Trends of Hepatitis C Virus Infection,Kingdom of Saudi Arabia, 2008 – 2012

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Abstract

OBJECTIVE: Infection with hepatitis C virus (HCV) is a risk factor for liver disease and responsible for significant morbidity and mortality. In this study, we determined the trends of HCV infection in the Kingdom of Saudi Arabia (KSA) during the period of 2008 – 2012.

METHODS: This is a descriptive study in whichwe analyzed all cases of HCV infection reported to the Ministry of Health (MoH) by thirteen administrative regions to determine trends in cumulative numbers and incidence rates (IRs) by gender, nationality, and region.

RESULTS: A total of 12,336 cases of HCV infection were reported. Despite the significant increase in the IR of HCV infection in Asirregion,the IRs of reported cases of HCV infection decreased significantly all over the country during this period. Saudis had consistently higher IRs than non-Saudis and there was a significant reduction in the IR for both Saudi and non-Saudi populations over time. The IR of HCV infection was consistently higher among males than females. For both men and women, we observed a statistically significant reduction in the IR from 2008 to 2012.

CONCLUSION: The reported IRs of HCV infections significantly decreased over the 5-year study period in each of the thirteen administrative regions except Asir region. The reduction in HCV infection is encouraging, and the MoH should review the policies and procedures of the HCV infection prevention and control program.

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1. Introduction

Hepatitis C virus (HCV) infection is a primary risk factor for liver disease and one key cause of projected increases in morbidity. Acute HCVinfections areassociated with 955,000 disability-adjusted lifeyears (DALYs)and 54,000 deaths worldwide(1). Challenges to addressing HCV infection stem from the uncertainty of its prevalence and the difficulties of detecting its risk factors (2).

HCV is a blood-borne infection that can be transmitted in several ways, including the sharing of needles amongintravenous drug users, through hemodialysis treatment sessions for end-stage renal disease, organ transplantation, sexual contact,or childbirth if the mother is infected(3).

The prevalence of HCV infection varies across Kingdom of Saudi Arabia(KSA). In 2007, the Ministry of Health(MoH) classified HCV infection as the second most commonnotifiableviral infection after chickenpox (4, 5). The prevalence of HCV infection among the general population of KSA is estimated to be 1.1 – 1.7% (6).

HCV infection receives special attention from the MoH in the KSA because of its challenging nature and the difficulty of tracking those who are infected, a number of whom are pilgrims. KSA receives no fewer than 4 million pilgrims annually who visit the Two Holy Mosques some of them from countries with high HCV infection. It is the largest Arab country in Asia and second largest Arab country in the world after Algeria, with a total area of approximately 2,150,000 km^2 (830,000 sq mi) and a total population of 26,939,583 people, of whom, nine million residents from different countries (33.4 %)distributed across 13 administrative regions (7).

Although the number of HCV infection cases has decreased in KSA since 1990, it still poses a serious health risk. HCV infection is a predisposing risk factor for hepatocellular carcinoma and liver cirrhosis in non-alcoholic patients. Most diagnosed chronic HCV patients in KSA end up needing liver transplantation (4, 5, 8-12). It has been estimated that 1% - 5% of women and 10% - 20% of men develop hepatocellular carcinoma after developing cirrhosis of the liver (13).

In our review of the literature, we found no study that focused particularly on the trend of HCV infection separate from hepatitis A and B using data from the MoH. Previous studies concluded that the HCV infection rate was greater among non-Saudis and older adults, but these studies were done on selected populations, such as blood donors, and not representative of the general population. In addition, these studies focused on either the prevalence or the genotypes of HCV for a specific population without looking at the incidence rate (IR).The distribution of HCV infection over time is the essential epidemiologic predictor for the burden of the disease in the community, but few studies have focused on this analysis. The ones that include incidence have encompassed all types of hepatitis or one specific type, like HBV infection(14), but have not examined the HCV infection in depth.

The spread of HCV infection was investigated in KSA in order to serve as a reliable reference for public health policymakers. To that end, this study aims to determine the changes in distribution of HCV infection throughout KSA over 5 years from 2008 – 2012.

2. Methods

2.1 Data Sources

Through the Department of Public Health, the MoH collects case reportsmonthly from all administrative regions via anelectronic surveillance system, which collects all laboratory-

confirmed HCV infectioncases fromthe hospitals and health centers of the 13 administrativeregions(Figure 1, A & B). The surveillance system registers the cases with a unique code number to avoid duplication.

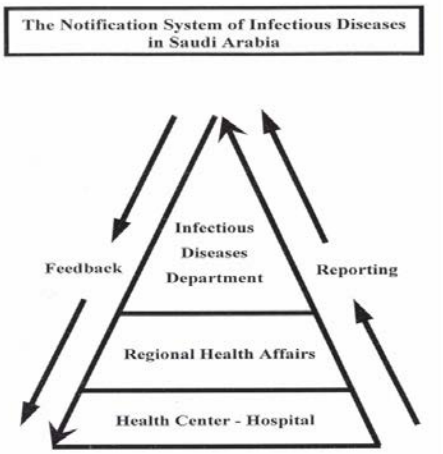

Figure 1 (A) The Infectious DiseaseNotification System, Kingdom of Saudi Arabia(16).

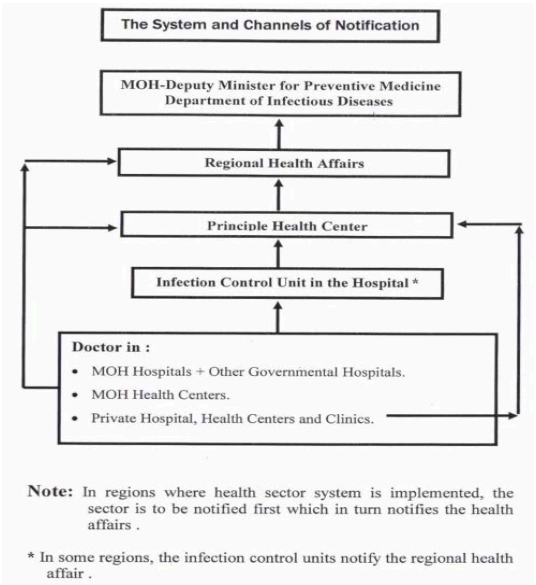

Figure 1 (B) The System and Channels of Notification (16).

We obtained case reports of HCV infections occurring from 2008 – 2012 from the KSA MoH and organized the data by nationality, gender, region, and age. The total population of each administrative region was obtained from the Ministry of Finance, and the population by gender and nationality were obtained from the online database of the Central Department of Statistics and Information, which is based on the annual census field survey as well as on data collected from the records of the administrative regions (15).

Case Definition of Hepatitis C Virus infection

The standard case definitions of suspected and confirmed HCV cases according to the National Hepatitis program (NHP) are as follows:

Suspected case: acute illness that includes acute jaundice, dark urine, loss of appetite, malaise, general fatigability and increased liver enzyme (serum aminotransferase) > 2.5 folds of the normal level with no Urobilinogen in the urine(3, 16).

Confirmed case: any suspected case that is laboratory confirmed by positive result of both anti-HCV antibody and any recombinantimmunoblot assay testin addition to a negative result of anti-bodies to the other types of hepatitis virus infection(3),(16). Only the confirmed cases were included in this study.

Study Variables and study group

In this study, the variableswere nationality, gender, and administrative regions. The nationality variable wasdefined as Saudi and Non-Saudi. The analysis was run for 13 administrative regions: Makkah, Madinah, Riyadh, Qasim, Asir, Eastren region, Tabouk, Northern border, Hail, Jizan, Al-Baha, Al-jouf and Najran (Figure 2). The gender was either male or female. A total of 12,336 HCV reported cases were enrolled in this study.

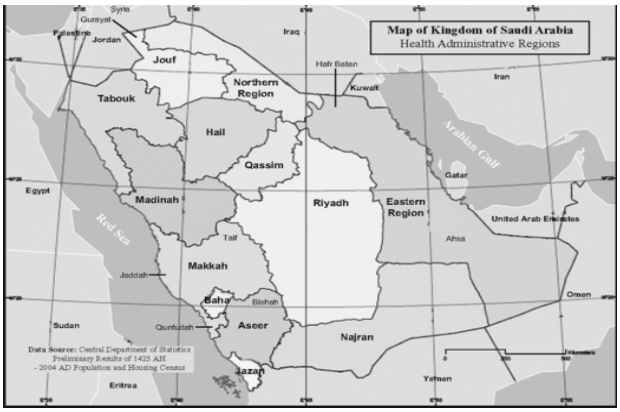

Figure 2 Administrative provinces of Saudi Arabia(23).

2.2 Statistical Analyses

The IR of HCV infection was calculatedby dividing the reported cases of HCV infection for a specific variable and year by the corresponding population of the same variable and year.per 100,000 population with a 95% confidence interval. Chi square test was used to compare the proportion of the incidence rate between the regions, gender and nationality. P value < 0.05 was considered significant.

Ethics

The Emory University Institutional Review Board (IRB00073771) confirmed an exemption from Human Subjects Research for this study.

3. Results

There were 12,336 cases of HCV infection reported. Over all IRwas 9.0 cases per 100,000 population.The IR was 10.6 (95% CI = 10.2 – 11) per 100,000 population in 2008, gradually declining to 7.7 (95% CI = 7.7 – 8.3) per 100,000 in 2012 There was a significant reduction in the IR over the study period,(table 1,Figure 3).

Table 1. Reported cases of hepatitis C virus infection and incidence rates, Kingdom of Saudi Arabia, 2008 – 2012 P< 0.001

Year	# Cases (IR°)	95% CI*
2008	2733 (10.6)	10.2 – 11
2009	2487 (9)	9 – 9.7
2010	2448 (8.5)	8.5 – 9.2
2011	2328 (7.9)	7.9 – 8.5
2012	2340 (7.7)	7.7 – 8.3
Total	12336	

P< 0.001
°IR = incidence rate per 100,000 popula
*CI = confidence interval

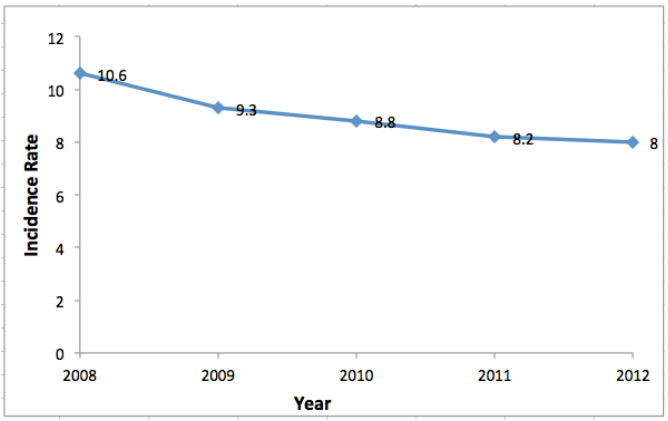

Figure 3. Incidence Rate over 5 years of the study.

Over the fife years of this study, Makkah and Al-baha regions had the highest IR (13.91, 13.35 cases per 100,000 population, respectively) (Figure 4). In contrast, Hail region had the lowest IR (1.4 cases per 100,000 population) over the study period (Figure 4).

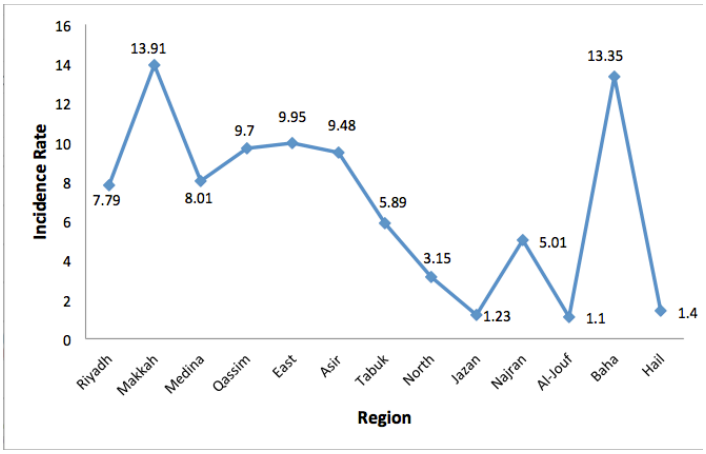

Figure 4. Incidence Rates° of Reported Cases of Hepatitis C Virus Infection, by Region, Kingdom of Saudi Arabia, 2008 – 2012.

The IRs of HCV infection demonstrated several trends from 2008 – 2012. We observed significant decreases in the IRs in Riyadh, Qassim, Eastern Region andTabuk, over the study period, demonstrated by non-overlapping confidence intervals (see appendix). In contrast, no significant decreases were documented in, Northern Borders, and Najran, demonstrated by overlapping confidence intervals (see appendix).

Asir was the only region that experienced an upward trend in IR overthe entire study period with average IR of (9.95 cases per 100,000 population).

The IR of HCV infection was consistently higher among males than females. For both men and women, we observed a statistically significant reduction in the IR from 2008 to 2012 (table 2). Among men, the IR was 10.8 (95% CI = 10.3 – 11.4) per 100,000 population in 2008, gradually declining to 8.5 (95% CI = 8.1 – 9) per 100,000 in 2012 (Table 3). A similar trend was observed among women: the IR was 10.3 (95% CI = 9.7 – 11) in 2008 and declined to 7.3 (95% CI = 6.9 – 7.8) in 2012 (Table3).

Over the study period, Saudis had consistently higher IRs than non-Saudis.There was a significant reductionin the IR for both Saudi and non-Saudi populations over time(table 2). For Saudi nationals, the IR was 11.5 (95% CI = 11 – 12) per 100,000 population in 2008, gradually declining to 8.5 (95% CI = 8.1 – 8.9) per 100,000 in 2012 (Table 4). A similar trend was observed for non-Saudis. The IR was 8.5 (95% CI = 7.8 – 9.1) in 2008 and declined to 6.9 (95% CI = 6.4 – 7.4) in 2012. However, there was an increase in this IR in 2010 (Table 4).

In terms of the total number of HCV infection cases, we noticed significant differences among the thirteen provinces.Makkah, Riyadh, and Eastern Region reported the highest numbers of HCV infection cases. For example, in 2012, Makkah had 1007 cases, followed by Riyadh with 478 cases. At the other end of the scale, many regions had as few as 1 case of HCV, as seen in Aljouf in 2010 and 2012

The highest number of HCV infection cases was observed among those > 45 years old (1,671 cases in 2008; 1,375 cases in 2012), followed by those 15 – 44 years old (1,036 cases in 2008; 930 cases in 2012).

4. Discussion

This study aimed to determine the changes in HCV infection IRs in KSA over 5 years from 2008 – 2012.Based on our literature review, this is the second study to determine the IR trend of HCV infection apart from the other types of hepatitis infections over the entire kingdom.

Overall incidence was 8.9 cases per 100,000 population. This ismuch lower than the rate of HCV infection in Egypt (up to 500 000 new infections are estimated to occur annually) which is believed to have the highest rate of hepatitis C in the world (estimated at >10%) (17).In the other hand, it is higher than some neighboring countries such as Qatarand Gaza (6.3& 0-1%, respectively)(11) as well as higher than the incidence in the united state (0.7 cases per 100,000 population in 2013) which is one of the lowest country of HCV infection rate (18).

The HCV infection IR in this study dropped from 11.02 to 8.01 over the 5-year study period. Compared with previous study conducted by Saudi Aramco Medical Services Organization, which estimated the annual Incidence Rate of HCV infection as 37.7 per 100,000

populations(19). Anther recent study of the IR trends of viral hepatitis A, B, and C, have shown a similar decline (20 – 30%) in the HCV infection rate (5).

Many factors have contributed to this remarkable decline, but the most important one is the marked development of the MOH's HCV infection prevention and control strategies and their adoption by health institutions in all parts of the Kingdom. For example, what was observed in hail region with the lowest IR.

However, these prevention and control measures might not be applied fully in many regions, possibly contributing to higher IRs (the high IR in Makkah over the 5 years could be an example). This could be attributed to regional differences;Makkah has a more diverse population with different health backgrounds and more migrants from countries with a high HCV prevalencesuch as Egypt and Pakistan (20).

Although Al-Baha region experienced a drop in IR in 2012, its disease burden was high during the previous 4 years. In another study examining the HCV infection IR between 1995 and 2006, Al-Baha region had the highest HCV infection prevalence rate (0.32%)(21). The region's higher IR could be due to non-compliance with the measures needed to combat the disease, or due to the aggravating passive surveillance system, whichcould be a generalized probable cause for the regions with high IR.

Asir region is the only region that experienced a gradual increase in HCV infection IR without any drop over the 5-year study period. This could be due to report overestimation or a defect in the surveillance or reporting system. Another possible explanation for this ascending rate is that Asir region receives many patients from nearby cities because of the shortage of medical services in those cities. Neighboring regions, which include Jizan and Najran, also have

high HCV infection IRs, and they are outlets for people from the southern part of KSA and even Yemen, which is known to have a high burden of HCV infection(22).

It was found that males had a higher IRs than females. This might be due to the fact that males are more exposed to risk factors than females. Examples of these factors are almost daily exposure to shaving tools as well as more exposure to intravenous drug use.

The Saudi population had a higher HCV infectionIR than the non-Saudi population, and this might be due to the fact that non-Saudis are screened before entering the KSA. This result could also be due to underestimation; non-Saudis inside the country may not seek screening or treatment even when they know that they are infected, for fear of being deported.

5. Conclusion& recommendations

The incidence of HCV infection decreased dramatically over the 5-year study period.Despite the drop in the HCV infection IR, this infection is still a major, challenging public health problem, not only in KSA but all over the world.

Because of that, the regional hospitals should be staffed with those who have expertise in the field of public health so that they can apply preventive measures properly and follow reporting protocols to improve the accuracy of the notification system.

Furthermore, more researches are neededfor determining the risk factors for HCV infection based on different variables to detect the real burden of HCV infection.

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Appendix

Supplementary Table 1: Reported cases of hepatitis C virus infection and incidence rates, by year and administrative region, Kingdom of Saudi Arabia, 2008 – 2012.

	2008			2009			2010			2011			2012		
	Cases	IR*	95%CI	Cases	IR*	95%CI	Cases	IR*	95%CI	Cases	IR*	95%CI	Cases	IR*	95%CI
Riyadh	643	10.57	9.75-11.39	534	8.55	7.82-9.28	381	5.62	5.06-6.18	544	7.67	7.03-8.31	478	6.54	5.95-7.13
Makah	1036	16.63	15.62-17.64	895	14.1	13.18-15.02	949	13.72	12.85-14.59	845	11.66	10.87-12.45	1007	13.48	12.65-14.31
Medina	92	5.49	4.37-6.61	126	7.33	6.05-8.61	224	12.6	10.95-14.25	173	9.31	7.92-10.7	102	5.34	4.3-6.38
Qassim	136	12.24	10.18-14.3	144	12.68	10.61-14.75	122	10.03	8.25-11.81	105	8.28	6.7-9.86	69	5.29	4.04-6.54
Eastern region	458	12.58	11.43-13.73	430	11.58	10.49-12.67	435	10.59	9.59-11.59	314	7.32	6.51-8.13	339	7.68	6.86-8.5
Asir	149	8.18	6.87-9.49	154	8.29	6.98-9.6	182	9.51	8.13-10.89	207	10.38	8.97-11.79	226	11.05	9.61-12.49
Tabuk	77	9.96	7.74-12.18	73	9.19	7.08-11.3	38	4.8	3.27-6.33	33	4	2.63-5.37	13	1.54	0.7-2.38
Hail	11	1.93	0.79-3.07	9	1.55	0.54-2.56	7	1.17	0.3-2.04	4	0.64	0.01-1.27	10	1.57	0.6-2.54
Northern Borders	13	4.32	1.97-6.67	11	3.58	1.46-5.7	10	3.12	1.19-5.05	9	2.7	0.94-4.46	7	2.04	0.53-3.55
Jazan	17	1.28	0.67-1.89	18	1.32	0.71-1.93	13	0.95	0.43-1.47	6	0.42	0.08-0.76	32	2.19	1.43-2.95
Najran	26	5.48	3.37-7.59	28	5.73	3.61-7.85	39	7.71	5.29-10.13	15	2.84	1.4-4.28	18	3.33	1.79-4.87
Al-Baha	66	16.54	12.55-20.53	58	14.33	10.64-18.02	47	11.41	8.15-14.67	68	15.84	12.07-19.61	38	8.64	5.89-11.39
Al-Jouf	9	2.26	0.78-3.74	7	1.71	0.44-2.98	1	0.23	-0.9	5	1.09	0.13-2.05	1	0.21	-0.82