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Prevalence of Hepatitis C Virus in Thalassemia and Hemoglobinopathies in Duhok City/Iraq

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Abstract: Hepatitis C virus regards as one of the most important challenges in present era because of its increasing infection all over the world. Infection with HCV causes severe complications end up with shortage in liver functions, cancer and death. The aim of this study is to determine the rate of HCV antibodies prevalence in thalassemia patients and other hemoglobinopathiesin Duhok City, Iraq. About 190 blood samples were collected at December 2015-August 2016 from Thalassemia Unit in Golan Hospital, Aqra, Duhok, Iraq. Chemical immunofluorescence technique was used to detect the antibodies and antigens for HCV. The positive samples were retested as additional confirmation to the results. The results revealed that the total rate of HCV prevalence reached 15.26% (29 from 190) but in patients with thalassemia the ratio was 11.05% (21 from 117). For age groups, the highest rate of infection (65.5%) was in patients with age ranged between 11-20 years. The result revealed that HCV infects 69% of patients witha thalassemia major. There are no relationship between HCV infection and each of sex, blood groups and Rh factor.

Key words: HCV, thalassemia, hemoglobinopathies, Rh factor, antibodie, cancer

INTRODUCTION

Thalassemia is an inherited blood disorder that affects the body's ability to produce hemoglobin and red blood cell. Thalassemia types are alpha thalassemia and β thalassemia. β thalassemia includes β Thalassemia Major (β TM) which regards the most prevalence disease over all the world (200 million patients) (Li, 2017). In Iraq the prevalence ratio may reach 5% (Hassan *et al*., 2003). In some societies practice the habit of consanguineous marriage the ratio may increase (Samavat and Modell, 2004). This disease characterized with distortion of globin chains which lead to malfunction in hemoglobin end up with destruction of red blood cells in bone marrow and causes death if it is not treated (Rund and Rachmilewitz, 2005). In 2013 about 25000 patients dead by thalassemia (Li, 2017). Patients with βTM need blood transfusions 1-2 time monthly to keep them alive (Rund and Rachmilewitz, 2005). The blood transfusions may cause blood born infections such as Hepatitis C Virus infection (HCV). HCV is the most transmitted virus through the blood (Rich and Taylor, 2010). This virus recorded in 1989 (Houghton, 2009) belong to Flaviviridae family with RNA genome (Smith *et al*., 2014). The global number of patients with chronic HCV may exceeds one billion with 750000 annual deaths (Thomas, 2013). The infection with HCV causes acute infection may reach for 6 months without symptoms (Tarky *et al*., 2013), 80% of them may change to chronic infection without symptoms, thus, HCV is also named the silent disease which end up within 10-20 years to liver fibrosis or cirrhosis (Lee *et al*., 2015). HCV has long incubation period and late seroconversion which causes difficulties in sero-diagnosis especially in new infected patients. Therefore, the early diagnosis of viral nucleic acid and serological tests using chemiluminescence technique (Snibe® Systems) are very important to detect the low level of viral RNA during incubation period (Mattsson *et al*., 1992; Lai *et al*., 1993; Guo *et al*., 2012). The aim of this study is to determine the prevalence rate of HCV in patients with thalassemia and other hemoglobinopathies in Aqra, Duhok City, Iraq.

MATERIALS AND METHODS

Blood sample: About 190 blood samples were collected from patients with thalassemia and hemoglobinopathies (β TM, sickle β-thalassemia and sickle cell anemia, β thalassemia intermedia and alpha thalassemia) in Gollan Hospital, Agra, Duhok, Iraq from December 2015-August 2016. Age patients ranged between 1-46 years. Blood samples (6-7 mL) were taken and put in serum-separating tube (contains special gel).

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The sample centrifuged, incubated (37°C) for 5 min, centrifuged for 10 min at 1000 rpm. Within 3 h serology test performed using Snibe Diagnostic systems and Maglumi 1000® (Chemiluminiscence Immunoassy (CLIA) Technology)) which give 100% sensitivity and 99.93% specificity (Guo *et al*., 2012). Anti-Hepatitis C IgG antibodies test was used as standard test according to, recommendation from Centers for Disease Control and prevention (CDC). Results interpreted asnon-reactive (negative) if it is <20 AU/mL or reactive if it is equal or more than 20 AU/mL (positive).

RESULTS AND DISCUSSION

Total prevalence of HCV was 15.26% (n = 19) whereas prevalence of HCV in thalassemia patients was 11.05% (n = 19) (Table 1). The results showed that HCV infect 58.6% (n = 17) of male compared with 41.4% (n = 12) in female (Table 2).

The age of patients ranged between 1-46 years, patients with age ranged between 11-20 infected with 65.5% (n = 19) from the total HCV infected patients (n = 29). Group with 21-30 years infected with 24%, group with 1-10 years was infected with 6.8%, group with 31-40 years infected with 3.4% (Table 3).

HCV infections varies according to the types of hemoglobinopathies. HCV infections in patients with βTM reached 69% (n = 20) whereas HCV infections in patients with sickle cell anemia was 17.2% (n = 5). In patients with sickle beta thalassemia, HCV infects 10.3% of them whereas in patients with beta thalassemia minor infecgtion ratio with HCV reached 3.4% (Table 4).

HCV infects 44.8%, 31%, 20.7% and 3.4% of patients with O+, A+, B+ and AB+ blood groups, respectively (Table 5). All patients with HCV were positive for rhesus factor (Table 6).

Patients with thalassemia and hemoglobinopathies need frequent blood transfusions which are important for their improvement of survival and reduce dangerous complications that produced from severe anemia . On the other hand this frequent blood transfusions will increase the probability of infection with different microbes especially HCV, HBV and HIV (Rund and Rachmilewitz, 2005). Previous study (2005-2006) national survey (general population) performed through all provinces in Iraq and recorded low prevalence of HCV (0.4%) (Tarky *et al*., 2013). In present study prevalence ratio of HCV was 15.06% from 190 patients suffer from hemoglobinopathies whereas in thalassemia patients (beta major and beta intermedia) HCV prevalence was 11.05%. This result was lower than other study (17%) performed on 200 thalassemia patients in Mosul City (Khalid and Abdullah, 2012). In other Iraqi cities including Diyala (Raham *et al*., 2011) and Karbala (Al-Greti, 2013) higher ratio recorded 26.4% and 37%, respectively whereas in Babylon City lower prevalence was recorded (7.5%) (Tarish and Shakeer, 2014). These variations in prevalence of HCV may belong to variations in hygienic surveillance especially tests blood. In addition, it reflect the variation of health awareness of the citizens in these cities. In Baghdad the prevalence ratio of HCV in thalassemia patients increased up to 67% in 1989 (Al-Kubaisy *et al*., 2006) then reduced to 46% in 2008 (Abed, 2010)

Table 1: Prevalence of HCV in Aqra, Duhok, Iraq

HCV	Number	Percentage
Negative	161	84.74
Positive	29	15.26
Total	190	100.00

Table 2: Prevalence of HCV in male and female

Sex	Number	Percentage	-Ve HCV	+Ve HCV	Statically values	Significance
Male	87	45.8	70 (43.5%)	17 (58.6%)	2.270	
Female	103	54.2	91 (55.5%)	12 (41.4%)		0.096
Total	109	100	161 (100%)	29 (100%)		

Table 3: Prevalence of HCV in age groups

Age groups	Anemia patients	-Ve HCV	+Ve HCV	Statically values	Significance
1-10	91	89 (55.3%)	2 (2.19%)	28.21	0.0001
11-20	57	38 (23.6%)	19 (33.3%)		
21-30	32	25 (15.5%)	7 (21.8%)		
31-40	6	5 (3.1%)	1 (16.6%)		
41-50	4	4 (2.5%)	-		
Total	190	161	29		

Table 4: Prevalence of HCV according to the type of thalassemia and hemoglobinopathies

Anemia type	Number (%)	-Ve HCV	+Ve HCV	Statically values	Freedom degree	Significance
βTM	85 (44.7)	65 (40.4%)	20 (69.0%)	10.235	4	0.037
Sickle cell anemia	32 (16.8)	27 (16.8%)	5 (17.2%)			
Beta thalassemia anemia	41 (21.6)	38 (23.6%)	3 (10.3%)			
Beta thalassemia intermedia	23 (12.1)	22 (13.7%)	1 (3.4%)			
Alph thalassemia	9 (4.7)	9 (5.6%)	-			
Total	190(100)	161(100%)	29(100%)			

Table 5: Prevalence of HCV according to blood groups

Blood group	Number	-Ve HCV	+Ve HCV	Statically values	Freedom degree	Significance
O+	69 (36.3%)	56 (34.8%)	13 (44.8%)	4.224	7	0.75
A+	56 (29.5%)	47 (29.2%)	9 (31.0%)			
B+	36 (18.9%)	30 (18.6%)	6 (20.7%)			
AB+	13 (6.8%)	12 (7.5%)	1 (3.4%)			
A-	7 (3.7%)	7 (4.3%)	-			
O-	4 (2.1%)	4 (2.5%)	-			
B-	3 (1.6%)	3 (1.9%)	-			
AB-	2 (1.1%)	2 (1.2%)	-			
Total	190 (100%)	161 (1005)	29 (100%)			

Table 6: Prevalence of HCV in patients with positive rhesus factor

Rhesus factor type	-Ve HCV	+Ve HCV	Statically values	Freedom degree	Significance
Positive	145 (90.1%)	29 (100.0%)	3.147	1	0.06
Negative	16 (9.9%)	-			

and in 2011 it become 16.9% (Albahadle *et al*., 2013) and this gradual decreasing may be belong to improvement incheck procedures for blood donors in last years. In neighboring countries like Iran, the ratio of HCV prevalence in South West Iran was 28.1% (Boroujerdnia *et al*., 2009) whereas in North Iran it reduced to 13.6% (Jafroodi *et al*., 2015) then reduced to 8% in Esfahan City (Ataei *et al*., 2012). In Pakistan other studies recorded high ratio (49%) of HCV prevalence in thalassemia patients (Din *et al*., 2014) and increased in another study to reach 56% (Saeed *et al*., 2015). In other countries such as Honk Kong the ratio reached 46.8% (Lau *et al*., 1993), Brazil 46.8% (Covas *et al*., 1993), India 43.6% (Choudhury *et al*., 1998), Burma (Myanmar) 55.6% (Okada *et al*., 2000), Malaysia 22.4% (Jamal *et al*., 1998), Taiwan 17% (Chung *et al*., 1997). These variations are very clear and may belong to different reasons such as sample size, type of technique (ELISA, Minividas, Immunofluorescences, Chemiluminescence), variations in kit types and their trade mark, time of incubation during the test and the differences inblood test procedures between countries, cities and societies. In addition, to that the variations in customs and social customs in each society such as tattoo, body piercing, take drugs by injection. Level of hygienic surveillance in addition to hygienic awareness of people may interpet all these variation in results.

HCV characterized with low viral load, long incubation period which may extended to 6 months and asymptomatic in acute and chronic periods, all these reasons will delay the seroconversion and finally, delay diagnosis of HCV in blood donor leading to increase the probability of infections to patients with thalassemia and hemoglobinopathies through hemolysis and this interprets the increasing of infection in thalassemia patients in all previous studies. To reduce the infection with HCV, many countries insert the DNA test within the routine protocol test which recognize very low concentration of viral DNA and RNA (Dodd *et al*., 2002; Whittaker *et al*., 2008).

This study revealed that HCV infect males (8.95%) more than females (6.4%), this result coincided with other studies performed inside and outside Iraq (Raham *et al*., 2011; Abed, 2010; Boroujerdnia *et al*., 2009; Jafroodi *et al*., 2015; Satia *et al*., 2016; Namat Allah, 2013; Al-Juboury *et al*., 2010). The present study showed that the age group with 11-20 years infected with the highest ratio (27%) compared with other groups and these results agreed with other studies Albahadle *et al*., 2013; Boroujerdnia *et al*., 2009; Satia *et al*., 2016). The highest ratio of infection with HCV was in the group with 10-20 years which may be attributed to more frequent number of blood transfusions in older patients compared with very low number of blood transfusions in group with 1-10 years and this result was confirmed with other studies (Albahadle *et al*., 2013; Boroujerdnia *et al*., 2009).

Our results revealed that HCV infects patients with βTM with high ratio (69%) compared with other hemoglobinopathies. These results agreed with previous study showed that HCV infects patients with βTM (21%) compared with 12.9% beta thalassemia intermedia (Mirmomen *et al*., 2006). These differences in HCV infections may be attributed to more frequent hemodialysis in βTM whom suffer from high shortage of Hb, so, they need more frequent blood transfusions) compared with beta thalassemia intermedia (have simple shortage in Hb). There is no significant relationship between HCV infections and blood groups A+, B+, O+ and Rh. Theseresults come in agreement with other studies (Mohammadali and Pourfathollah, 2014; Jeremiah *et al*., 2008; Gao *et al*., 2011).

CONCLUSION

The prevalence ratio of HCV infections in thalassemia patients is lower than other studies in or out Iraq. The most prevalence of HCV was in βTM patients compared with other types. Approval of chemical immunofluorescence technique and viral nucleic acid test

as routine tests before blood transfusion are very important to reduce HCV prevalence in patients with thalassemia and hemoglobinopathies.

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