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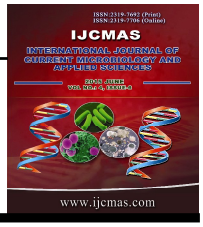

Original Research Article

Study of Hepatitis B and C Virus Infection in Urban and rural Population of Tamil Nadu, India

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A B S T R A C T

Hepatitis B virus (HBV) and hepatitis C virus (HCV) account for a significant proportion of liver diseases worldwide. These viruses causes liver diseases of varying severity ranging from minor disorders to chronic liver disease, liver cirrhosis and hepatocellular carcinoma (HCC). Study on the prevalence of HBV and HCV infection is needed to understand its epidemiology and to create strategies to improve public health which may help in the disease prevention and control. Serum samples from a total of 2291 individuals from randomly chosen urban and rural areas of Tamil Nadu were screened for HBsAg and anti-HCV using rapid test device. Any reactive specimen with the rapid test device was confirmed with ELISA. Data were analyzed using SPSS 15.0 statistical software. Odds ratio (OR) and 95% confidence interval (CI) were used to measure the strength of association. Of the 2291 individuals screened, 5 (0.2%) were positive for anti-HCV. All the five participants were urban residents. The overall prevalence of HBV was 3.6% (83/2291). The prevalence was higher in urban than rural area (OR=0.35; 95% CI: 0.18-0.66; P=0.001). More males were infected with HBV than females (OR=0.56; CI: 0.35-0.88; P=0.013). Alcoholics were at two times more risk of getting HBV infection than non-alcoholics (OR=2.01; CI: 1.25-3.24; P=0.004). Data on the general population prevalence of HBV or HCV were limited in India. Availability of sufficient recent estimates of HBV or HCV prevalence is necessary to evaluate control measures and health care policies.

Keywords

Hepatitis,
HBV,
HCV,
liver cirrhosis,
hepatocellular carcinoma

Introduction

Hepatitis is the inflammation of the liver, which is most often caused by a viral infection. Infections due to hepatitis B virus (HBV) and hepatitis C virus (HCV) account for a significant proportion of liver diseases worldwide. These viruses causes liver diseases of varying severity ranging from minor disorders to chronic liver disease, liver cirrhosis and hepatocellular carcinoma (HCC) (Ayele and Gebre-Selassie, 2013). HBV and HCV have similar routes of transmission, viz., through infected blood

and blood products, sharing of needles to inject drugs and sexual activity (Saravanan *et al.,* 2007).

More than 2 billion people in the world have been reported to be infected with HBV, in which more than 360 million are chronically infected and 1.2 million die from chronic hepatitis, cirrhosis and HCC (Lavanchy, 2004). World Health Organization reported that about 130-150 million people globally have chronic hepatitis C infection and 350 000 to 500 000 people die each year from liver diseases due to HCV (Hepatitis C-WHO, 2015).

HBV infection is reported to be high (2-10%) in the developing world particularly in Asia and sub-Saharan Africa, where as infection due to HCV varies from 0.3-13% or more with the highest prevalence documented in Central Africa and South-Eastern Asia (Taye *et al.*, 2014). A safe and effective vaccine has been available for HBV, whereas no vaccine is available to prevent HCV infection (Mast and Ward, 2008).

Though reports on the prevalence of HBV and/or HCV infection among blood donors (Arora *et al.,* 2010) and in patients with certain clinical conditions (Ali *et al.,* 2008; Mysorekar *et al.,* 2008) are available, prevalence among general population in India is sparse and to our knowledge no recent study is available from South India.

Study on the prevalence of HBV and HCV infection is needed to understand its epidemiology and to create strategies to improve public health which may help in the disease prevention and control. Hence, this study was undertaken to determine HBV and HCV prevalence and associated factors in rural and urban populations of Tamil Nadu.

Materials and Methods

Blood samples from a total of 2291 individuals from randomly chosen urban and rural areas of Tamil Nadu from May 2014 to November 2014 were included in this study. Institutional ethical clearance was obtained to conduct this study. Prior to the collection of blood samples, individuals were informed about the study camp via., press and loud speakers; participation was voluntary and free of cost; that all participants would be informed of the test outcome and get medical advice and counseling accordingly. Individuals previously vaccinated for HBV were excluded from the study. Data on sociodemographic and risk factor were gathered using predesigned questionnaire. Five milliliter of blood was collected and serum separated and transported to the Department of Hepatology, Madras Medical College, Chennai. During transportation, the cold chain was maintained properly. Then the serum sample was divided into two aliquots; one was used for HBsAg screening and the other was used to screen anti-HCV as per the manufacturer protocol.

Initially, all the serum samples were screened for HBsAg and anti-HCV using rapid test device (Reliable Pro-detect Biomedical Ltd, India). It utilizes the principle of lateral flow chromatographic immunoassay for the qualitative detection of HBsAg, IgG and IgM of HCV in human serum. Any reactive specimen with the rapid test device was confirmed with ELISA (Erba Lisa, Germany) for HBsAg or anti-HCV as per the manufacturer procedure. Data were analyzed using SPSS 15.0 statistical software. Odds ratio (OR) and 95% confidence interval (CI) were used to measure the strength of association. P value <0.05 was considered as significant.

Results and Discussion

Of the 2291 individuals screened for HBV and HCV, 1180 (51.5%) were males and 1111 (48.5%) were females. The age of the participants ranges from 10-86 years. Majority (57.8%) were more than 35 years of age. In relation to residence area, 1607 (70.1%) were urban dwellers and 684 (29.9%) were rural dwellers. The prevalence of HBV and HCV in relation with various factors was shown in Table 3.

Of the 2291 individuals screened, 5 (0.2%) were positive for anti-HCV. All the five participants were urban residents. The prevalence was higher among males (3/1180, 0.3%) than females (2/1111, 0.2%) but the difference was not statistically significant (OR=0.708; CI: 0.12-4.24; P=0.705). HCV prevalence in the age group of ≤35 and >35 years were 0.2% (2/965) and 0.23% (3/1326), respectively, which was not statistically significant (OR=1.092; CI: 0.182-6.547; P=0.923). Among the five anti-HCV positive individuals, 2/434 (0.5%) were alcoholics and 3/1857 (0.2%) were non-alcoholics (OR=2.86; CI: 0.48-17.17; P=0.25). Other factors were not associated with the HCV infection (P>0.05) (Table 3).

The overall prevalence of HBV was 3.6% (83/2291) (Table 1). The prevalence was higher in urban area (72/1607, 4.5%) than rural area (11/684, 1.6%) which was statistically significant (OR=0.35; 95% CI: 0.18-0.66; P = 0.001). More males (54/1180, 4.58%) were infected with HBV than females (29/1111, 2.6%), and the difference was statistically significant (OR=0.56; CI: 0.35-0.88; P = 0.013).

HBV prevalence was more in the age group of >60 (30.95%, 13/42), followed by 40-49 (22.92%, 22/96), 30-39 (17.7%, 17/96), 50-59 (15.8%, 12/76). 6.3% (18/285) individuals in the age group of 20-29 were positive HBsAg, whereas 1.12% (1/89) positivity was observed in the age group of <20 years (Table 2). Married individuals had HBV prevalence of 3.9% (77/1957) and unmarried had 1.8% (6/328). Alcoholics were at two times more risk of getting HBV infection than non-alcoholics (OR=2.01; CI: 1.25-3.24; P=0.004). 7.7% (3/36) smokers and 3.6% (80/2172) non-smokers had HBV infection. One participant (1/7) who had history of blood transfusion was positive for HBsAg. Individuals who had history of hospital admission and history of liver disease had HBV prevalence of 1.5% (1/64) and 6.2% (8/120), respectively.

Hepatitis B and C virus infections are a serious global public health problem (Ding *et al.*, 2003; Taye and Lakew, 2013). There is a considerable variation in the geographical distribution of HCV (Saeed *et al.*, 2014). The overall prevalence of HCV in our study was 0.2% (5/2291), which is similar to study reports from Bangladesh (Ashraf *et al.*, 2010) and Tamil Nadu (Gowri *et al.*, 2012). All the five anti-HCV positive individuals were from urban area.

In India, very few studies are available on the prevalence of HCV in general population. Community based studies from West Bengal (Chowdhury *et al.*, 2003), Andhra Pradesh (Khaja *et al.*, 2006) and Arunachal Pradesh (Phukan *et al.*, 2001) showed the HCV prevalence of 0.87%, 1.4% and 7.89% respectively, which is higher than our study result. In this study, no statistically significant association was observed between HCV infection and associated factors (Table 3).

HBV prevalence in different population has been shown to vary widely from 0.1% in the developed countries to 20% in the developing nations (Behal *et al.*, 2008).

Table.1 Overall prevalence of HBV and HCV infection among urban and rural population

Area	**Number of HBsAg positive individuals (%)**	**Number of anti-HCV positive individuals (%)**	**Total number of screened individuals**
Urban	72 (4.5)	5 (0.3)	1607
Rural	11 (1.6)	0 (0)	684
Overall prevalence	83 (3.6)	5 (0.2)	2291

Table.2 Distribution of hepatitis B and C virus among urban and rural population based on gender and different age intervals

Hepatovirus	**Area**	**Age group**												**Total positive**
		< 20		**20-29**		**30-39**		**40-49**		**50-59**		**>60**		
		Male	**Female**	**Male**	**Female**	**Male**	**Female**	**Male**	**Female**	**Male**	**Female**	**Male**	**Female**	
HBV	Urban	-	1	6	5	8	9	14	5	9	2	9	4	83
	Rural	-	-	6	1	-	-	1	2	1	-	-	-	
Total		1		18		17		22		12		13		
HCV	Urban	-	1	1	-	-	1	-	-	2	-	-	-	5
	Rural	-	-	-	-	-	-	-	-	-	-	-	-	
Total		1		1		1		-		2		-		

Table.3 Factors associated with the prevalence of HBV and HCV in general population

Associated factors	Total No.	HBsAg		OR (95% CI)	P value	anti-HCV		OR (95% CI)	P value
		Negative (%)	Positive (%)			Negative (%)	Positive (%)		
Age (year)									
≤35	965	936 (97)	29 (3)	R	-	963 (99.8)	2 (0.2)	R	-
>35	1326	1272 (96)	54 (4)	1.37 (0.86-2.17)	0.178	1323 (99.77)	3 (0.23)	1.092 (0.182-6.547)	0.923
Gender									
Male	1180	1126 (95.4)	54 (4.6)	R	-	1177 (99.7)	3 (0.3)	R	-
Female	1111	1082 (97.4)	29 (2.6)	0.56 (0.35-0.88)	0.013*	1109 (99.8)	2 (0.2)	0.708 (0.12-4.24)	0.705
Area of residence									
Urban	1607	1535 (95.5)	72 (4.5)	R	-	1602 (99.7)	5 (0.3)	NA	
Rural	684	673 (98.4)	11 (1.6)	0.35 (0.18-0.66)	0.001*	684 (100)	0 (0)		
Education level									
Un educated	399	381 (95.5)	18 (4.5)	R	-	399 (100)	0 (0)		
Upto school	1597	1550 (97.1)	47 (2.9)	0.64 (0.37-1.12)	0.117	1592 (99.7)	5 (0.3)	NA	
Upto college	295	277 (93.9)	18 (6.1)	1.37 (0.7-2.69)	0.352	295 (100)	0 (0)		
Marital status									
Unmarried	334	328 (98.2)	6 (1.8)	R	-	332 (99.4)	2 (0.6)	R	-
Married	1957	1880 (96.1)	77 (3.9)	2.24 (0.97-5.18)	0.06	1954 (99.8)	3 (0.2)	0.25 (0.04-1.53)	0.135
Occupation									
Unemployed	512	491 (95.9)	21 (4.1)	R	-	511 (99.8)	1 (0.2)	R	-
Government	413	397 (96.1)	16 (3.9)	0.94 (0.48-1.83)	0.86	412 (99.8)	1 (0.2)	1.24 (0.08-19.89)	0.879
General	814	779 (95.7)	35 (4.3)	1.05 (0.6-1.83)	0.86	811 (99.6)	3 (0.4)	1.89 (0.19-18.22)	0.582
Business	295	288 (97.6)	7 (2.4)	0.57 (0.24-1.35)	0.202	295 (100)	0 (0)	NA	
Educational institution	257	253 (98.4)	4 (1.6)	0.37 (0.13-1.09)	0.071	257 (100)	0 (0)		

History of hospital admission									
No	2226	2144 (96.3)	82 (3.7)	R	-	2221 (99.8)	5 (0.2)	NA	
Yes	65	64 (98.5)	1 (1.5)	0.41 (0.06-2.98)	0.377	65 (100)	0 (0)		
Diabetes									
No	2217	2135 (96.3)	82 (3.7)	R	-	2212 (99.8)	5 (0.2)	NA	
Yes	74	73 (98.6)	1 (1.4)	0.36 (0.05-2.59)	0.308	74 (100)	0 (0)		
Alcohol consumption									
No	1857	1800 (96.9)	57 (3.1)	R	-	1854 (99.8)	3 (0.2)	R	-
Yes	434	408 (94)	26 (6)	2.01 (1.25-3.24)	0.004*	432 (99.5)	2 (0.5)	2.86 (0.48-17.17)	0.25
Active Smoking									
No	2252	2172 (96.4)	80 (3.6)	R	-	2247 (99.8)	5 (0.2)	NA	
Yes	39	36 (92.3)	3 (7.7)	2.26 (0.7-7.5)	0.182	39 (100)	0 (0)		
History of blood transfusion									
No	2284	2202 (96.4)	82 (3.6)	R	-	2279 (99.8)	5 (0.2)	NA	
Yes	7	6 (85.7)	1 (14.3)	4.47 (0.53-37.6)	0.168	7 (100)	0 (0)		
History of liver Diseases									
No	2163	2088 (96.5)	75 (3.5)	R	-	2158 (99.8)	5 (0.2)	NA	
Yes	128	120 (93.8)	8 (6.2)	1.86 (0.87-3.94)	0.107	128 (100)	0 (0)		
History of Jaundice									
No	2282	2199 (96.4)	83 (3.6)	NA		2277 (99.8)	5 (0.2)	NA	
Yes	9	9 (100)	0 (0)			9 (100)	0 (0)		

OR-Odds Ratio; R-Referral; NA-Not applicable; *-Significant

Many studies have been carried out in India on the epidemiology of HBV infection and there are several levels of variability have been observed amongst these studies.

The factors which have been shown to influence the variability in the HBV prevalence include, the sample size, the method employed for the detection of HBV serological markers, the age group covered, general population sample versus blood donor and risk population samples, ethnicity and geographical location of the study population (Chowdhury, 2004).

In our study the overall prevalence of HBV was 3.6%. In 1995, the average estimated carrier rate of HBV in India was 4% (Tandon *et al.,* 1996). A community based study on HBV prevalence in urban and rural subjects in Tamil Nadu documented 5.7% of HBsAg positivity (Kurien *et al.,* 2005), which is comparatively higher than our study report. In contrast, studies from West Bengal (Chowdhury *et al.,* 2005) and Kanpur (Behal *et al.,* 2008) showed that 2.97% (227/7653) and 2.25% (450/20000) were positive for HBsAg, respectively. A study on the prevalence of HBV in northern Indian population revealed that the HBsAg carrier rate was similar in the urban and rural populations (Singh *et al.,* 2003) where as in our study we have observed a significant variation in both populations.

A study on risk factors of HBV infection documented that alcohol consumption was significantly associated with HBV seropositivity (Gheorghe *et al.,* 2013), which is correlated with our study report. Study report from Bangladesh reported a significant association between individuals with the history of jaundice and HBsAg positivity (Ashraf *et al.,* 2010) where as in our study no significant association was observed. HBV seropositivity was not significantly associated with blood transfusion, smoking and diabetes, which is in agreement with other study reports (Chen *et al.,* 2006; de Paula Machado *et al.,* 2013).

In conclusion, data on the general population prevalence of HBV or HCV were limited in India. In comparison with study reports from India, we have observed a low prevalence of HCV infection. None of the individuals from rural area was positive for anti-HCV. In relation to the previous community based study from our region, we have observed a low level of HBV infection among general population. More number of individuals from urban area was positive for HBsAg than rural area. Availability of sufficient recent estimates of HBV or HCV prevalence is necessary to evaluate control measures and health care planning.

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