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# HCV infection prevalence in a population recruited at health centers in Jordan

Waseem Hamoudi \*, Sami Adel Sheikh Ali, Mohammad Abdallat, Chris R. Estes, Homie A. Razavi

Al-Bashir Hospital, Jordan

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## KEYWORDS

Hepatitis C;  
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**Abstract** *Background:* Jordan lacks statistical data regarding prevalence of HCV.

*Aim:* To determine the prevalence of HCV in selected areas of Jordan (north, middle and south of Jordan).

*Methods:* A random sample of 700 patients attending health centers was used to determine HCV prevalence. ELISA testing was used to determine HCV-Ab positive cases, which were confirmed by PCR testing.

*Results and conclusion:* The study concluded that the prevalence of HCV infection in the population recruited from different health centers in Jordan is relatively low and estimates a prevalence of 0.42% among all age groups and 0.56% among those aged >15 years old.

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## 1. Introduction

Infection with hepatitis C virus (HCV) is a major cause of chronic liver disease. Worldwide there are more than 170 million people infected with HCV, and 4 million people are newly infected each year [1,2].

The World Health Organization (WHO) has provided prevalence estimates for six regions, includ-

ing the Eastern Mediterranean Region (EMR)<sup>1</sup> which includes 22 countries in North Africa, the Middle East and South Asia. WHO estimates that the number of HCV-infected individuals in the EMR is about 21 million [1], however, there have been a few prevalence studies carried out at the national or regional level that could corroborate this value. Within the EMR, there is a lack of accurate statisti-

\* Corresponding author. Al-Bashir Hospital, Internal Medicine Department, P.O. Box 922720, Amman 11192, Jordan. Tel.: +962 795723273; fax: +962 5650784.

E-mail address: [waseem6520012001@yahoo.com](mailto:waseem6520012001@yahoo.com) (W. Hamoudi).

<sup>1</sup> The WHO Eastern Mediterranean Region comprises 22 Member States: Afghanistan, Bahrain, Djibouti, Egypt, Islamic Republic of Iran, Iraq, Jordan, Kuwait, Lebanon, Libyan Arab Jamahiriya, Morocco, Oman, Pakistan, Qatar, Saudi Arabia, Somalia, South Sudan, Sudan, Syrian Arab Republic, Tunisia, United Arab Emirates, Yemen, as well as the occupied Palestinian territory.

cal data regarding incidence and prevalence of HCV in numerous countries, including Jordan. The objective of this study was to try to determine the magnitude of HCV infection in Jordan and to describe the demographic and disease characteristics of those infected by HCV.

## 2. Background

WHO estimates a worldwide anti-HCV prevalence of 3% [3]. In combination with hepatitis B, chronic HCV infection accounts for 75% of all cases of liver disease [3]. In developing countries, chronic hepatitis C is a leading cause of liver cirrhosis, hepatocellular carcinoma and liver transplantation.

Historically, transmission of HCV in the developing world has been largely iatrogenic. Today, sporadic transmission is more prevalent (drug addicts, needle sharing, needle-stick injury in medical personnel, tattooing and piercing or razor sharing) [4].

In 1999, WHO estimated that 21.3 million of the 466 million people in the EMR were infected by HCV, resulting in an anti-HCV prevalence rate of 4.6% [1]. The same report provided an estimated seroprevalence rate of 2.1% for Jordan based upon previously published regional estimates. Within the EMR, the highest rates of anti-HCV have been reported in Egypt (14.5%) and Pakistan (3–4.7%) [5–7].

The Jordanian National Strategy for Hepatitis B & C formulated several recommendations aimed at improved understanding and control of viral hepatitis within Jordan. One such recommendation was to conduct a nationwide epidemiological study regarding the prevalence of HCV in Jordan [8]. In accordance with this recommendation, the primary objective of this study was to determine the prevalence of HCV in selected areas in Jordan (north, middle and south of Jordan) and to identify risk factors for HCV infection among Jordanian citizens.

There have been relatively few studies quantifying the burden of HCV infection for Jordan. In one study, the estimated anti-HCV prevalence rate among the general population was estimated at 1.2% [9]. In another study, prevalence rates among several sub-populations at two hospitals in the Amman region were examined; hospital employees had an anti-HCV prevalence of 0.65% while hemodialysis (HD) patients had an anti-HCV prevalence of 6.25%; prevalence rates were found to be higher among older age groups [9]. A 2009 study reported anti-HCV antibodies of 28% among long-term HD patients in southern Jordan [10]. In a study of pa-

tients with hereditary hemolytic anemia, 40.5% were anti-HCV positive, with anemia diagnosis prior to 1995 (when blood screening began) predictive of anti-HCV positivity [11]. The predominant genotype for HD patients was 1a [12].

Nations near Jordan have conducted studies to quantify and describe the national burden of HCV. In Lebanon, a study of 16,000 blood donors found a seroprevalence of 0.404% and a decline in prevalence from 1.22% to 0.16% between 1997 and 2003 [13]. An earlier study found a seroprevalence rate of 0.41% among 7,771 blood donors and 27% in HD patients with length of time on HD predictive of HCV seropositivity [14]. A study of injection drug users (IDU) in Lebanon found that 52.8% were anti-HCV positive [15]. A study of male Lebanese prisoners found an anti-HCV prevalence of 3.4% and identified risk factors including IDU, previous imprisonment and tattooing [16]. The predominant genotypes in Lebanon were genotypes 4 and 1a [17].

Anti-HCV prevalence in Saudi Arabia shows variation with estimates ranging from 0.6% to 1.1% among blood donors [18–20]. Studies of HD patients show varied prevalence rates (14.7% to 68%), but nosocomial transmission before blood screening is probably a large contributor to prevalence in Saudi Arabia [21]. A study of sera from over 3,000 patients at a large medical center in Saudi Arabia showed that anti-HCV prevalence varied between age groups from 2.05% in ages 15–24 up to 15% for those aged 45–54 [22]. A community-based study in Saudi Arabia showed that 14.8% of anti-HCV-positive individuals reported a history of blood transfusion and 7.4% reported a history of schistosomiasis [23].

Anti-HCV prevalence among several groups in Syria has been measured, including blood donors (0.95%), sex workers (1.96%), health care workers (3%), injection drug users (IDU) (60.5%), and HD patients (48.9%) [24–26]. In Iraq, a study of nearly 500,000 blood donors in Baghdad between 2006 and 2009 demonstrated anti-HCV prevalence of 0.3% with higher prevalence among women (0.4%) as compared with men (0.2%) [27]. A study of 169 HD patients in Baghdad showed an anti-HCV prevalence of 7.1%, with female gender, older age, duration of HD, and history of blood transfusion as risk factors [28–30].

## 3. Methods

Three main populated areas in Jordan were selected to investigate random visitors of the comprehensive health centers for issues other than liver disease to estimate anti-HCV prevalence in those areas. The sample size was estimated using

**Table 1** Distribution of study sample by region.

Region	Population (thousands)	Percentage	Proposed No. of participants	No. Participants
Irbid	1087	29	206	201
Amman	2369	64	449	404
Karak	241	7	46	101
Total	3697		700	706

the Epi-Info software (Centers for Disease Control and Prevention, Atlanta, GA). Based on the estimated prevalence in Jordan being 1-2% [9] and a 95% confidence level, the required sample size was calculated to include 380 people. To increase the power of the study, the sample size was increased to 706 people. Study populations were selected proportional to population size from three regions which represent Jordan: north (Irbid), central (Amman) and south (Karak). A random selection of patients attending selected comprehensive health centers for other diseases was performed; urban and rural areas, age groups and gender were considered.

To ensure representativeness, study populations were selected proportional to population size from all three regions. In addition, age groups were selected proportional to the percentage of the age groups in the general population as illustrated in Table 1.

### 3.1. Selection criteria

Two health centers were selected from south Jordan, three from north Jordan and four from central Jordan. For each participant, a short investigation form assessing demographics and risk factor exposures was completed by co-investigators under the supervision of the investigators.

Five milliliters of venous blood was collected by trained laboratory technicians in a plain tube with gel; blood specimens were centrifuged and transported to the referral lab refrigerated in an ice box for HCV-Ab testing by ELISA. Antibodies to HCV were detected using the ELISA 192 Test DIA pro system (cat # CVAB.CE) Anti-HCV V 4.0. ELISA (DIAsource ImmunoAssays (BioSource), Belgium).

All persons with positive HCV-Ab by ELISA were provided confirmatory testing by PCR – Abbott Real-time HCV quantitative assay (Abbott Laboratories, Rungis, France), with a detection limit of 10 IU/ml and tested for genotype. The HCV genotype was determined by sequence analysis using the HCV genotyping Trugene assay (Bayer, Puteaux, France) and referred to the hepatologist for appropriate clinical care.

The number of participants from Karak was increased to 100 due to the relatively small population in this region.

### 3.2. Exclusion criteria

Non-Jordanian citizens were excluded from this study.

### 3.3. Ethical issues

Data collected were treated confidentially, and all participants provided informed consent for this study. Serum collection tubes were identified by random identification numbers and the specimens were sent to the laboratory with a list of identification without the names of participants. This study was approved by the Ministry of Health Ethics Committee (MOH/EC/13700/2011).

### 3.4. Statistical assessment

Seroprevalence was calculated for the study group and by region, sex, and age group. Significant associations were determined using Pearson's chi-square test, or, when small sample sizes necessitated, Fisher's exact test. *P* values <0.05 were considered significant.

**Table 2** Distribution of participants by area of residence and age group.

Age_Group	Irbid	Amman	Karak	Total	Proportion by age groups
<5	23	24	6	53	7.5
5–14	49	72	21	142	20.1
≥15	129	308	74	511	72.4
Total	201	404	101	706	100.0

**Table 3** Age specific prevalence rate of HCV-Ab.

Age_Group	Positive HCV Ab	Negative HCV Ab	Total	Prevalence Rate per 1000
<5	0	53	53	0.0
5–14	0	142	142	0.0
≥15	3	508	511	5.9
Total	3	703	706	4.2

## 4. Results

A total number of 706 persons met eligibility requirements and were selected for testing for anti-HCV antibodies (HCV-Ab) by ELISA test from the three selected areas. They were further stratified by age groups and area of residence as illustrated in Table 2.

The prevalence of HCV-Ab among the study population was 4.2 per thousand (0.42%). All HCV-Ab positive patients were from the ≥15 age group; taking into consideration that the worldwide prevalence is very low among those less than 15 years old, the age specific prevalence rate among the ≥15 age group was 5.9 per thousand (0.59%) as illustrated in Table 3.

All persons with positive HCV-Ab by ELISA were provided confirmatory testing by PCR and testing for genotype, which showed that all infected persons were infected with HCV genotype 4.

## 5. Discussion

This is the first multi-region study assessing seroprevalence of HCV in Jordan. The results of this study reiterate results from previous studies within Jordan and some nearby countries that demonstrate a relatively low burden of HCV infection as compared with other nations within the EMR.

This study was subject to several limitations. First, participants recruited at health centers may not be representative of Jordanian citizens at the national level. The prevalence of HCV is lower than that reported through earlier studies in Jordan and some neighboring countries. However, the prevalence reported among blood donors in Lebanon (0.40%) was relatively low and showed a decline over time from 1.22% to 0.16% between 1997 and 2003 [13].

In conclusion, this study assesses the seroprevalence of HCV in Jordan among participants from three geographical regions. It confirms that the prevalence of HCV in Jordan is low, 0.42% among all age groups, and 0.56% among age groups >15 years old. There is a need for better understanding

of HCV infection in Jordan and other developing countries, as well as stronger efforts to mitigate transmission of HCV.

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