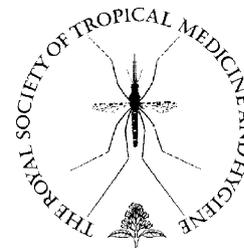




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Hepatitis C virus infections reported over 11 years of surveillance in Saudi Arabia

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Received 11 May 2007; received in revised form 1 August 2008; accepted 1 August 2008

KEYWORDS

Hepatitis C;
HCV;
Hepatitis C
antibodies;
Prevalence;
Saudi Arabia

Summary This was a case series descriptive study of all subjects reported to the Ministry of Health in Saudi Arabia from January 1995 to December 2005 as having hepatitis C virus (HCV) infection, diagnosed by detection of antibodies to HCV. A total of 24 948 cases were reported, of whom 19 185 (76.9%) cases were Saudis. The number of HCV infections by region ranged from 16 to 322 cases, with a mean of 124 cases per 100 000 population, or 0.124%. The number of cases reported among children <15 years was 998 cases (12 cases per 100 000 pediatric population, or 0.012%), and that among adults was 23 950 cases (202 cases per 100 000 adult population, or 0.202%). There was a slight steady increase in the annually reported infections from 1995 to 2002, followed by a plateau. The lower number of HCV infections reported in children compared with those reported in adults suggested that perinatal and childhood transmission was not a major mode of infection and that other modes of transmission, such as unscrutinized blood transfusion before 1990 and intravenous drug use, were likely to be the main modes of infection. The study was limited by being a passive reporting of cases and not a cross-sectional survey. © 2008 Published by Elsevier Ltd on behalf of Royal Society of Tropical Medicine and Hygiene.

1. Introduction

Hepatitis C virus (HCV) infection is an important public health problem worldwide.¹ As of June 1999, WHO estimated that 169.7 million people (3% of the world's population) were chronically infected with HCV globally, and that three to four million people are newly infected each year.² The prevalence rate was estimated to be 5.3% in Africa (31.9 million cases), 4.6% in the Eastern Mediterranean region (21.3 million cases), 3.9% in the West Pacific region

(62.2 million cases), 2.15% in Southeast Asia (32.3 million cases), 1.7% in the Americas (13.1 million cases) and 1.03% in Europe (8.9 million cases).¹ Data on the prevalence of HCV infection in Saudi Arabia is limited. The objective of this study was to describe the number of HCV infections reported in Saudi Arabia during 11 years of surveillance, from January 1995 to December 2005.

2. Materials and methods

2.1. Saudi Arabia

Saudi Arabia occupies most of the Arabian Peninsula, with an area of about 2 240 000 km². It comprises 13 administrative

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Table 1 Number of subjects with antibodies to hepatitis C virus per 100 000 population by regions in Saudi Arabia (1995–2005)

Province	No. reported cases	Mean population during the surveillance period	Cases per 100 000 population
Baha	1268	393 327	322
Jeddah	9186	2 866 113	321
Najran	734	356 250	206
Eastern	3522	1 824 952	193
Qunfoda	102	55 725	183
Makkah	2022	1 483 258	136
Riyadh	4159	4 538 346	92
Qassim	812	890 625	91
Bisha	218	288 321	76
Tabook	389	575 000	68
Madina	808	1 283 251	63
Jouf	112	205 882	54
Asir	568	1 297 311	44
Ahsa	351	940 217	37
Qerayyat	33	113 393	29
Hail	143	487 778	29
North borders	78	270 808	29
Tayef	221	883 186	25
Hafr Albaten	62	280 727	22
Jizan	160	1 030 159	16
Total	24 948	20 064 629	2036

provinces: namely, Makkah province (which includes the holy city of Makkah, Jeddah and Tayef); Madinah province (which includes the holy city of Madinah); Riyadh province (which includes the capital city, Riyadh); the Eastern province (which includes Dammam, Ahsa and Hafr Albaten); Asir province (which includes Abha and Bisha); Jouf province (which includes Jouf and Qerayyat); Hudud Shamaliyah (North Borders) province (which includes Arar); and Baha, Jizan, Najran, Hail, Qassim and Tabook provinces. The latest census conducted in Saudi Arabia in 2004 indicated that the total population was 22 673 538, of whom 16 529 302 (72.9%) subjects were Saudis. Approximately 40.8% of the population is below 15 years, 56.1% is 15 to 64 years, and 3.1% is above 64 years of age. The population annual growth rate is 3.3%. The infant mortality rate is 19.1 per 1000 live births, and the maternal mortality rate is 1.8 per 10 000 live births. The total life expectancy at birth is 71.4 years.

2.2. Data collection

HCV infection and other causes of acute or chronic viral hepatitis have been notifiable in Saudi Arabia since 1990. The Ministry of Health officials rely on health-care providers, laboratories and other public health personnel to report the occurrence of these infections to the Department of Preventive Medicine in the Central Ministry of Health office in Riyadh, where all surveillance data are compiled. HCV infection during the study period was identified by detection of antibodies to HCV (anti-HCV) by ELISA. Specimens with a reactive ELISA result were retested in duplicate. If the result of either duplicate test was reactive, the specimen was defined as repeatedly reactive and was interpreted as screening-test-positive. Screening-test-positive results were confirmed using the recombinant immunoblot analy-

ses (RIBA; Chiron Corporation, Emeryville, CA, USA). Only RIBA-positive patients were included in the study. Indications for testing for anti-HCV included: clinical suspicion and routine screening of blood and organ donors; contacts of HCV-infected patients; prisoners; intravenous drug users; patients with other sexually transmitted infections; and expatriates pre-employment. Obtaining informed consent for testing for HCV or other blood-borne infections is not required in Saudi Arabia.

3. Results

From January 1995 to December 2005, 24 948 people with HCV infection were reported to the Ministry of Health, and of these 19 185 (76.9%) were Saudis. The number of cases per 100 000 population by regions is shown in Table 1. The number of HCV infections by region ranged from 0.016% to 0.322% (16–322 cases per 100 000 population), with a mean of 0.124% (124 cases per 100 000 population). Figure 1 shows the number of HCV cases by year. Figure 2 shows the number of cases by age group. The mean pediatric (children <15 years of age) and adult (subjects \geq 15 years of age) populations during the study period were 8 186 369 and 11 878 260 individuals, respectively. The total number of HCV cases reported among children was 998 cases, or 0.012% (12 cases per 100 000 pediatric population). The total number of HCV cases reported among adults was 23 950 cases, or 0.202% (202 cases per 100 000 adult population).

4. Discussion

In 1989, HCV was first identified and found to be responsible for most transfusion-associated non-A non-B viral

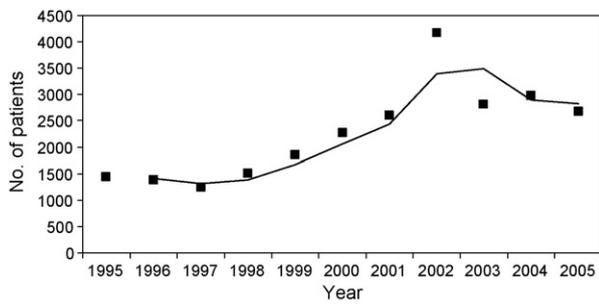


Figure 1 Annually reported subjects with antibodies to hepatitis C virus in Saudi Arabia with a moving average trend line (1995–2005).

hepatitis.^{3,4} Before HCV identification, the major causes of HCV infection worldwide were the use of unscreened blood transfusions, and re-use of needles and syringes that were not adequately sterilized. Screening of blood and organ donors for HCV since 1990 has virtually eliminated the spread of HCV by these routes. Consequently, sharing contaminated needles has become the most common mode of transmission of this infection.¹ Sexual and perinatal transmission may also occur, although less frequently.^{5–7} Infection via other modes of transmission, such as ear and body piercing, circumcision, tattooing and cupping (Hijama), can occur if inadequately sterilized equipment is used.²

The prevalence of anti-HCV in some neighboring and other Islamic countries was reported to be as follows: Algeria 0.2%; Egypt 18.1%; Indonesia 2.1%; Iraq 0.5%; Jordan 2.1%; Kuwait 3.3%; Libya 7.9%; Malaysia 3.0%; Mauritania 1.1%; Morocco 1.1%; Oman 0.9%; Pakistan 2.4%; Palestine 2.2%; Qatar 2.8%; Somalia 0.9%; Sudan 3.2%; Tunisia 0.7%; Turkey 1.5%; United Arab Emirates 0.8%; and Yemen 2.6%.¹ The prevalence of HCV in Saudi Arabia and the aforementioned countries is similar to the prevalence reported in industrialized countries.¹ One notable exception is Egypt, in which the prevalence is known to be exceptionally high (up to 40% in some parts of Egypt), probably because of the use of non-disposable, non-sterilized syringes to administer tartar emetic in mass treatment campaigns to control schistosomiasis from the 1960s to the 1980s.^{8–12}

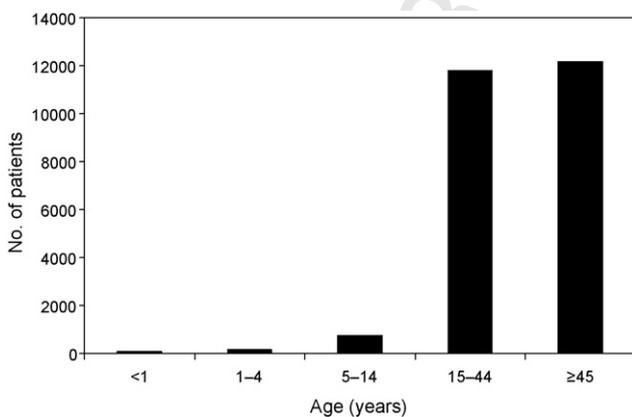


Figure 2 Number of subjects with antibodies to hepatitis C virus according to age group in Saudi Arabia (1995–2005).

Previous studies in Saudi Arabia indicated that the anti-HCV prevalence was 0.4 to 1.7% for adults and 0.1% for children.^{13–16} For instance, a study in Jeddah among 528 blood donors showed an anti-HCV prevalence of 1.7%.¹³ In a large study among 557813 Saudi subjects of all ages in Riyadh province, the anti-HCV prevalence was 1.1% for adults and 0.1% for children.¹⁶ A study among 24173 blood donors in Riyadh province over a three-year period from January 2000 to December 2002 showed an anti-HCV prevalence of 0.4%.¹⁵ A recent study among 13443 blood donors in the Eastern province of Saudi Arabia showed a decline in the prevalence of anti-HCV from 1.04% in 1998 to 0.59% in 2001.¹⁴ In this nationwide study, the number of HCV infections reported in Saudi Arabia ranged from 0.016 to 0.322% in various regions, with a mean of 0.124%. The number of cases reported among adults was on average 0.202% and that among children was 0.012%. The relatively low number of reported cases in this study is likely to be due to under-reporting, as the majority of subjects infected with this virus are usually asymptomatic. The prevalence of anti-HCV slightly and steadily rose from 1998 to 2002, perhaps owing to improved reporting and/or population growth, estimated to be 3.3% annually. From 2003 to 2005, the number of annually reported cases seemed to have plateaued (Figure 1).

In this study, the number of HCV infections reported among children (0.012%) was much lower than that among adults (0.202%). This suggests that perinatal and childhood transmission is not a major mode of infection. However, predominance of this infection in adults suggests that other modes of transmission, such as unscreened blood transfusion before 1990 and intravenous drug use, are the main modes of infection in Saudi Arabia. Substance abuse is an increasing problem in Saudi Arabia, as it is in the rest of the world.¹⁷ Substances abused include injectable drugs such as heroin and cocaine and non-injectable drugs such as cannabis and amphetamine-type stimulants. The estimated annual prevalence of substance abuse in Saudi Arabia in 2000 as percentage of the population aged 15 and above was 0.01% for heroin and 0.002% for amphetamine.¹⁷ The number of drug abusers annually admitted to detoxification centers in Riyadh, Jeddah, Dammam and Qassim from 1996 to 2001 ranged from 4740 to 6650 patients, with an average annual increment of 5.1% (unpublished data). Several studies were conducted in Saudi Arabia to describe the socio-demographic characteristics, pattern of substance abuse, and prevalence of blood-borne infections among drug abusers. For instance, 799 drug abusers from a voluntary detoxification unit in Jeddah were studied.¹⁸ Sixty-eight percent of subjects were under 35 years of age, and 64% starting taking drugs before age 25. Eighty-seven percent used heroin or alcohol, and 14% were dependent on more than one drug. Among heroin users, 91% injected the drug. The prevalence of HCV infection among these patients was 69%.¹⁸ In another study of 349 drug abusers in Jeddah, 281 (80.5%) subjects were intravenous drug users. The prevalence of hepatitis B surface antigen (HBsAg), antibodies to HBsAg and antibodies to hepatitis B core antigen was 12.6, 49.0 and 53.6%, respectively, suggesting that sharing of needles was a common practice.¹⁹ In a more recent study in Jeddah including 1321 drug abusers, 1038 (78.6%) subjects were intravenous drug users, and the prevalence of HBsAg and anti-hepatitis D virus was 6.1 and 0.8%, respectively.²⁰ Among 116 drug

192 users in the Eastern province, 83% of subjects were below
193 32 years of age, 52.6% were unemployed, and the majority
194 was of intermediate education.²¹ Eighty-four percent of the
195 patients abused heroin either alone or in combination with
196 other drugs, 31% used alcohol, 26% used cannabis and 10%
197 used stimulants. The use of other drugs was rare.²¹ Thus,
198 substance abuse seems to be a potential major risk factor
199 for the spread of HCV among adults in Saudi Arabia.

200 The prevalence of HCV infection is lower than the preva-
201 lence of hepatitis B virus (HBV) in Saudi Arabia. A recent
202 study showed that the prevalence of HBV infection in Saudi
203 Arabia was on average 0.15%, with wide variations between
204 various regions, ranging from 0.03 to 0.72%.²² In that study,
205 the prevalence of HBV among children was 0.05% and that
206 among adults was 0.22%. The prevalence of HIV infection
207 in Saudi Arabia has also been recently described. It ranged
208 from 0.002 to 0.074%, with an average of 0.039%.²³

209 An important limitation of this study is that it was not a
210 cross-sectional survey but rather a passive reporting of anti-
211 HCV positive cases to the Ministry of Health, thus carrying a
212 risk of under- or perhaps over-estimation of the actual mag-
213 nitude of HCV infection in Saudi Arabia. On the one hand,
214 routine testing of low-risk groups (such as blood or organ
215 donors and expatriates pre-employment) may underesti-
216 mate the prevalence. On the other hand, testing high-risk
217 groups (such as drug abusers, prisoners, contacts of HCV-
218 infected patients, patients with other sexually transmitted
219 infections) may overestimate the actual prevalence. Given
220 such a limitation, comparing the anti-HCV prevalence in this
221 study to cross-sectional survey prevalence in other countries
222 may not be sound. However, comparing anti-HCV prevalence
223 between regions within Saudi Arabia may be acceptable,
224 as all regions followed the same system of diagnosis and
225 notification.

226 As there is as yet no vaccine to prevent HCV infection,
227 the strategy to prevent this infection in Saudi Arabia focuses
228 mainly on health education, routine screening of blood
229 and organ donors and high-risk subjects such as household
230 and sexual contacts of HCV patients, hemodialysis patients,
231 patients requiring recurrent blood transfusion, intravenous
232 drug users and patients with other sexually transmitted
233 infections. Additionally, implementation and maintenance
234 of proper infection control practice in health-care settings,
235 including standard precautions and proper sterilization of
236 surgical and dental equipment, and good hygienic practice
237 in barbershops and traditional therapy settings such as wet
238 cupping (Hijama), are emphasized in Saudi Arabia.

239 In conclusion, the prevalence of HCV infection in Saudi
240 Arabia is low. In the absence of an HCV vaccine, efforts to
241 prevent the spread of this infection should focus on: ensuring
242 safe blood, blood products and organs for transplantation;
243 ensuring safe use of syringes, needles, sharps and other
244 equipment used for medical or traditional percutaneous
245 interventions; implementation and maintenance of proper
246 infection control practice in health-care settings; and health
247 education, particularly targeting high-risk groups.

248 **Author's contribution:** TAM is responsible for all aspects of
249 this study and is guarantor of the paper.

250 **Funding:** None.

Conflicts of interest: None declared.

Ethical approval: Not required.

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