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Prevalence of Hepatitis C and Related Factors among Beta-Thalassemia Major Patients in Southern Iran in 2005-2006

[1]H. Ansari, [2]H. Kamani and [3]A. Arbabi Sarjo

The purpose of this study was to assess of hepatitis C and related factors among beta-thalassemia patients. In 2005-5006 a cross sectional study was conducted in Dastgheib hospital, Shiraz, Iran. Participants were all beta-thalassemia major patients (806 cases). Blood samples were taken from patients and HCVAb was determined using commercial Kit. The data collected using a questionnaire consists on demographic and treatment related variables. Data were analyzed using chi-square test. The subjects were 400 (49.6%) females and 406 (50.4%) males. Thirty-two patients (3.9%) were more than 30 years old and 372 (46.1%) were less than 15 years old. Prevalence of this infection among males and females was 12.8 and 16%, respectively. No significant difference was seen between males and females regarding prevalence of hepatitis C (p = 0.15). The prevalence of hepatitis C was statistically correlated with type of transfused blood and blood group of patients (p = 0.05). The findings showed that despite blood screening to prevent hepatitis C, prevalence of this infection was higher among Beta-thalassemia major patients. Thus, careful screening and healthy blood transfusion is too important. It must be mentioned that packed red blood cell should be inspected with great attention and probably O blood group predispose the patients to HCV infection.

Key words: Prevalence, hepatitis C, beta-thalassemia major

[1]Department of Epidemiology and Statistic, Faculty of Health,
Zahedan University of Medical Sciences, Zahedan, Iran
[2]Department of Environmental health, Faculty of Health,
Zahedan University of Medical Sciences, Zahedan, Iran
[3]Department of Nursing, Faculty of Nursing,
Zahedan University of Medical Sciences, Zahedan, Iran

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INTRODUCTION

Thalassemia major is one of the most prevalence hereditary diseases around the world. In Iran, it is more prevalent in the northern and southern provinces (Karimi *et al.*, 2002). This disorder is one of the sever hemoglobinopathies which is presently observed in the center of Africa, Asia, the south of Pacific Ocean and some districts of India (Ghotbi and Tsukatani, 2005). Among 18000 beta-thalassemia major patients who live in Iran, 2000 live in Fars province, which is more than those who live in all over the USA (Karamifar *et al.*, 2003). This disorder has different complications because of inappropriate treatment and other demographic factors related to the treatment. Some of these complications are cardiac disease, endocrinologic disease and viral disease transmittable through blood such as hepatitis B and C and AIDS. Infections are the second prevalent cause of death among thalassemic patients (Karimi *et al.*, 2002; Ghotbi and Tsukatani, 2005; Karamifar *et al.*, 2003; Tamaddoni *et al.*, 2007; Mirmomen *et al.*, 2006). The most prevalent infection which is transmittable through blood transfusion among these patients is hepatitis C. From each 1000 blood receivers almost 5-10 people get hepatitis C (Hajiani *et al.*, 2006). Lack of control and accurate screening of blood caused a remarkable number of thalassemic patients, who were in need to regular blood transfusion and leads to get hepatitis C (Hajiani *et al.*, 2006; Abram and Benenson, 1995; Jules *et al.*, 1999; Melody *et al.*, 2004). Using screening methods, specially advanced methods like ELIZA generation I and II, decreased the risk of both hepatitis C and HIV (Hajiani *et al.*, 2006). Nevertheless for some reasons, hepatitis C is observed among these patients that is necessitates more attention. Since it is not only affects the life of thalassemic patients and their families but also other especially their relatives are at risk of transmission (Tamaddoni *et al.*, 2007; Mirmomen *et al.*, 2006; Melody *et al.*, 2004).

HCV is transmittable through platelets, plasma, packed cells and specially coagulating factors (Hajiani *et al.*, 2006). This virus is also transmittable through sexual intercourse and organ transplantation and also transmittable through contaminated needles and syringes especially among addicts and thalassemic patients. The transfer of disease among the family members of the hepatitis C patients has been observed (Abram and Benenson, 1995; Bastie *et al.*, 1995). Therefore special attention is necessary to prevent the transfer of infection among the patient's family members

There are about 100,000,000 hepatitis C virus carriers through the world (Tamaddoni *et al.*, 2007; Hajiani *et al.*,

2006; Peter and Hepatitic, 1997). This virus is the main cause of liver cirrhosis in Japan and the US. In the US hepatitis C is the main cause which leads to liver Transplantation (Peter and Hepatitic, 1997; Sheila and James, 1999). In Iran, prevalence of this infection is less than hepatitis B, so that only 0.3% of Tehran's volunteer blood donors have HCVAb in their blood serum (Mirmomen *et al.*, 2006; Hajiani *et al.*, 2006) while it has been reported that the prevalence of HCVAb were 4, 2.2 and 1.4% among Egyptians, Japanese and Africans respectively (Bastie *et al.*, 1995; El-Ghohara *et al.*, 1995; WHO, 1998). There are noticeable geographical differences in the prevalence of this infection. For example the epidemiological studies show that the prevalence of this infection is 0.4-1.1% in North America, 0.9-1.4% in New York and 9.6-13.6% in North Africa (Jules and Dienstag, 1999; Bastie *et al.*, 1995; Peter and Hepatitic, 1997). Among thalassemia patients, because of repetitive blood transfusion, the prevalence of HCV is reported between 10-50%. In Iran the prevalence of this infection among syringe using addicts, hemophilic and thalassemic patients are 40, 60 and 15-20%, respectively (Tamaddoni *et al.*, 2007; Mirmomen *et al.*, 2006; Jules *et al.*, 1999; Bastie *et al.*, 1995).

Hepatitis c is the most common and important cause of chronic Hepatitis among Iranian thalassemic, hemophilic and hemodialysis patients (Tamaddoni *et al.*, 2007; Mirmomen *et al.*, 2006). Nowadays among blood transfusion transmittable infections hepatitis C is the most important prevalent reason for acute hepatitis and cirrhosis of liver among thalassemic and hemophilic patients (Tamaddoni *et al.*, 2007; Mirmomen *et al.*, 2006; Sheila and James, 1999). The main reasons of these infectious are transmission through blood transfusion and change of body immunity because of spleen hyperactivity. The standard blood transfusion to keep hemoglobin rate higher than 10 mg dL^{-1} causes thalassemic patients to be recipient of blood from 4 or 5 donors (Karimi *et al.*, 2002; Ghotbi and Tsukatani, 2005; Tamaddoni *et al.*, 2007; Mirmomen *et al.*, 2006; Melody *et al.*, 2004; WHO, 1998).

Epidemiological studies findings regarding the methods of transmission of infection is not enough; however the most important method of transmission is through blood transfusion, specially its components. Among susceptible people to infection such as addicts, hemophilic patients and thalassemic patients, thalassemic ones are the most ready to be infected (Hajiani *et al.*, 2006; Jules *et al.*, 1999; Bastie *et al.*, 1995; Peter and Hepatitic, 1997).

Infection by HCV has a high inclination to turn to be chronic. We hypothesized that blood group, type of

transfused blood and sex would relate to Hepatitis C infection. The purpose of this study was to assess prevalence of hepatitis C among Beta-thalassemia major patients and to determine distribution of this infection based on sex, age, type of transfused blood and blood group.

MATERIALS AND METHODS

In 2005-5006 a cross sectional study was conducted in Dastgheib hospital, Shiraz, Iran. Participants were all Beta-thalassemia major patients (806 cases). Blood samples were taken from patients and HCVAb was determined using commercial Kit. The data collected using a questionnaire consists on demographic and treatment related variables. The patients were referred to the hospital for blood transfusion and chelating therapy and check up periodically and they were from boushehr, kouhkiloye and boyerahmad and Fars provinces. The patients were age ranging from 1-43 years and all of them had files in the center. After informed consent was taken, the data collected using a questionnaire. In addition to interview with patients and their companions to complementation of information we also used from files and consulted with physicians in the center. The accuracy of information was increased by the patient's regular visits in previously set times, necessary in treatment of the cases with complications, doctors roles in prescribing medicine and the family roles in dealing with the complications. The data analysis was performed by descriptive statistic (mean, standard deviation and percentage) and analytical statistic (chi-square and independent t-test) using SPSS version13 software. The level of significance was set at $p<0.05$.

RESULTS

The subjects were 400 (49.6%) females and 406 (50.4%) males. Thirty-two patients (3.9%) were more than 30 years old and 372 (46.1%) were less than 15 years old. The mean age of the patients was 15.3 ± 6.82 years. The mean age of the females' was 15.7 ± 6.7 and of the males were 14.9 ± 6.8 years. There was no statistically significant difference between them ($p>0.05$). The mean age of the first blood transfusion and chelating therapy were 19.1 ± 20.1 months and 5.8 ± 3.9 years, respectively. Twenty-four old of patients (75%) who have delayed chelating therapy were older than 30 years old (75%). Five hundred and thirty four of patients (69%) that were younger than 30 years old started chelating therapy on time. Four hundred and sixty five of patients (57.7%) used deferoxamin through pumping and 317 (39.3%) through

injection together with blood and pumping. Twenty four of patients (3%) never injected deferoxamine. The amount of injected blood in accordance with the patient's level of hemoglobin differed between 70-780cc in different patients. Six hundred and forty six of patients (80.1%) used packed red blood cell and 160(19.9%) used washed red blood cell. Only 209 (26%) of patient's mothers had university education. The distribution of BG among these patients was concordance with population (using chi-square test, $p>0.05$) and 38% of patients had O blood group.

The prevalence of hepatitis C was 14.4%. Prevalence of this infection among males and females was 12.8 and 16%, respectively. No significant difference was seen between males and females regarding prevalence of hepatitis C ($p = 0.15$). The results are shown in Table 1.

According to the findings, the highest prevalence is observed among 1991-2005 peer groups (24.7%) and the lowest prevalence is observed among 1976-1990 peer groups (4.2%) (Table 2).

As the results show, in Table 3 the prevalence of this infection among patients who used packed red blood cell (15.9%) was more than patients who used washed red blood cell (8%). Chi square test was also approved the finding at statistically significant level of 0.05 ($p<0.05$).

The results suggest that the highest prevalence of hepatitis C existed among the patients with O blood group patients (20.6%). Therefore, it seems that they are at higher risk of infection than other patients. On the other hand the least prevalence of hepatitis C was observed among the patients with AB blood group (7.4%). However, the difference was statistically significant at level of 0.05 ($p<0.05$) (Table 4).

The mean age at onset of hepatitis C and age in patients with complication were 17.13 ± 5.4 and 19.13 ± 5.05 respectively and mean of years with hepatitis C was estimated 1.99 years. Since hepatitis C is due to contamination of blood and injection instruments, the mean age may differ in different circumstances.

Since the prevalence of hepatitis C is related more to the quality and contamination of blood rather than demographic factors, hence, we study only its prevalence

Table 1: Distribution of hepatitis C among thalassemia major patients by sex

| | Hepatitis C | | | | | |
| | Infected | | Uninfected | | Total | |
Sex	No.	Percent	No.	Percent	No.	Percent
Males	52	12.8	354	87.2	406	100
Females	64	16.0	336	84.0	400	100
Total	116	14.4	690	85.6	806	100
	$X^2 =1.9$			$p = 0.1$		

Table 2: Distribution of hepatitis C among thalassemia major patients by age groups

| Hepatitis C | Age groups | | | | | | | |
| | 1961-1975 N = 32 | | 1976-1990 N = 402 | | 1991-2005 N = 372 | | Total N = 806 | |
	No.	Percent	No.	Percent	No.	Percent	No.	Percent
Infected	7	21.8	17	4.2	92	24.7	116	14.4
Uninfected	25	78.2	385	95.8	280	75.3	690	85.6
Total	32	100	402	100	372	100	806	100

Table 3: Distribution of hepatitis C among thalassemia major patients by type of transfused blood

| Type of transfused blood | Hepatitis C | | | | | |
| | Infected | | Uninfected | | Total | |
	Frequency	Percent	Frequency	Percent	Frequency	Percent
Packed red blood cell	103	15.9	543	84.1	646	100
Washed red blood cell	13	8.1	147	91.9	160	100
Total	116	14.4	690	85.6	806	100

$X^2 = 6.3$ p = 0.006

Table 4: Distribution of hepatitis C among thalassemia major patients by blood group

| Blood group | Hepatitis C | | | | | |
| | Infected | | Uninfected | | Total | |
	Frequency	Percent	Frequency	Percent	Frequency	Percent
A	20	8.7	210	91.3	230	100
B	28	13.9	174	86.1	202	100
AB	5	7.4	63	92.6	68	100
O	63	20.6	243	79.4	306	100
total	116	14.4	690	85.6	806	100

$X^2 = 18.3$ p = 0.0001

of this infection with regard to blood, age and sex. Other factor is not taken into consideration. All the patients were using antiviral drugs. Also 6% of the patients were affected by hepatitis B.

DISCUSSION

This study showed that the main factor to prevention of this infection among these patients is complete and correct survey and screening of donned blood. It seems that the contamination of packed red blood cell is more than washed red blood cell. Therefore packed red blood cell should be inspected with great attention. This study showed that probably O blood group predisposes the patients to HCV infection but further study should be conducted to approve this result. Since this infection is communicable through injection instruments such as transfusion and chelating therapy instruments, so it seems that sterilization of these instruments and training patients to privately use of them are importances.

Hepatitis C prevalence in this study was 14.4%. This result showed that prevalence of this infection is too high and checking bloods had not done so perfect, hence

health care service authorities and personnel should take into consideration. Prevalence of this infection in this study is lower than that of the USA (Melody *et al.*, 2004). Nevertheless prevalence of hepatitis C is related more to the quality and contamination of blood rather than other factors, so this difference in special periods and different cities or countries is not out of expectation. The prevalence of hepatitis C in this study is also different from the previous study in Iran (Tamaddoni *et al.*, 2007; Mirmomen *et al.*, 2006) and it is higher than of it. This can be due to distribution of infected blood all over the country for the purpose of transfusion in a specific period of time. The most important way of hepatitis C transmission is through blood transfusion. In Iran most infections happened before 1996, because after then blood was screened carefully for the prevention of infection.

In this study, there was not any statistically significant relation between sex and prevalence of hepatitis C. It is clearly that the male and female patients used the same blood and the main way of the infection transfer is transfusion, so it is not expected to observe any differences between male and female subjects. Unless

accidentally one sex be exposed more to infected blood than the other one. This result is in accordance with the previous findings in Iran (Tamaddoni *et al.*, 2007; Mirmomen *et al.*, 2006).

As we fined in this study it seems that packed red blood cell is more contaminated than washed red blood cell. According to the findings of this study, the prevalence of hepatitis C in patients who used packed red blood cell was significantly more than those who use washed red blood cell (Table 3). It is recommended that to pay more attention to patients who use packed red blood cell because they are at higher risk of infection.

Another interesting result of this study was that the prevalence of hepatitis C among the patients with O blood group was more than the other patients. It seems that this blood group is more susceptible to contamination than other blood groups. Therefore, careful screening of this blood group is more important. Further studies are necessary to prove if there is factual relationship between blood group and hepatitis C and other infection disease among these patients.

Hepatitis C not only causes suffering to the patients and their families, it may be communicated to others (Hajiani *et al.*, 2006; Jules *et al.*, 1999; Bastie *et al.*, 1995) so study about this infection in different times is very important.

The findings show that, despite blood screening to eliminate pathogenic factors, hepatitis C resulting from infected blood was observed. Most of these patients were affected in recent years. Hence careful screening and healthy blood transfusion is too important.

Hepatitis C is a global main problem with expensive treatment and the result of the treatment is not always satisfactory (Melody *et al.*, 2004) hence prevention of this infection is very important. It must be mentioned that the blood needs through screening before transfusion to decrease the risk of infection. Moreover, all of injection instruments for chelating therapy must be sterilized before application. Health care service authorities and personnel should take these points into consideration. It suggested that thalassemia major patients with hepatitis C must avoided drinking alcohol, because it causes the liver damage, increase the risk of liver cancer and decrease response to Interferon (Sheila and James, 1999; Marsano and Pena, 1998).

Thalassemia major is a hereditary disease which necessitates blood transfusion and chealation therapy thought the life. Appropriate treatment and care may lead to a normal life cycle in these patients. It is possible that these patients like their peer groups without any serious complication continue their life. Patients and their families cooperation with physicians, health service personnel's education of patients and their families, encouragement of patients, following appropriate treatment procedures and familiarizing patients with the complications can significantly decrease the complications of beta-thalassemia majors specially iron overload complications. It's clear that bone marrow plantation is not possible for all patients. It is hoped that more efforts into these patients bring appropriate treatment methods to promote the patient's life quality.

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