Original Research Article

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An epidemiological study to find out the seroprevalence of Hepatitis B in a rural population of Kashmir valley

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ABSTRACT

Background: Hepatitis B continues to pose a tremendous burden of disease with approximately 240 million people having chronic hepatitis B virus (HBV) infection globally. The prevalence of HBV infection varies widely, with rates ranging from 0.1% to 20% in different parts of the world.

Methods: This Community based Cross sectional study was carried out for a period of one year (2015-2016) in bock Hajin of Kashmir to find out the seroprevalence of Hepatitis B and various risk factors associated with it.1861 subjects consented and participated in the study. A semi structured, pre tested, self-designed questionnaire was used to gather requisite information. Both screening as well as confirmatory tests were used to find out the seroprevalence of HBsAg in the study population.

Results: Out of 1861 participants, 65.1% were females and 34.9% were males. All study participants were Muslims with 64.4% belonging to Sunni sec. 67.3% belonged to age group 10-40 years. Prevalence of hepatitis B infection in the study population was 0.9%. Gender, occupation, education and treatment by quacks were significantly associated with seropositivity. Only 76 (4.1%) of the participants had some knowledge about hepatitis B.

Conclusions: The study reveals that the seroprevalence of hepatitis B is very low in the study population. It also reflects a low awareness level of population regarding hepatitis B infection thus demanding timely intervention in the form of awareness campaigns to keep transmission under check.

Keywords: Hepatitis B, Seroprevalence, Risk factors

INTRODUCTION

Hepatitis B is a major public health problem worldwide and is considered to be responsible for 68000 deaths globally every year. It is a cause of a spectrum of diseases from self-limited hepatitis to acute fulminant and chronic hepatitis which may result in sequelae like liver cirrhosis and hepatocellular carcinoma. Approximately 30% of the world's population or about 2 billion persons have serological evidence of either current or past infection with hepatitis B virus and an estimated 240

million people harbor chronic infection. Chronic carriers of HBV have an elevated risk of developing cirrhosis and hepato cellular carcinoma (HCC) which leads to death of an estimated 0.5 to 1.2 million subjects annually. Prevalence of HBV infection varies greatly in different parts of the world. The World Health Organization (WHO) has classified HBV prevalence into high endemicity (>8%), intermediate (2-7%) and low endemicity (<2%). HBV prevalence in India is in intermediate range. Every year 100,000 Indians die due to HBV infection related illnesses.²

Hepatitis B virus (HBV) is classified in Hepadnaviridae family and has a circular, partially double-stranded DNA. Virus replication occurs in the liver; however, specific proteins and antibodies of the virus are present in the blood of infected individuals.³ The principal way of transmission is through blood and blood products. Hemodialysis, shared needles among drug abusers, dental surgery, receiving blood or blood products, cupping, tattooing, ear and nose piercing practices and sexual exposure to HBV can elevate the risk of transmission.⁴

Sero-surveys are one of the primary methods to determine the prevalence of hepatitis B infection. The assessment of the occurrence of infections in the population is made on the basis of the evaluation of the data on the prevalence of hepatitis B infection. It also gives an idea of the epidemiology of this disease in the community.⁵

Prevalence of hepatitis B surface antigen (HBsAg) in India varies from 1 to 13 per cent, with an average of 4.7 per cent. There are only a few community-based studies that have looked into the prevalence of hepatitis B infection. However, these studies have been done in selected groups. Very less community-based studies have looked into the prevalence of HBV infection in this part of India.

METHODS

The present study was undertaken to estimate the prevalence of hepatitis B infection in a rural population of Kashmir valley and to throw more light on the dynamics of virus transmission in the community.

This Community based Cross sectional study was carried out for a period of 1 year (2015-2016) in Hajin block (District Bandipora), field practice area of Department of Community Medicine, SKIMS, Soura with an aim: To find out the seroprevalence of Hepatitis B infection in the study population and to find out the various risk factors associated with Hepatitis B infection.

The total population covered by Hajin block is 2, 10, 946. The block is divided into three zones viz (Hajin zone -85,405, Sumbal zone-80,570, Ajas zone-44,971) respectively.

Sample size

Using the formula n= Z2 p (1-p) /e2 to calculate the sample size and assuming p (prevalence) of 5%, and margin of error at 1% the sample size needed was 1825. After taking non response rate of 10% into consideration the target sample size was 2006 subjects. Finally 1861 subjects consented and participated in the study. The sample size was achieved through multistage random sampling.

Sampling technique

The three zones of block Hajin vary in size and there is heterogeneity in these zones in terms of various socioeconomic and other development characteristics. The Census 2011 population was used to allocate the number of subjects in each zone and their villages. The sample within each zone was allocated proportionally to the size of the zone's populations. A uniform sample design was adopted in all 3 zones. In each zone, the sample was selected in two stages, with the selection of 30% of villages randomly after enlisting all villages in a zone followed by selection of 25 households within each village using systematic random sampling by calculating the sampling interval. In each of the selected households the participants fulfilling inclusion criteria were taken for the study purpose.

Inclusion criteria

- Age more than 10 years
- Those who consent to participate.

Exclusion criteria

- Participants <10 years of age.
- Not willing to participate in the study.

Procedure

A semi structured, pre tested, self-designed questionnaire was prepared to find out the prevalence of hepatitis B and to assess the risk factors associated with it. The questionnaire had questions pertaining to sociodemographic particulars, various risk factors, hepatitis B vaccine coverage and level of knowledge about hepatitis B. After explaining the purpose of the study a written informed consent was taken from each study participant as well as the head of the household. (In case of age <18 years consent was taken from guardian as well). The required information was collected from each participant using the questionnaire. 3 ml of blood from the anticubital vein was drawn from participants taking all the aseptic precautions. These samples were preserved and transported to the Department of Immunology, SKIMS under appropriate conditions for further processing. In the lab serum was separated and stored in refrigerator till further processing. HBsAg detection in the serum samples was done using Trans Asia Biomedicals Ltd HBsAg ELISA kits and following the manufactures protocol. The samples with absorbance above cut off value (COV) at 450 nm using software driven ELISA reader from Bio Rad Labs were considered positive for HBsAg. The test was repeated for the samples that tested positive and were further subjected to a confirmatory test based on chemiluminisence method on Roche Cobas chemiluminisence analyzer and the results so obtained were recorded.

Ethical issues

Ethical clearance was obtained from the institutional ethics committee. Besides maintenance of confidentiality the study participants in need of medical attention were appropriately referred.

Data analysis

Data was evaluated using SPSS software program. Differences between personal characteristics were evaluated in terms of seropositivity. In data analysis, the

Chi Square test, fishers exact test and odds ratio were performed to identify the risk factors for hepatitis B infection.

RESULTS

In Table 1, out of the total of 1861 study participants, 43.5% belonged to zone Hajin, 42.1% to Sumbal and 14.4% to zone Ajas with a zone wise HBsAg sero-prevalence of 0.7%,0.9% and 1.1% respectively and an overall sero-prevalence of 0.9%.

Table 1: Distribution of study population by zones.

Zone	Total participants N (%)	HBsAg (ELISA)	HBsAg (ELISA) test result.		
		Positive	Negative	P value	
Hajin	809 (43.5)	6 (0.7%)	803 (99.3%)		
Sumbal	784 (42.1)	7 (0.9%)	777 (99.1%)	0.789	
Ajas	268 (14.4)	3 (1.1%)	265 (98.9%)	0.707	
Total	1861 (100.0)	16 (0.9%)	1845 (99.1%)		

Table 2: Distribution of study population by general characteristics.

	Number	Percent
Age Group		
10-25 Years	748	40.2
26-40 Years	505	27.1
41-55 Years	331	17.8
> 55 Years	277	14.9
Mean age = 34.64 ± 17.94 years		
Gender		
Male	649	34.9
Female	1212	65.1
Religious Sect.		
Sunni	1198	64.4
Shia	663	35.6
Type of Family		
Nuclear	889	47.8
Joint	972	52.2
Income		
<=10000	1379	74.1
11000-20000	244	13.1
21000-30000	176	9.5
>30000	62	3.3
Occupation		
Student	462	24.8
Home maker	825	44.3
Farmer/Labourer	432	23.2
Self employed	87	4.7
Govt. servant	55	3.0
Education Level		
Illiterate	944	50.7
Primary/Middle	363	19.5
High/Higher	423	22.7
Graduate and above	131	7.0

Table 3: Distribution of study population by hepatitis b vaccine coverage.

	N	%			
H/o hepatitis b vaccination					
Present	25	1.3			
Absent	1836	98.7			
Total	1861	100			
No of doses received					
One dose	3	12.0			
Two doses	3	12.0			
Three doses	19	76.0			
total	25	100			
Duration since last dose					
≤ 5 years	8	32.0			
5-10 years	12	48.0			
>10 years	5	20.0			
Total	25	100			
Post vaccination antibody titers done					
Yes	0	0.0			
No	25	0.0			
Total	25	100			

Table 4: Distribution of study population by knowledge about Hepatitis B.

	Yes No. (%)	No No. (%)
Know (something) about Hep. B disease	76 (4.1)	1785 (95.9)
Know how HBV is transmitted	55 (3.0)	1806 (97.0)
Consider yourself at risk of getting Hepatitis B infection	8 (0.4)	1853 (99.6)
Do you know about Hep. B vaccine	49 (2.6)	1812 (97.4)
Know number of doses of vaccine required	31 (1.7)	1830 (98.3)

Table 2 shows that the mean age of studied population was 34.64 ± 17.94 years. Majority (67.3%) of the participants studied belonged to age group10-40 years. Female participants were more in number (65.1%). All the study participants were muslims with 64.4% belonging to Sunni sect and rest being shias. 52.2% belonged to joint families. 74.1% families had a monthly income equal or less than ten thousand. 50.7% of the participants were illiterate and 44.3% were home makers by occupation.

Table 3 depicts that only 1.3% of the participants had ever received hepatitis B vaccine out of which 76.0% had received 3 doses. 48 % of the vaccinated participants had received last dose of the vaccine 5-10 years back. None of the vaccines had got their post vaccination antibody titers done.

Table 4 shows that only 4.1% had some knowledge about hepatitis B disease and only 3.0% knew about its transmission. Mere 0.4% considered they were at risk of getting this disease.2.6% knew about hepatitis B vaccine and only 1.7% knew about number of required doses of hepatitis B vaccine.

Table 5 depicts the sero-prevalence of hepatitis B by socio demographic factors .The age group of 41-55 years

showed greater odds of sero positivity {OR 1.97 (0.50-7.70)}. Similarly male gender {OR 4.16 (1.43-12.03)}, Shia sect {OR 1.40 (0.52-3.80)}, illiterates {OR 2.93 (0.94-9.14)}, income more than 20000{OR 1.58 (0.44-5.58)} and employed class {OR 9.85(3.61-26.86)} had higher odds of seropositivity. This difference was found to be statistically significant in case of gender (P=0.007) and occupation (P=0.000). However on Multivariate analysis only occupation (p=0.001) and education (P=0.015) were significant predictors of risk.

Table- 6 depicts various risk factors like dental procedures (53.9%), iv infusions (65.8%), injections (92.7%), body piercing (59.9) were quite prevalent in the study participants. The risk factors like H/o dental procedure (OR=1.42), Jaundice (OR=1.28) urinary catheterizations (OR 1.33), iv infusions (OR=1.14), blood donations (OR=2.27), treatment by quacks (OR=2.73), family history of hepatitis (OR= 1.94) and self-inflicted injury (OR=1.52) showed greater odds of seropositivity, however the difference was not found to be statistically significant except for the risk associated with treatment by quacks which was found to be statistically significant. However on multivariate analysis none of the risk factors was found to be statistically significant.

Table 5: Seroprevalence by socio-demographic features

	HBsAg (ELIS Positive	SA) test result Negative	Total	Odds ratio (95% CI)	p-value (univariate)	p-value (regression)
Age group						
10-25 Years	0 (0.0%)	748 (100.0%)	748	0 (-)	0.991	.994
26-40 Years	6 (1.2%)	499 (98.8%)	505	1.09 (0.27-4.42)	0.895	.884
41-55 Years	7 (2.1%)	324 (97.9%)	331	1.97 (0.50-7.70)	0.328	.423
> 55 Years	3 (1.1%)	274 (98.9%)	277			
Mean a	ge of positive ca	$ases = 45.5 \pm 12.43$	years			
Gender						
Male	11 (1.7%)	638 (98.3%)	649	4.16 (1.43-12.03)	0.007	.156
Female	5 (0.4%)	1207 (99.6%)	1212	4.10 (1.45-12.05)		.130
Religious Sect.						
Shia	7 (1.1%)	656 (98.9%)	663	1 40 (0.52.2.90)	0.601	.422
Sunni	9 (0.8%)	1189 (99.2%)	1198	1.40 (0.52-3.80)		
Type of Family						
Nuclear	7 (0.8%)	882 (99.2%)	889	0.94 (0.21.2.29)	0.806	.856
Joint	9 (0.9%)	963 (99.1%)	972	0.84 (0.31-2.28)		
Income						
> 20000	3 (1.3%)	235 (98.7%)	238	1.58(0.44-5.58)	0.447	750
<= 20000	13 (0.8%)	1610 (99.2%)	1623			.750
Occupation						
Employed	7 (4.9%)	135 (95.1%)	142	9.85(3.61-26.86)	0.000	001
Unemployed	9 (0.5%)	1710 (99.5%)	1719			.001
Education Level						
Illiterate	12 (1.3%)	932 (98.7%)	944	2.93 (0.94-9.14)	0.076	.015
Literate	4 (0.4%)	913 (99.6%)	917			

Table 6: Seroprevalence by risk factors.

	HBsAg (ELl	(SA) test result.	Total N (%)	Odds ratio	p-value	p-value	
	Positive	Negative	10tal N (70)	(95% CI)	p-value	(regression)	
Received any blood transfusion							
Yes	0 (0.0%)	114 (100.0%)	114 (6.1)	0	0.619	.996	
No	16 (0.9%)	1731 (99.1%)	1747 (93.9)	(-)	0.019		
History of	any dental proce	edure					
Yes	10 (1.0%)	994 (99.0%)	1004 (53.9)	1.42	0.617	.618	
No	6 (0.7%)	851 (99.3%)	857 (46.1)	(0.51-3.94)	0.617		
History of	jaundice						
Yes	2 (1.1%)	185 (98.9%)	187 (10.0)	1.28	0.671	.916	
No	14 (0.8%)	1660 (99.2%)	1674 (90.0)	(0.28-5.68)	0.671		
Any surgic	al procedure do	ne					
Yes	5 (0.9%)	567 (99.1%)	572 (30.7)	1.02	1.000	.775	
No	11 (0.9%)	1278 (99.1%)	1289 (69.3)	(0.35-2.96)	1.000		
History of	IV infusion						
Yes	11 (0.9%)	1214 (99.1%)	1225 (65.8)	1.14	1.000	.950	
No	5 (0.8%)	631 (99.2%)	636 (34.2)	(0.39-3.30)	1.000		
History of	any abscess drai	nage					
Yes	0 (0.0%)	74 (100.0%)	74 (4.0)	0	1.000	.997	
No	16 (0.9%)	1771 (99.1%)	1787 (96.0)	(-)	1.000		
History of	History of urinary catheterization						
Yes	1 (1.1%)	88 (98.9%)	89 (4.8)	1.33	0.545	.535	
No	15 (0.8%)	1757 (99.2%)	1772 (95.2)	(0.17-10.19)	0.545		
History of	History of any blood donation						

Yes	3 (1.7%)	170 (98.3%)	173 (9.3)	2.27	0.181	.832
No	13 (0.8%)	1675 (99.2%)	1688 (90.7)	(0.64-8.05)		
Receiving in	njection					
Yes	16 (0.9%)	1709 (99.1%)	1725 (92.7)	-	0.624	.996
No	0 (0.0%)	136 (100.0%)	136 (7.3)	-		
Treatment	by quacks					
Yes	8 (1.6%)	494 (98.4%)	502 (27.0)	2.73	0.048	.061
No	8 (0.6%)	1351 (99.4%)	1359 (73.0)	(1.02-7.32)	0.048	
Pierced any	site of body					
Yes	6 (0.5%)	1101 (99.5%)	1107 (59.5)	0.40	0.070	.963
No	10 (1.3%)	744 (98.7%)	754 (40.5)	(0.14-1.12)	0.079	
Tattooing o	f body sites					
Yes	0 (0.0%)	16 (100.0%)	16 (0.9)	0	1.000	.998
No	16 (0.9%)	1829 (99.1%)	1845 (99.1)	-	1.000	
Family hist	ory of hepatitis	. , ,				
Yes	3 (1.5%)	196 (98.5%)	199 (10.7)	1.94	0.240	.390
No	13 (0.8%)	1649 (99.2%)	1662 (89.3)	(0.54-6.87)	0.240	
Circumcisio	on done by (only	males)	· , , ,			
Surgeon	5 (1.6%)	306 (98.4%)	311 (16.7)	0.90	0.060	.830
Hajam	6 (1.8%)	332 (98.2%)	338 (18.2)	(0.27-2.99)	0.868	
History of a	bortions (only 1	married females)				
Yes	0 (0.0%)	178 (100.0%)	178 (9.6)	0	0.700	.996
No	5 (0.5%)	942 (99.5%)	947 (50.9)	-	0.723	
Taken leech	n therapy					
Yes	3 (0.9%)	332 (99.1%)	335 (18.0)	1.05	1.000	.973
No	13 (0.9%)	1513 (99.1%)	1526 (82.0)	(0.29-3.71)	1.000	
Traditional	method of bloo	dletting	· , , , , , , , , , , , , , , , , , , ,			
Yes	3 (0.9%)	332 (99.1%)	335 (1.1)	1.05	1.000	.998
No	13 (0.9%)	1513 (99.1%)	1526 (98.9)	(0.29-3.71)		
	y/RTA/self infli		· ,			
Yes	2 (1.2%)	158 (98.8%)	160 (8.6)	1.52	0.5:5	.922
No	14 (0.8%)	1687 (99.2%)	1701 (91.4)	(0.34-6.77)	0.642	
	xposed to needle		(- ,)	,		
Yes	0 (0.0%)	68 (100.0%)	68 (3.7)	0	1.000	.081
No	16 (0.9%)	1777 (99.1%)	1793 (96.3)			
	(3.7/0)	(>>/0)	(> 0.0)			

DISCUSSION

Hepatitis-B infection is found throughout the world. Prevalence of hepatitis B varies from country to country and depends upon a complex interplay of behavioral, environmental and host factors. In general, it is lowest in countries or areas with high standards of living (e.g. Australia, North America, North Europe) and highest in countries or areas where socio economic level is low (e.g. China, South East Asia, South America). 7 The reported prevalence of HBsAg carrier in different population varies widely from 0.1% in the advanced countries to 20% in the developing nations. The seroprevalence of HBsAg in our study was 0.9 % (comparable with that of developed countries) which is much lower than the rest of the country where it is estimated to be 2-5% of the general population. The studied area thus qualifies as a low prevalence area as per the WHO criteria while as India, with a 3.7% point prevalence, is considered to have an intermediate level of HBV transmission.8 The seroprevalence of HBsAg in the study was in accordance

with a community based study from Maharashtra (0.92) by Prasad et al. In another community based study in Kashmir by Irfa et al seroprevalence of 1.2% was reported. Similarly Quadri et al reported a prevalence of 1.63 from Bijapur, Karnataka. Contrarily a higher prevalence of 4.7% was reported by Mohamad et al from Bangalore. Wang et al reported a prevalence of 2.24% from Beijing.

The mean age of studied population was 34.64 ± 17.94 years. Majority (67.3%) of the participants studied belonged to age group10-40 years. This is in accordance with a study conducted by Irfa et al who reported median age of 35 years and 21-40 years as the commonest affected age group. ¹⁰ Khosravani et al in their study observed mean age as 34.9 years and majority (39.6%) belonging to age group 21–30 years, where as in a study by Ana RC M et al the mean age was 25 years and half the study participants belonged to less than 20 years age group. ^{14,15}

Majority (65.1%) of our participants were females. Female preponderance in our study population could be attributed to the fact that during data collection most of the male members in the house holds was out for work. This is in accordance with studies by Irfa et al and Patil et al where the proportion of female participants was 74.6% and 56.08% respectively. Most of our study participants belonged to the sunni muslim sect (64.4%) as also reported by Irfa et al (68.1% sunni's).

Vaccination coverage of our study participants was quite low (1.3%) with 76.0% of those vaccinated having received all the three doses and 48.0% of them having received the last dose 5-10 years back. This low hepatitis B coverage could be attributed to the low levels of awareness regarding all aspects of hepatitis B infection including vaccination. Almost similar vaccination coverage was reported by Irfa et al (2.0%) who however reported that only 26.9% had received three doses of the vaccine and 65.4% of them having received the last dose 8 years back. ¹⁰ In contrast Brouard C et al in French population reported a vaccination coverage of 47%. ¹⁷ Chung et al reported coverage of 26% in adult Chinese population. ¹⁸

Knowledge level about hepatitis B was dismally low (4.1%) in the study participants. It was even lower regarding the transmission (3.0%), about hepatitis vaccine (2.6%), number of doses of vaccine(1.7%) and a mere 0.4% considered themselves at risk of getting the disease. Irfa N et al in their study also reported a low level of knowledge regarding hepatitis B (10.2%). Chung P W et al reported that 14 % of adult Chinese population had knowledge about hepatitis B. Contrary to this Taylor et al reported an awareness of 78% in Combodian Americans. Brouard C et al in a study on French population reported that 96.1% population had heard about hepatitis B. 17

In our study 41-55 years age group showed greater odds of HBsAg sero positivity (2.240). Patil et al reported highest seroprevalence in 51-60yrs age group. 16 While as Kurien et al and Amidu et al reported highest seroprevalence in younger age groups of 15-20 years, and 19-24 years respectively. 6,21 Mustafa et al also reported highest prevalence in age groups 19-24 years and 37-42 years.²² In our study male gender (4.878) had higher odds of seropositivity. Similar observations were reported by Sood et al and Amidu et al.^{21,23} A higher prevalence of seropositivity was seen in shia sect (OR 1.40)in our study which is in accordance with that observed by Irfa et al from Srinagar. 10 This could be explained on the basis of sharing razors and other instruments for self-inflicted injury practiced by shia community during Muharram processions and gatherings.

We observed that higher odds of seropositivity were seen in illiterates (OR: 2.93), higher income groups (more than 20000) and employed class. Similar observations have

been reported by Irfa N et al regarding income and literacy. Jagannathan L et al in their study reported that about half of the cases were from high socio-economic status.²⁴ A higher seropositivity in illiterates was reported by Gadhir et al.²⁵ Study by Wang et al report that on multivariate logistic regression analysis age, community, occupation, residence status and sex were all associated with positive rate of HBsAg (P <0.01). ¹³

None of our study participants gave history of risk factors like acupuncture, dialysis, organ transplant, i/v drug abuse and unsafe sexual practices. Higher odds of seropositivity were however seen in participants who gave history of risk factors like dental procedure (OR=1.42), Jaundice (OR=1.28) urinary catheterizations (OR =1.33), iv infusions (OR=1.14), blood donations (OR=2.27), treatment by quacks (OR=2.73), family history of hepatitis (OR= 1.94) and H/O self-inflicted injury (OR=1.52) but it was statistically significant only with regard to risk associated with treatment by quacks. Xiaoqing et al report that for participants aged 15-59 years, several factors significantly contributed to having HBsAg which included male gender, (OR = 1.47, P <0.01), a history of surgical operations (OR = 1.24, P <0.05), having at least one HBsAg positive family member (OR = 2.04, P < 0.01), and being unvaccinated (OR = 1.51, P < 0.01. Among adults aged 60+ years old, the greatest risk factor was a history of blood transfusions.²⁶ Same findings were reported by Jagannathan L et al and in a study conducted by CDC in New York city.^{24,8} Likewise Irfa et al in their study reported significantly higher risk of seropositivity with tattooing, dental procedures, I/v drug use, having multiple sexual partners and family history of hepatitis B. 10 Pereira et al. reported tattooing as a significant risk factor (OR=2.24; P=0.015) in Northeast region of Brazil.27 Qureshi et al also reported dental procedure as a significant risk factor for HBV infection (OR= 2.3; 95% CI: 1.8-3.0).²⁸ Li X et al. also reported a significant risk of seropositivity in those who had family history of hepatitis B.(OR=2.04; P < 0.001).²⁶

Mustafa et al in their study on blood donors reported that unprotected sexual activities was the most apparent predisposing risk factor (20%), followed by razor sharing (13.3%), parentral drug injections (10%), tattooing and surgical procedures (3.3%) for each.²²

CONCLUSION

The study revealed that the HBsAg prevalence was quite low in our study population. This was paradoxical to the dismally low level of awareness regarding the disease. However this could be used an early opportunity to direct efforts towards creating awareness among different sections of the community regarding all aspects of the disease in order to keep further transmission of this infection at check.

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Limitations

Children less than 10 years were excluded from the study because of technical difficulties expected in blood collection and refusal of parents for allowing blood collection in the group. However immunization against hepatitis B in newborns in India may have an impact on prevalence of hepatitis B in this age group .Another limitation was a potential recall bias regarding the risk factors. Failure to identify occult and cured infections because other serological markers were not included in the study.

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Ethical approval: The study was approved by the

Institutional Ethics Committee

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