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Seroprevalence of Hepatitis C Virus and Hepatitis G Virus and Their Relation with Anti-nuclear Antibody in Kirkuk City

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Abstract: Hepatitis C and G viruses are blood born viruses which are distributed throughout the world. These viruses may infect the general population, blood recipient such as thalassemic, hemadialysis and hemophilic patients and individuals who receive the blood, or expose to operations and injection of drugs. The study was planned to determine the seropositive of HCV and HGV among blood donors and risky population in Kirkuk City.This study carried out from 21st of November 2012 to 30th of April 2013 in Azadi Teaching Hospital (patients attended Gastroenterology-Liver Disease Unit and Thalassemia Center), Kirkuk General Hospital (Hemodialysis Center) and Blood Bank Center of Kirkuk City, to detect hepatitis C virus antibody using the ELISA and mini-VIDAS techniques and hepatitis G virus antibody using ELISA technique in thalassemic patients, hemodialysis patients, general population and blood donors. The rate of HCV seropositive by using ELISA in thalassemic patients, hemodialysis patients, general population and blood donors were 29.5%, 7.1%, 9.8% and 1.6% respectively and by using mini-VIDAS were 29.5%, 7.1 %, 8.8 % and non-respectively. The rate of HGV seropositive was 2.6 % in thalassemic patients, non in hemodialysis patients, 0.98 % in general population and 1.6 % in blood donors. Antinuclear antibody (ANA) was found in 6.1 % of HCV seropositive and none of HGV seropositive. Seropositive of HCV and HGV was found in Kirkuk patient's with high rate in risky groups, particularly multiple blood recipients.
Keywords: Seroprevalance, Hepatitis C virus, Hepatitis G virus, Anti-nuclear antibody, Kirkuk city

INTRODUCTION

Hepatitis C virus (HCV) was first detected in 1989 using molecular biology techniques after extensive testing of serum from experimentally infected animals[1]. Hepatitis C virus is a small enveloped positive stranded Ribonucleic acid (RNA) virus that belongs to the Hepacivirus genus in the Flaviviridae family. The HCV particle consists of a nucleocapsid surrounded by a lipid bilayer in which the two envelope glycoproteins, E1 and E2, are anchored as a heterodimer which plays a major role in HCV entry[2]. The HCV is transmitted through contaminated blood transfusion, surgery, surgical instruments, dental surgery and excessive dental consultations, sexual contacts, drug abuses, sharing of the house hold items such as razors, toothbrushes and shaving from the barber. Some health care procedures, i.e. surgical and dental treatments, have been indicated as risk factors for acute infection with HCV[3]. Infections by HCV are extensive throughout the world[4]. Globally, 0.5% - 1.5% of the blood donors are anti-HCV antibodies positive with great geographical variation [5]. In Iraq, the prevalence of anti-HCV antibodies among the blood donors was 2.79 % in Alanbar[6], while in Diyala was 0.15 % but the higher prevalence rates were detected among certain risky groups, such as hemophilia (27.3%), thalassemic (16.9 %) and hemodialysis patients (14.3%)[5]. Diagnosing acute hepatitis C is still difficult since the disease is frequently asymptomatic and the presence of HCV-RNA in serum or liver is the first evidence of exposure to this virus. However, the diagnosis of hepatitis C virus infection is most frequently based on anti-HCV antibodies seroconversion which is screened by enzyme linked immunosorbent assay (ELISA) and confirmed by polymerase chain reaction (PCR)[7].

In 1995, hepatitis G virus (HGV), or GB virus C (GBV-C) was discovered in sera from two patients. The HGV and GBV-C are two isolates of the same virus. Hepatitis G is an RNA virus of 9 to 10 Kb, similar to that of hepatitis C and members of the Flaviviridae family. The structure of hepatitis G virion is similar to that of HCV. The HGV has been found to replicate in lymphocytes rather than in hepatocytes. An antibody assay can detect past infection and detection of acute infection with hepatitis G requires a PCR assay for viral RNA in serum. Up to 2 % of volunteer blood donors and 35 % of human immunodeficiency virus (HIV) infected patients are positive for HGV-RNA,

which is a blood-borne virus. In addition to being closely related to hepatitis C, data suggest that 10-20% of patients infected with hepatitis C are also infected with hepatitis G. Patients infected with both viruses do not appear to have worse disease than those infected by HCV only[8]. The HGV is mainly transmitted through the parenteral route, with poly-transfused patients and intravenous drug users being considered high risk groups. However, the high prevalence rate of HGV among blood donors suggests that other routes, especially vertical and sexual transmission play a relevant role in the dissemination of the virus[9].

The aim of this study was to determine the rate of HCV and HGV seropositive among blood donors and risky population in Kirkuk City and estimate some immunological responses.

PATIENTS AND METHODS

The study was a cross sectional carried out in Kirkuk City from 21st of November 2012 to 30th of April 2013. A total number of 255 blood samples were collected from patients belonging to various risk groups including (78 thalassemic patients, 102 general population patient, 14 hemodialysis patients and 61 blood donors) who attended Azadi Teaching Hospital (Thalassemia Center and Gastroenterology-Liver Disease Unit), Kirkuk General Hospital (Hemodialysis Center) and Blood Bank Center of Kirkuk City. The total number of males and females enrolled in this study were 148 and 107 respectively. ELISA and mini-VIDAS techniques were used to test HCV antibody, while only ELISA technique used to test the HGV antibody.

RESULTS

Table 1 showed the rate of anti-HCV antibodies were 29.5 % in thalassemic patients, 7.1 % in hemodialysis patients, 9.8 % in general population and 1.6 % in blood donors by using ELISA technique, while the rate of anti-HCV antibodies were 29.5 % in thalassemic patients, 7.1 % in hemodialysis patients, 8.8 % in general population and non in blood donors by using mini-VIDAS technique

Table−1: Comparison between ELISA and Mini-VIDAS Techniques in Anti-HCV Antibodies Detection

Categories	Total No.	ELISA				Mini-VIDAS			
		+ve	%	-ve	%	+ve	%	-ve	%
Thalassemic Patients	78	23	29.5	55	70.5	23	29.5	55	70.5
Hemodialysis Patients	14	1	7.1	13	92.9	1	7.1	13	92.9
General Population	102	10	9.8	92	90.2	9	8.8	93	91.2
Blood Donors	61	1	1.6	60	98.4	0	0	61	100
Total	255	35	13.7	220	86.3	33	12.9	222	87.1
ELISA $X^2 = 25.726$ P = 0.000011 P < 0.01 Highly Significant									
Mini-VIDAS $X^2 = 29.974$ P = 0.0000014 P < 0.01 Highly Significant									

Table 2 showed the rate of HGV antibodies were 2.6 % in thalassemic patients, non in hemodialysis patients, 0.98 % in general population and 1.6 % in blood donors.

Table−2: The Rate of Hepatitis G Virus Antibodies

Categories	Total No.	HGV +ve cases		HGV -ve cases	
		No.	%	No.	%
Thalassemic Patients	78	2	2.6	76	97.4
Hemodialysis Patients	14	0	0	14	100
General Population	102	1	0.98	101	99.02
Blood Donors	61	1	1.6	60	98.4
Total	255	4	1.6	251	98.4
$X^2 = 0.960$ P = 0.810 P > 0.05 Non Significant					

The total number of males were 40 in thalassemic patients, 8 in hemodialysis patients, 40 in general population and 60 in blood donors, while total number of females were 38 in thalassemic patients, 6 in hemodialysis patients, 62 in general population and 1 in blood donors. The seropositive of HCV antibody was at highest rate in thalassemic male patients (32.5 %), while in hemodialysis patients and general population, the highest rate of HCV infection was found in female patients (16.7 % and 11.3 % respectively). The seropositive of HGV was found in both genders of thalassemic patients, while in general population and blood donors, the seropositive of HGV was found in males.

Table-3: Gender Distribution among HCV and HGV Seropositive Cases

Categories	Male					Female				
	Total No.	HCV+ve		HGV+ve		Total No.	HCV +ve		HGV+ve	
		No.	%	No.	%		No.	%	No.	%
Thalassemic Patients	40	13	32.5	1	2.5	38	10	26.3	1	2.6
Hemodialysis Patients	8	0	0	0	0	6	1	16.7	0	0
General Population	40	2	5.0	1	2.5	62	7	11.3	0	0
Blood Donors	60	0	0	1	1.7	1	0	0	0	0
Total	148	15	10.1	3	2.0	107	18	16.8	1	0.9
X^2(HCV) = 3.934 P = 0.139 P > 0.05 Non Significant X^2(HGV)= 1.333 P = 0.513 P > 0.05 Non Significant										

Table-4: Relation of HCV and HGV Seropositive Cases with Age Groups

Age groups years	Categories of study															
	Thalassemic patients					Hemodialysis Patients			General population					Blood donors		
	Total No.	HCV +ve		HGV+ve		Total No.	HCV +ve		Total No.	HCV +ve		HGV +ve		Total No.	HGV +ve	
		No.	%	No.	%		No.	%		No.	%	No.	%		No.	%
2-12	50	8	16.0	1	2.0	0	0	0	4	0	0	0	0	0	0	0
13-22	22	12	54.5	0	0	3	0	0	10	0	0	0	0	3	0	0
23-32	3	2	66.7	0	0	3	0	0	24	2	8.3	0	0	21	1	4.8
33-42	3	1	33.3	1	33.3	4	0	0	24	2	8.3	0	0	21	0	0
43-52	0	0	0	0	0	1	0	0	17	3	17.6	1	5.9	10	0	0
53-62	0	0	0	0	0	1	0	0	13	2	15.4	0	0	5	0	0
63-72	0	0	0	0	0	2	1	50	10	0	0	0	0	1	0	0
Total	78	23	29.5	2	2.6	14	1	7.1	102	9	8.8	1	0.98	61	1	1.6
X2 (HCH)= 57.498 P=0.001 P< 0.01 Highly Significant X2 (HGV)= 8.0 P= 0.238 P > 0.05 Non Significant																

Table 4 shows the highest rate (66.7 %) of HCV antibodies was found in thalassemic patients from the age group 23-32 years, while the highest rate of HCV antibodies in hemodialysis patients (50 %) was in the age group 63-72 years, but the highest rate (17.6 %) of HCV seropositive in general population was found in the age group 43-52 years. The highest rate (33.3 %) of HGV antibodies was found in thalassemic patients from the age group 33-42 years, while the highest rate of HGV antibodies in blood donors (4.8 %) was in the age group 23-32 years. The highest rate (5.9 %) of HGV seropositive in general population was found in the age group 43-52 years. Table 5: Relation of Seropositive HCV and HGV Antibodies in Thalassemic Patients with Number of Blood Transfusion.

Table 5 shows the highest rate of HCV seropositive was found in patients who received the blood every 15 days, while the HGV seropositive was found in patients who received blood every month.

Table-5: Relation of Seropositive HCV and HGV Antibodies in Thalassemic Patients with Number of Blood Transfusion.

No. of blood transfusion	HCV +ve		HGV +ve	
	No.	%	No.	%
Every 15 Days	13	56.52	0	0
Every Month	7	30.44	2	100
2-3 Months	3	13.04	0	0
Total	23	100	2	100

Table-6: Relation of Seropositive HCV and HGV Antibodies with ANA

ANA	HCV +ve		HGV +ve	
	No.	%	No.	%
Positive	2	6.1	0	0
Negative	31	93.9	4	100
Total	33	100	4	100

DISCUSSION

Early and regular blood transfusion therapy in patients of β-thalassemia decreases the complications of severe anemia and prolongs survival[10]. Such transfusions increase their exposure not only to HCV but also to other blood-borne viruses (hepatitis B virus, hepatitis G virus and human immunodeficiency virus)[11]. The seropositive rate of HCV among thalassemic patients in this study was 29.5 %, this result was higher than that reported in other studies such as 16.9 % in Diyala[5], 17 % in Mosul [12], 11.8 % in Central Islamic Republic of Iran [13], 20.9 % in Larestan of Iran[14], but lower than the studies that reported in Ibn-Albalady Hospital-Baghdad (46%)[15], Mid Delta-Egypt (76%) [16] and Pakistan (42 %)[17].

Hemodialysis patients are at particularly high risk for hepatitis C virus infection because of the exposure to blood products and contaminated equipment[18]. In the present study, hepatitis C virus antibodies were observed in 7.1 % of hemodialysis patients. This result was higher than that reported in other studies such as 4.4 % in Central Islamic Republic of Iran[13], but identical to that reported in Mexico 6.7 %[19], while lower than that reported in Al-Kadhmiya Teaching Hospital-Baghdad (41%) [20], Diyala (14.3%)[5] and Turkey (41 %) [21].

Hepatitis C virus may be diagnosed accidentally in general population due to asymptomatic infection. The current study revealed that the rate of HCV seropositive among general population was 9.8 % by using ELISA technique and 8.8 % by using mini-VIDAS technique. Many other studies showed lower rate of HCV infection among general population including Central Region of Yemen (1.3 %) [22], Mansehra, Pakistan (7 %) [23], South-Western Greece (0.5 %) [24] and South India (4.8 %)[25].

The present study demonstrate that the rate of HCV seropositive among blood donors was 1.6 % by using ELISA technique and non by using mini-VIDAS technique, so the result of this study was different from that reported in other studies such as 1.7 % in Baghdad[26], 0.45 % in Al-Aanbar[27], 0.5 % in Babylon[28], 0.11 % in Sulaimani[29] and 1.3% in Aden City-Yemen [30].

This study showed highly significant results among different tests used in the HCV diagnosis ($P<0.01$). The different results from these techniques may be due to difference in the sensitivity and specificity of these tests. The sensitivity is 99.9 % for ELISA technique, 99.61 % for mini-VIDAS technique, the specificity is 99.8 % for ELISA technique and 99.50 % for mini-VIDAS technique. Also the difference in ELISA technique procedure from mini-VIDAS technique procedure performance by technique, adding reagents and incubation period may have a great role for obtaining these different results. The variation in results of this study from that reported in other studies may be due to sample size, using different kits from different companies which have different sensitivity for diagnosis and other socioeconomic factors[11,12]. Hepatitis C virus infection is characterized by low plasma viral load, long incubation period that may extend to 3 months, the majority of infections are asymptomatic and the high chronicity rate. These factors delay the seroconversion and consequently the serological diagnosis of HCV infection and perpetuate the infectiousness of patients for longer period[13]. This reason may delay the detection of HCV infection in blood donors and increase the HCV infection in thalassemic and hemodialysis patients. Therefore, to minimize the risk of transmission of HCV infection through blood transfusion, several countries have introduced the nucleic acid technique (NAT) as a routine screening of blood donors[31].

Hepatitis G virus\GBV-C is a transfusion transmissible agent, which is endemic among the blood donor population worldwide[32]. The present study found that the rate of HGV seropositive was 2.6 % in thalassemic patients, non in hemodialysis patients, 0.98 % in general population and 1.6 % in blood donors. This study did not find co-infection with HCV and HGV in all categories of the study. There were non-significant differences among categories of the study concerning HGV seropositive which may be due to low number of identified cases. In Larestan-Iran the rate of HGV antibody in thalassemic patients was higher than that reported in this study (16.6 %) [14].

Other study demonstrated that the rate of HGV IgM was 28.3% and IgG was 38.3 % in Baghdad hematological malignancies patient [33], while in Southern Iran non-Hodgkin's lymphoma patients, the rate of HGV antibody was 3.6 %[34]. A study in Egypt reported that 22% of hemodialysis patients had HGV antibodies and 81.8 % were co-infected with HCV[35], also in Egyptian hemodialysis children, the rate of HGV antibody was 28.8 % in predialysis and 41.2 % in hemodialysis patients[36]. In Italy HGV antibody was found in 10.5 % of dialysis patients and 8.8 % in blood donors[37].

Results of this study seem to be similar to that recorded in Iran in which HGV was found in 1% of blood donors without HCV and HGV co-infection[38] , while lower than that recorded in United State (the rate of HGV antibody was 3.0 % in volunteer blood donors with normal ALT and 8.1 % in volunteer blood donors with elevated ALT)[39], and in Norwegian blood donors was 10.5 %[40]. The seropositivity of HGV in American children and young adults was 9.4 %[41].The variation in results of this study from that reported in other studies may be due to sample size and using of different kits from different companies which have different sensitivity for diagnosis, also in developed countries, there are more tattoos, drugs addiction and

sexual partner. Transfusion of viremic blood \blood product can be the route of HGV transmission[42]. Therefore, the existence of HGV antibody in blood donors may lead to transfusion of virus to thalassemic patients.

In the present study, the highest rate of HCV seropositive (66.7 %) among thalassemic patients was occurred at the age group 23-32 years; this may be due to that these patients received blood more frequently than thalassemic patients of younger ages, while the highest rate of HCV seropositive (17.6 %) among general population was occurred at the age group 43-52 years and the highest rate of HCV seropositive (50%) among hemodialysis patients was occurred at the age group 63-72 years.

Hepatitis C is a blood borne viral infection that being considered as the major causative agent of post-transfusional hepatitis (PTH) throughout the world[5]. This is especially true for counties where HCV is more prevalent in general population and therefore also amongst blood donors. The prevalence rate of seropositivity increases with the number of transfusions [17]. Regarding to the blood transfusion in thalassmic patients, this study indicated the highest rate of anti-HCV antibodies in patients who received blood every 15 days, while the highest rate of HGV antibody was in patients who received blood every month. AL-Wtaify and Hassan [43] reported in Basrah that the prevalence rate of HCV was directly related to the number of transfusion units of blood, 14.5 % of patients who had received blood more than 20 times were HCV seropositive compared to 2.4 % of patients who had received blood less than 20 times.

Chronic HCV infection frequently leads to autoimmune response including the production of autoantibodies and the coincidence of autoimmune diseases[44]. Antinuclear antibodies are a specific class of autoantibodies that have the capability of binding and destroying certain structures within the nucleus of the cells[45]. The present study showed that the positive rate of serum ANA was 6.1 % in HCV seropositive cases and non in HGV seropositive cases. This result is lower than that reported by Chen, *et al*.[46] which indicated that the ANA was found in 7.4 % of patients with HCV and Li, *et al*.[47] reported in china that the positive rate of ANA in CHC patients was 12.5 %. These variations in results may be due to difference in sample size, technique used to detect ANA, patient's age and period of infection (acute, chronic or persistent) . Although only a few patients with HCV develop autoimmune hepatitis (AIH), these patients appear to have a genetic predisposition that makes them more likely to develop AIH, compared to HCV-infected individuals without that predisposition. In such cases, the liver cells are damaged not only by the virus but also by the body's own immune system[48]. The current study did not find positive ANA autoantibody in hepatitis G virus cases, so this virus may not induce the autoantibodies.

There is some explanations for ANA appearance in HCV patients, molecular mimicry between HCV polyprotein and three nuclear host antigens including matrin, histone H2, and replication protein A as a mechanism for the emergence of ANA[44], another explanation is that the release of intracellular antigens at the time of hepatocellular injury triggers immune responses in the form of autoantibody production[46].

CONCLUSIONS AND RECOMMENDATIONS

The rate of HCV seropositive was highest in thalassemic patients and the HGV seropositive was found in thalassemic patients, general population and blood donors. The positive rate of ANA was 6.1 % in HCV seropositive cases and non in HGV seropositive cases. Therefore HGV should be enroll for screening program of blood and use polymerase chain reaction (PCR) in HCV-screening in blood which will transfuse to thalassemic and hemodialysis patients. The HCV infected patients should be diagnosed for existing of autoimmune antibodies.

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