus infections in patients with beta-thalassemia in Iran: a multicenter study. *Arch Iran Med.* 2006; 9(4): 319-23. PMID: 17061602.

- 3) Jamal R, Fadzillah G, Zulkifli SZ, Yasmin M. Seroprevalence of hepatitis B, hepatitis C, CMV and HIV in multiply transfused thalassemia patients: results from a thalassemia day care center in Malaysia. *Southeast Asian J Trop Med Public Health*. 1998; 29(4): 792-4. PMID: 10772566.
- 4) Borgna-Pignatti C, Rugolotto S, De Stefano P, Zhao H, Cappellini MD, Del Vecchio GC, et al. Survival and complications in patients with thalassemia major treated with transfusion and deferoxamine. *Haematologica*. 2004; 89(10): 1187-93. PMID: 15477202.
- 5) Yadollahi S, Hamadiyan H, Pour Ashouri F, Fallahi S, Parvizpanah A, Rasekhi S. Trends in the Lipid Profile, Mean Age and Fatality of Patients with Myocardial Infarction in the South of Iran from 2008 to 2014. *Int J Med Res Health Sci*. 2016; 5(6): 221-8. Available From: <http://ijmrhs.com/trends-in-the-lipid-profile-mean-age-and-fatality-of-patients-with-myocardial-infarction-in-the-south-of-iran-from-2008-to-2014/>.
- 6) Olivieri NF, Nathan DG, MacMillan JH, Wayne AS, Liu PP, McGee A, et al. Survival in medically treated patients with homozygous beta-thalassemia. *N Engl J Med*. 1994; 331(9): 574-8. doi: 10.1056/NEJM199409013310903. PMID: 8047081.
- 7) Pruett CR, Vermeulen M, Zacharias P, Ingram C, Tayou Tagny C, Bloch EM. The use of rapid diagnostic tests for transfusion infectious screening in Africa: a literature review. *Transfus Med Rev*. 2015; 29(1): 35-44. doi: 10.1016/j.tmr.2014.09.003. PMID: 25447555.
- 8) Singh H, Pradhan M, Singh RL, Phadke S, Naik SR, Aggarwal R, et al. High frequency of hepatitis B virus infection in patients with β - thalassemia receiving multiple transfusions. *Vox Sang*. 2003; 84(4): 292-9. doi: 10.1046/j.1423-0410.2003.00300.x. PMID: 12757503.
- 9) Inati A, Taher A, Ghorra S, Koussa S, Taha M, Aoun E, et al. Efficacy and tolerability of peginterferon alpha - 2a with or without ribavirin in thalassaemia major patients with chronic hepatitis C virus infection. *Br J Haematol*. 2005; 130(4): 644-6. doi: 10.1111/j.1365-2141.2005.05645.x. PMID: 16098081.
- 10) Ocak S, Kaya H, Cetin M, Gali E, Ozturk M. Seroprevalence of hepatitis B and hepatitis C in patients with thalassemia and sickle cell anemia in a long-term follow-up. *Arch Med Res*. 2006; 37(7): 895-8. doi: 10.1016/j.arcmed.2006.04.007. PMID: 16971232.
- 11) Hesam AA, Taghipour L, Rasekhi S, Fallahi S, Hesam Z. Investigating the Multiple Aspects of Mental Health in Infertile Women. *Int J Ment Health Addict*. 2016; 1-5. doi: 10.1007/s11469-016-9675-1.
- 12) Ansari H, Kamani H, Arbabi-Sarjo A. Prevalence of hepatitis C and related factors among beta-thalassemia major patients in Southern Iran in 2005-2006. *J Med Sci*. 2007; 7(6): 997-1002. Available From: <http://198.170.104.138/jms/2007/997-1002.pdf>. doi: 10.3923/jms.2007.997.1002.
- 13) Yaghobi R, Afkari R, Mohsenzadeh M, Jafari M, Khorrami H, Pirouzi A. A study on the serologic and molecular prevalence of hepatitis G virus (HGV) and hepatitis C virus (HCV) infections in patients with thalassemia in Larestan of Iran. *Afr J Microbiol Res*. 2012; 6(29): 5866-70. doi: 10.5897/AJMR11.1274.
- 14) Manisha S, Sanjeev K, Seema N, Dilip C, Rashmi D. A Cross-Sectional Study on Burden of Hepatitis C, Hepatitis B, HIV and Syphilis in Multi-Transfused Thalassemia Major Patients Reporting to a Government Hospital of Central India. *Indian J Hematol Blood Transfus*. 2015; 31(3): 367-73. doi: 10.1007/s12288-014-0462-5. PMID: 26085723, PMCID: PMC4465515.
- 15) Ataei B, Hashemipour M, Kassaian N, Hassannejad R, Nokhodian Z, Adibi P. Prevalence of anti HCV infection in patients with Beta-thalassemia in isfahan-iran. *Int J Prev Med*. 2012; 3(Suppl 1): S118-23. PMID: 22826753, PMCID: PMC3399295.
- 16) Calderón GM, González-Velázquez F, González-Bonilla CR, Novelo-Garza B, Terrazas JJ, Martínez-Rodríguez ML, et al. Prevalence and risk factors of hepatitis C virus, hepatitis B virus, and human immunodeficiency virus in multiply transfused recipients in Mexico. *Transfusion*. 2009; 49(10): 2200-7. doi: 10.1111/j.1537-2995.2009.02248.x. PMID: 19538543.
- 17) Vidja PJ, Vachhani JH, Sheikh SS, Santwani PM. Blood transfusion transmitted infections in multiple blood transfused patients of Beta thalassaemia. *Indian J Hematol Blood Transfus*. 2011; 27(2): 65-9. doi: 10.1007/s12288-011-0057-3. PMID: 22654294, PMCID: PMC3136674.
- 18) Chakrabarty P, Rudra S, Hossain MA. Prevalence of HBV and HCV among the multi-transfused beta thalassemic major patients in a day care centre of blood transfusion department of Mymensingh Medical College Hospital. *Mymensingh Med J*. 2014; 23(2): 235-41. PMID: 24858148.
- 19) Ansari SH, Shamsi TS, Khan MT, Perveen K, Farzana T, Erum S, et al. Seropositivity of Hepatitis C, Hepatitis B and HIV in Chronically Transfused $\beta\beta$ -Thalassaemia Major Patients. *J Coll Physicians Surg Pak*. 2012; 22(9): 610-1. doi: 10.2012/JCPSP.610611. PMID: 22980623.

- 20) Riaz H, Riaz T, Ullah F, Aziz S, Khan MU, Pervaiz R, et al. Assessment of the seroprevalence of viral hepatitis B, viral hepatitis C and HIV in multitransfused thalassaemia major patients in Karachi, Pakistan. *Trop Doct.* 2011; 41(1): 23-5. doi: 10.1258/td.2010.100158. PMID: 20940290.
- 21) Remesar M, Gamba C, Kuperman S, Marcosa MA, Miguez G, Caldarola S, et al. Antibodies to hepatitis C and other viral markers in multi-transfused patients from Argentina. *J Clin Virol.* 2005; 34 Suppl 2: S20-6. doi: 10.1016/S1386-6532(05)80030-7. PMID: 16461236.
- 22) Harmatz P, Jonas MM, Kwiatkowski JL, Wright EC, Fischer R, Vichinsky E, et al. Safety and efficacy of pegylated interferon α -2a and ribavirin for the treatment of hepatitis C in patients with thalassemia. *Haematologica.* 2008; 93(8): 1247-51. doi: 10.3324/haematol.12352. PMID: 18556414.
- 23) Li CK, Chan PK, Ling SC, Ha SY. Interferon and ribavirin as frontline treatment for chronic hepatitis C infection in thalassaemia major. *Br J Haematol.* 2002; 117(3): 755-8. doi: 10.1046/j.1365-2141.2002.03491.x. PMID: 12028054.
- 24) Di Marco V, Capra M, Angelucci E, Borgna-Pignatti C, Telfer P, Harmatz P, et al. Management of chronic viral hepatitis in patients with thalassemia: recommendations from an international panel. *Blood.* 2010; 116(16): 2875-83. doi: 10.1182/blood-2009-11-248724. PMID: 20551378.
- 25) Al - Sheyyab M, Batiha A, El - Khateeb M. The Prevalence of Hepatitis B, Hepatitis C and Human Immune Deficiency Virus Markers in Multi - transfused Patients. *J Trop Pediatr.* 2001; 47(4): 239-42. doi: 10.1093/tropej/47.4.239. PMID: 11523766.
- 26) Ansari Fard S, Rasekhi S, Ashoorian MJ, Parvizpanah A. Knowledge of dentists of Bandar Abbas toward anaphylactic shock. *Int J Pharm Tech Res.* 2016; 9(4): 299-302.
- 27) Wanachiwanawin W, Luengrojanakul P, Sirangkapracha P, Leowattana W, Fucharoen S. Prevalence and clinical significance of hepatitis C virus infection in Thai patients with thalassemia. *Int J Hematol.* 2003; 78(4): 374-8. doi: 10.1007/BF02983565. PMID: 14686498.
- 28) Sievert W, Pianko S, Warner S, Bowden S, Simpson I, Bowden D, et al. Hepatic iron overload does not prevent a sustained virological response to interferon- α therapy: a long term follow-up study in hepatitis C-infected patients with β thalassemia major. *Am J Gastroenterol.* 2002; 97(4): 982-7. doi: 10.1111/j.1572-0241.2002.05550.x. PMID: 12003436.
- 29) Borgna-Pignatti C, Cappellini MD, De Stefano P, Del Vecchio GC, Forni GL, Gamberini MR, et al. Survival and complications in thalassemia. *Ann N Y Acad Sci.* 2005; 1054(1): 40-7. doi: 10.1196/annals.1345.006. PMID: 16339650.
- 30) Boroujerdnia MG, Assareh Zadegan MA, Zandian KM, Haghirizadeh Rodan M. Prevalence of hepatitis-C virus (HCV) among thalassemia patients in Khuzestan Province, Southwest Iran. *Pak J Med Sci Q.* 2009; 25(1): 113-7. doi: 10.1.1.318.3811.