RISK FACTORS OF HEPATITIS C INFECTION AMONG EGYPTIAN BLOOD DONORS

Hala Ibrahim Awadalla[1], Mostafa Hassan Ragab[1], Nozat Ahmed Nassar[3], Mahmoud Abd Hamid Osman[2]
[1]Institute of Environmental Studies and Research, Ain Shams University, Cairo, Egypt
[2]Faculty of Medicine, Ain Shams University, Cairo, Egypt
[3]Faculty of Medicine, Cairo University, Cairo, Egypt

SUMMARY

Background: Surveillance of infectious disease markers in the blood donor population is important in recognizing trends in prevalence and incidence of transfusion related infections in asymptomatic volunteer blood donors.

Subjects and Methods: It was a cross sectional study. Samples were collected from volunteer blood donors and questionnaire was designed to collect the risk factors data. The prevalence of hepatitis C antibodies among 1,000 apparently healthy blood donors were determined.

Objective: To estimate the prevalence of virus C hepatic infection and to illustrate the various socio-economic, behavioural and medical factors related to infection with Hepatitis C (HCV) among apparently healthy individuals. It contributed to analysis of the particularities of Egyptian blood donors and helped to better understand the challenges and solutions of blood safety.

Results: The prevalence of HCV was 16.8%. There was an association of positive anti-HCV test with socio-demographic, medical and behavioural risk factors.

Conclusion: This study provided comprehensive and reliable information on the possible risk factors affecting spread of Hepatitis C in the area.

Key words: HCV, risk factors, blood

Address for correspondence: H. I. Awadalla, Medical Science Department, Institute of Environmental Studies and Research, Ain Shams University, Abbassia Cairo 11566, Egypt. E-mail. Hala_Awadalla@yahoo.com

INTRODUCTION

Hepatitis C virus (HCV), first identified in 1989, is strictly a blood-borne RNA viral infection in the family Flaviviridae. Humans are the only reservoir for this viral infection (1). Despite that Hepatitis C is one of the most frequent infections associated with blood transfusion; it was the HIV epidemic that alerted general public to the importance of serological tests in blood banks (2). Hepatitis C is a serious global public health problem. An estimated 170 million people were chronically infected with hepatitis C virus and 3–4 million people are newly infected each year (3). Available data suggest that only between 10% and 40% of people with HCV in Europe are aware of their infection (up to 90% of the prevalent pool are undiagnosed in such countries as Germany or Poland) (4).

The Middle East and North Africa region suffers from high prevalence of unnecessary medical injections and transfusions, reuse of needles and syringes, needle-stick injuries among health care workers, and skin scarifications (1). Hepatitis C is now recognized as the primary cause of transfusion associated with non A non B hepatitis. Hepatitis C is a major cause of chronic liver disease, including cirrhosis and liver cancer. Patients can live for many years without experiencing symptoms, and as a consequence, large number of cases remain undiagnosed. In more than 50% of infected individuals chronic hepatitis with serious and possibly life threatening sequel such as cirrhosis and hepatocellular carcinoma will develop (HCC) (5). About 80% of newly infected patients progress to develop chronic infection. Cirrhosis develops in about 10% to 20% of persons with chronic infection, and liver cancer develops in 1% to 5% of persons with chronic infection over a period of 20 to 30 years (6).

Numerous HCV prevalence studies in Egypt have published various estimates from different Egyptian communities, suggesting that Egypt, relative to the other nations of the world, might be experiencing intense ongoing HCV transmission (1).

In middle 20th-century Egypt, iatrogenic transmission of the hepatitis C virus occurred during the treatment of schistosomiasis with tartar emetic administered intravenously using hastily sterilized reusable syringes and needles (7). Egypt has a very high prevalence of HCV and high morbidity and mortality rates from chronic liver disease, cirrhosis, and hepatocellular carcinoma. Approximately 20% of Egyptian blood donors were anti-HCV positive (3).

SUBJECTS AND METHODS

This was a cross sectional study, the total number of blood donors tested was 1,000 subjects volunteered to donate blood in Kaser Al Ani hospital blood bank, Cairo, Egypt. To be eligible to donate blood, a person must be in good health and must be between 18–60 years of age. Generally, donors must weigh at least 50 kilos. All donors must pass general and medical examinations prior to donation. Exclusion criteria include: younger or older

ages, past history of jaundice, HIV, hypotension, anemia and severe chronic diseases. Before recruitment an informed consent was taken from every participant who agreed to be included in this study. Questionnaire was designed; it included questions concerning demographic (gender and age) and socioeconomic (education) aspects, detailed history of exposure to blood or blood products, social and sexual behaviour, and occupational hazard (unintentional needle-stick injuries, for instance), intravenous drug use, tattooing, acupuncture, surgery, personal history of jaundice or hepatitis or history of these diseases in the donor's family, previous hospitalization and parenteral administration of drugs.

Blood collected by venepuncture, serum or plasma might be used. An enzyme immunoassay for the detection of antibodies to Hepatitis C virus in human serum or plasma was used. Samples were incubated in micro wells coated with highly purified antigens of HCV. During the course of the first incubation, any anti HCV antibodies in the sample will bind to the immobilized antigens. Following washing to remove unbound material, the captured anti-HCV antibodies were incubated with peroxidase conjugated monoclonal anti-human IgG. A purple color developed in the wells which contained anti-HCV positive samples.

Statistical analysis: The collected data was organized and tabulated and statistically analyzed using SPSS for Windows version 13.0. Quantitative data was presented as mean ± standard deviation (SD) and student t-test was used for statistical analysis. For qualitative data, the number and percentage distribution was calculated and chi-square test was applied for comparison. $p<0.05$ was considered to indicate a significant difference.

RESULTS

Table 1 indicates that 16.8% of the studied sample were seropositive. It shows that the mean age of positive subjects (37.9) was higher than of negative subjects (30.4). It demonstrates the relation between HCV test results and the socio-demographic data of the studied group. This table shows that 15% of males and one quarter (25.1%) of females were positive. More than half (57.1%) of farmers were positive and more than one third of participants (39.6%) who had jobs related to blood exposure were positive as well. Nearly three quarters (71.1%) of illiterates were positive and all university graduated subjects were negative. Nearly one fifth (21.6%) of low socio-economic level were positive.

Table 2 summarizes the medically related risk factors for HCV transmission; all factors were significantly associated with HCV transmission. It was found that nearly half (48.4%) of those who had undergone surgical treatment were positive and nearly one third (35.2%) of circumcised subjects by traditional healer were positive. Nearly three quarters (72%) of subjects with history of blood transfusion were positive while nearly half (52.7%) of those subjected to a used needle were positive. 81% of subjects who had received parenteral antischistosomal treatment were positive.

Table 3 demonstrates the behavioural related risk factors for HCV transmission. This table shows that 47.5% of drug abusers were positive, 30.1% of subjects having had ear piercing using common tools were also positive. There was no statistically significant difference related to sexual relations.

Table 1. *Relation between HCV test results and socio-demographic characteristics of the studied subjects*

Socio-demographic risk factors		HCV test results				test	p-value
		negative (N=832)		positive (N=168)			
		n	%	n	%		
Gender	Male	701	85%	124	15%	χ^2=10.5	0.001
	Female	131	74.9%	44	25.1%		
Occupation	Laborers	124	75.6%	40	24.4%	χ^2=286.3	0.000
	Farmers	57	42.9%	76	57.1%		
	Managerial	199	97.5%	5	2.5%		
	Professionals	49	100%	0	.0%		
	House wife	76	74.5%	26	25.5%		
	Students	295	100%	0	.0%		
	Jobs related to- blood exposure	32	60.4%	21	39.6%		
Level of education	Illiterate	11	28.9%	27	71.1%	χ^2=236.8	0.000
	Read write	115	56.9%	87	43.1%		
	Secondary	570	91.3%	54	8.7%		
	University	136	100%	0	.0%		
Marital status	Married	356	70.2%	151	29.8%	χ^2=124.01	0.000
	Not	476	96.6%	17	3.4%		
Socio-economic level	High level	93	94.9%	5	5.1%	χ^2=38.3	0.000
	Mid level	191	94.1%	12	5.9%		
	Low level	548	78.4%	151	21.6%		
Mean of age ± std. deviation		30.45±7.78		37.99±5.49		t=11.9	0.000

Table 2. *Medically related risk factors for HCV transmission*

Medically related risk factors		HCV test result				χ^2	p-value
		negative (N=832)		positive (N=168)			
		n	%	n	%		
Surgical treatment	Yes	116	51.6%	109	48.4%	207.9	0.000
	No	716	92.4%	59	7.6%		
Site of circumcision.							
Private tools at home		24	100%	0	0%	145.6	0.000
Traditional healer		241	64.8%	131	35.2%		
Public hospital		521	93.4%	37	6.6%		
Not		46	100%	0	0%		
History of blood transfusion	Yes	21	28%	54	72%	176.7	0.000
	No	811	87.7%	114	12.3%		
Injection by needle used before	Yes	96	47.3%	107	52.7%	234.9	0.000
	No	736	92.3%	61	7.7%		
Accidental wound with used needle	Yes	144	64.9%	78	35.1%	68.6	0.000
	No	688	88.4%	90	11.6%		
Parental antischistosomal treatment	Yes	12	19%	51	81%	197.9	0.000
	No	820	87.5%	117	12.5%		
Dental treatment	Yes	582	78%	164	22%	56.4	0.000
	No	250	98.4%	4	1.6%		
Hospitalization	Yes	97	51.3%	92	48.7%	169.4	0.000
	No	735	90.6%	76	9.4%		

DISCUSSION

Chronic hepatitis C is a leading cause of end-stage liver disease, with a worldwide prevalence of up to 3%. However, the number of new cases of chronic hepatitis C decreased substantially over the last decade, with well established risk factors for transmission of HCV (8). The recently published Egyptian Demographic Health Survey (EDHS) in 2009 was a national probability sample of the resident Egyptian population. This report estimated an overall anti-HCV antibody prevalence of 14.7% (1). The prevalence rate of HCV infection among the studied subjects was 16.8%. It was more frequent in young and middle-aged adults and in males than females; these were in agreement with Luksamijarulkul et al. (9).

Blood donors are a low-risk population, usually presenting a lower prevalence than the open population (10). This study gives a highlight on HCV activity in Egypt. HCV prevalence varied considerably, from 8.8% to 26.6%, in the reports of blood donors, owing primarily to differences in the age structure of the blood donors tested (1). The prevalence of HCV infection was found to be 0.37% in Singapore (11). Epidemiology Donor Study in different regions of the United States from January 1991 to December 1996 revealed that HCV prevalence decreased from 0.63% to 0.40% (12). The prevalence of anti-HCV among Kuwaiti national and non-Kuwaiti Arab blood donors was 0.8% and 5.4%, respectively (13). The overall prevalence obtained from the study carried out on blood donors in the State of Puebla, Mexico was 0.84% (10).

In Egypt, HCV acquired a special importance, approximately one fifth (20%) of Egyptian blood donors were anti-HCV positive. Egypt has higher rates of HCV than neighboring countries as well as other countries in the world with comparable socioeconomic conditions and hygienic standards for invasive medical, dental, or paramedical procedures (3). The prevalence rate of HCV infection among the same studied sample was 16.8%. It was more frequent in young adults and middle-aged adult and in males than females; these were in agreement with Luksamijarulkul et al. (9).

A significant correlation was found between HCV test results and socio-demographic characteristics of the studied subjects. It was revealed that nearly one fifth (21.6%) of low socio-economic level were positive.

The current study revealed that more than one third of subjects (39.6%) who had jobs related to blood exposure were positive. HCV antibodies positive health care workers had been documented (5). The results of this study demonstrated that nearly half (52.7%) of those subjected to a used needle were positive. In another study, contaminated and inadequately sterilized syringes and needles had resulted in outbreaks of hepatitis C among patients in clinics and physicians' offices (14). In Egypt, infection with hepatitis C virus (HCV) has become the most important public health problem and viral hepatitis along with infection with Schistosoma mansoni is the major cause of chronic liver disease and liver cirrhosis (15). This study shows that 30.3% of HCV positive ones had received parenteral antischistosomal treatment, this was in accordance with Klenerman et al. (16) that a past injection treatment remains likely to be responsible for the high prevalence of HCV morbidity and

Table 3. *Behavioural related risk factors for HCV transmission*

Behaviour related risk factors		HCV test results				χ^2	p-value
		negative (N=832)		positive (N=168)			
		n	%	n	%		
Sexual relations	Yes	65	76.5%	20	23.5%	3.01	0.083
	No	767	83.8%	148	16.2%		
Contact with jaundiced patient	Yes	112	100%	0	0%	25.4	0.000
	No	720	81.1%	168	18.9%		
Tattoo	Yes	168	53.7%	145	46.3%	284.1	0.000
	No	664	96.7%	23	3.3%		
Drug abuse	Yes	31	52.5%	28	47.5%	42.1	0.000
	No	801	85.1%	140	14.9%		
Nail trimming	Private tools	776	83.8%	150	16.2%	3.2	0.072
	Common tools	56	75.7%	18	24.3%		
Ear piercing	Private tools	30	100%	0	0%	26.4	0.000
	Common tools	102	69.9%	44	30.1%		
	No	700	85%	124	15%		
Shaving	Private tools	107	70.9%	44	29.1%	20.1	0.000
	Common tools	720	85.3%	124	14.7%		
	No	5	100%	0	0%		

may be largely responsible for the continued endemic transmission of HCV in Egypt. There was an association of positive anti-HCV test with history of previous parenteral treatment, hospital admission for clinical treatment, and acupuncture therapy. Mostafa et al. (17) identified the important role of injections in spreading HCV infection in this rural community.

It was found that dental treatment was a predominant risk factor for viral hepatitis transmission where one fifth (22%) of subjects who had received dental treatment were positive. This was in agreement with Alam et al. (5) who found that people sharing unsterile medical or dental equipment are at high risk of contracting HCV. Traditional practices contributed to HCV transmission in Cameroon. All men were circumcised, but those who had undergone traditional (rather than medical) circumcision tended to be more likely to have been HCV infected. In a high-prevalence community of Egypt, male circumcision by an informal practitioner was also associated with HCV (7). Current study showed that nearly half (48.4%) of those who had undergone surgical treatment were positive and nearly one third (35.2%) of subjects circumcised by a traditional healer were positive. Nearly three quarters (72%) of subjects with history of blood transfusion were positive. Studies carried out in the 1970s suggested that about 7% of transfusion recipients developed non A non B hepatitis, and that up to 1% of blood units might contain causation virus. The introduction of anti- HCV screening has obviously reduced the transmission (18). Mostafa et al. (17) recommended screening of families of infected HCV subjects as an essential part of case management for early detection and their further management.

A low frequency of HCV infection (0.004% to 0.0004% per unit transfused) continues to accompany blood transfusion due to the presence of infectious donors who are not detected by currently available antibody screening tests. Before any screening test was available, the risk of contracting the virus was 1 in 200 units transfused (19). Luksamijarulkul et al. (9) reported that history of receiving blood or blood products was related to HCV infection.

Results of the current study indicated that there was no statistical significant difference between sexual relations and HCV test results (only 11.9% of positive subjects had sexual relations) this was in disagreement with Luksamijarulkul et al. (9).Transmission of HCV by household contact and sexual activity appeared to be low (20).

The findings of this study indicated that 47.5% of drug abusers were positive. Consistent with these findings, Lee et al. (6) reported that major risk factor for HCV infections is parenteral exposure, especially among injecting drug users. In Europe, between 20% and 90% of new HCV cases have been identified among past or current injecting drug users (4). Very high rates of HCV antibody reactivity (>70%) had been reported in injecting drug users and in hemophiliacs. Intermediate prevalence of 20 to 30% had been observed in patients receiving haemodialysis (21).

Results of the current study indicated that 46.3% of those who had tattoo were positive. This finding provides support for the postulate of Luksamijarulkul et al. (9) and Tripathi et al. (14). There was a limitation of this study. It was conducted on blood donors in general, thus it could not differentiate first time donor from a usual blood donor.

CONCLUSION AND RECOMMENDATION

It is required to carry out future community-based epidemiological studies also in other areas to determine the prevalence of HCV infection among Egyptians all over Egypt. Prevention is the only safeguard against spread of viral hepatitis infection, thus, careful screening of blood, blood products, and adequate

sterilization of reusable surgical or dental instruments should be done. Professional and public health education and implementation of infection control practices in all health facilities is of utmost importance.

Conflict of interest

Contributors: All authors contributed substantially to the study conception and design, data collection and analysis, and drafting and revision of the article. All approved the final version to be published.

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