Original article:

Risk factors of hepatitis B infection: a community based case control study from southern India.

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Abstract :

Introduction: The World Health Organization estimates that 2–5% of the general population is chronically infected with hepatitis B virus in Indian subcontinent. There are only a very few community based studies from India which identified risk factors for Hepatitis B Virus infection. The objective of the current study was to determine the preventable risk factors associated with transmission of Hepatitis B Virus infection in a rural developmental block in Kollam District, Kerala.

Methods: A community based case-control study was conducted with the cases being those with diagnosed Hepatitis B infection (HbsAg positive) as identified by the routine surveillance system of the district, from April 1st to August 15th, 2012. Controls were age (+/-5years) and sex matched neighbourhood controls. Univariate analysis for factors associated with Hepatitis B infection was done and selected variables were then entered in to a backward conditional logistic regression model.

Results: A total of 45 cases and 45 controls were interviewed. In the multivariate analysis, having done a blood investigation from a clinical laboratory in last six months (Adjusted OR 3.82; 95% CI 1.17-12.16) was significantly associated with hepatitis B cases.

Conclusion: Having done a blood investigation from a clinical laboratory in last six months was significantly associated with hepatitis B cases in Kollam district, Kerala. A comprehensive strategy to prevent blood borne pathogen transmission ensuring standard infection control practices in clinical laboratories is urgently needed.

Key words: hepatitis B, iatrogenic infections, risk factor, transmission

Introduction

Worldwide, an estimated two billion people have been infected with the hepatitis B virus (HBV) and more than 240 million have chronic liver infections. About 600 000 people die every year due to the acute or chronic consequences of hepatitis B.[1-3] Over time, approximately 15%–25% of people with chronic Hepatitis B develop serious liver problems, including liver damage, cirrhosis, liver failure, and liver cancer.[4] The chronic carriers also constitute the infectious pool for the spread of virus. The World Health Organization estimates that in Indian subcontinent, 2–5% of the general population is chronically infected.[1]The results from a Meta analysis has shown that the point prevalence of Hepatitis B infection in India is 2.4% (95% CI: 2.2%-

2.7%) in the general population.[5] Integrated Disease Surveillance Project (IDSP), a decentralized disease surveillance project in India was initiated by the Government of India in 2004.[6] Surveillance Units under the project have been set up at Central, State and District level with the district being the hub of all information. It includes field, hospital and laboratory based disease surveillance for the priority diseases as identified by the project. There was an increase in number of Hepatitis B cases reported to IDSP, of district surveillance unit, Kollam in recent years. Identification of the risk factors of HBV infection can form the basis for developing a comprehensive prevention strategy to prevent blood borne pathogen transmission in the district. The objective of the current study was to determine the preventable risk factors associated with transmission of Hepatitis B Virus infection in a rural developmental block in Kollam District.

Materials and methods

The study was carried out in a rural developmental block in Kollam district, Kerala from where maximum number of hepatitis B cases has been reported in recent years to the district surveillance unit. The block has a population of nearly 1, 40,000. The adult literacy rate is nearly 90%. The health care in this block is served by four government primary health centres, one government secondary care centres and various private clinics and hospitals. Hepatitis B vaccine is being given to children as routine immunization in this area since 2004.

A community based case-control study was conducted with the cases being those with diagnosed Hepatitis B infection (HbsAg positive) as identified by the routine surveillance system (IDSP) of the district, from April 1st to August 15th, 2012. Those who were pregnant or anybody with chronic illnesses including chronic HBV infection were excluded. Controls were age (+/- 5years) and sex matched neighbourhood healthy controls without symptoms or history of hepatitis.

With an approximation of proportion of controls who were exposed to injections in last six months as 10%, and proportion of cases as 40%, with 80% power of the study and 95% confidence, the number of people in each arm was calculated to be 42.

Data was collected by six health inspectors (trained community level health workers) by interviewing cases and controls at their home using a structured questionnaire. The questionnaire was designed based on literature review, expert opinion and frequent discussions with the health workers of that area. The questionnaire included basic demographic features, details of injections, blood investigations, blood donations, intravenous drug use, surgeries, skin piercing procedures, details of visit to hospitals, dental clinics and barbar shops, family history of hepatitis. The history of multiple sexual partners was elicited only for adults. The questionnaire was pilot tested before use. The interview technique was standardised by prior training of the health inspectors. The risk factors were assessed within a time frame of six months before the diagnosis of the disease. Informed consent was obtained from the subjects and from the parents in case of children.

Data entry was done using the software Epi-Info2002 version 3.5.1. Statistical Package for Social Sciences (SPSS Inc. Chicago, IL, USA), version 12.0 for

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Windows was used for analysis. Differences between the proportions were determined by the chi-square test and difference between means was determined by independent sample t test. Univariate analysis for factors associated with Hepatitis B infection was done, generating odds ratio and 95% confidence intervals. Selected variables were then entered in to a backward conditional logistic regression model.

Table 1. Characteristics of the study population

*Chi-square p value for difference between proportions and t test for independent samples for difference between two means.

Characteristics	**Categories**	**Cases** **N (%)**	**Controls** **N (%)**	**p value***
Age	<15 years	4 (8.9)	5 (11.1)	
	16-30 years	7 (15.6)	13 (28.9)	
	31-45 years	19 (42.2)	12 (26.7)	
	46-60 years	9 (20)	11 (24.4)	
	>60 years	6 (13.3)	4 (8.9)	
Mean age (SD)		39.95 (15.9)	37.44 (16.7)	0.395
Sex	Male	33 (73.3)	33 (73.3)	
	Female	12 (26.7)	12 (26.7)	
Education Mean (SD)		9.4 (3.6)	8.4 (3.2)	0.175
Marital status	Staying with spouse	33 (73.3)	30 (66.7)	
	Unmarried/widowed	12 (26.7)	15 (33.3)	0.323

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Socio economic status	Below poverty line Above poverty line	21 (46.7) 24 (53.3)	14 (31.1) 31 (68.9)	 0.091

Table 2.Univariate analysis of factors associated with Hepatitis B infection

Characteristics	**Categories**	**Cases N (%)**	**Controls N (%)**	**p value**	**Odds Ratio (CI)**
Any Injections	Yes No	19 (42.2) 26 (57.8)	14 (31.1) 31 (68.9)	0.19	1.62 (0.68-3.84)
Visit to a Dentist	Yes No	6 (13.2) 39 (86.7)	2 (4.4) 43 (95.6)	0.13	3.31 (0.63-17.36)
Surgery	Yes No	4 (8.9) 41 (91.1)	0 45	-	-
Suturing skin /skin piercing procedures	Yes No	1 (2.2) 44 (97.8)	2 (4.4) 43 (95.6)	0.51	0.48 (0.04-5.58)
Blood testing in laboratory	Yes No	13 (28.9) 32 (72.1)	5 (11.1) 40 (88.9)	0.032	3.25* (1.05-10.07)
Visit to Barbar shop	Yes No	18 (40) 27 (60)	24 (53.3) 21 (46.7)	0.145	1.71 (0.74-3.95)

*significant odds ratio

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Table 3. Results of multivariate analysis of factors associated with Hepatitis B Infection

Variable	Adjusted Odds Ratio (95% Confidence interval)
Blood test in a laboratory	3.82 (1.17-12.16)*
Received an injection	2.29 (0.84-6.17)
Visit to a dentist	6.33 (0.99-40.4)
Socio economic status	2.20 (0.82-5.92)

*significant odds ratio

Observations and Results

There were a total of 58 cases reported to the surveillance system from the block during the study period. Four were excluded as per the set exclusion criteria, one had not given consent and eight were not available for interview at the addresses provided. A total of 45 cases and 45 controls were interviewed. Four (8.9%) of the cases and two (4.4%) of the controls had a family history of hepatitis B (p 0.338). The mean age of the cases was 39.95 (SD 15.9) while that of controls was 37.44 (SD 16.7) (p 0.395). Bothe the groups were similar with respect to education, Socio economic status (SES) and marital status. None of them were health care workers. The basic demographic characteristics of cases and controls were shown in Table 1.The results of the univariate analysis of factors associated with hepatitis B infection were shown in Table 2. Having done a blood investigation from a laboratory in past six months was significantly associated with hepatitis B cases with an odds ratio of 3.25 (1.05-10.07). Four of the cases had a history of surgery in past six months while none of the controls had. In the study, 42.2% of the cases and 31.1% of the controls had received an injection in last six months, but the association was not statistically significant (p 0.19). Among the subjects, 13.2% of the cases had a history of visit to a dentist while the figure was 4.4% among the controls (p 0.13). None of the subjects reported homosexual activity, tattoos, intravenous drug use, or commercial sex work. The following variable were entered to a backward conditional logistitc regression model- age, socio economic status, educational status, blood testing in a laboratory, visit to a dentist and having received injections. In the final model, having done a blood investigation from a clinical laboratory in last six months (Adjusted OR 3.82; 95% CI 1.17-12.16) was significantly associated with hepatitis B cases. The final model is shown in Table 3.

Discussion

Hepatitis B is a ubiquitous virus with a global distribution. The public health burden of HBV infection is due almost entirely to its long-term effects on liver function.[7] In addition to health problems; these diseases cause broader social and economic problems.[8] HBV is acquired by percutaneous and mucosal exposure to the body fluids of an infected person.[9,10] However, there is considerable variation in transmission mode between geographic areas and populations.[11] The prevention

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of HBV infection has become a high priority in the global community. Having done a blood investigation in last 6 months was identified as risk factors for Hepatitis B infection in the study area. The study was followed by a visit to randomly selected 20 peripheral laboratories (5 Government and 15 private) in the block. It was found that majority of the private laboratories were working without license from Local self governments (14/15) and even without qualified technicians (12/15). Bio-medical wastes were not disposed satisfactorily in (14/20) laboratories. The needle shredder was either not available or not in proper working condition in 5/15 private laboratories. The needles and syringes were found carelessly discarded in the premises. Majority (14/20) of the lab personnel did not wear a gloves while drawing blood or while handling needles. The findings from the case-control study when corroborated with the findings from the inspection of laboratories, indicates that the transmission of hepatitis B through blood investigation in laboratories could be due to the deficiencies in standard infection control precautions in the laboratories. Blood-borne contamination can occur by exposure to the infectious material through non-intact skin and mucosal lesions. The highest infectious risk of this type is associated with direct contact with infected blood through punctures of the skin with blood-contaminated needles, lancets, scalpels, or other sharps. Insufficient cross-contamination control is also a possible device-borne means of pathogen transmission. Indirect contact with blood-contaminated surfaces can also transmit the hepatitis B virus.[12-14] HBV has demonstrated the ability to survive and remain infectious in dried blood at room temperature on environmental surfaces for at least 1 week and probably longer.[15] During this time, the virus can still cause infection if it enters the body of a person. Hand contact with blood-contaminated surfaces such as laboratory benches, test tubes, or laboratory instruments may transfer the virus to skin or mucous membranes.

Aseptic technique is absolutely essential while doing blood investigations to prevent microbial contamination, protect the patient from infection, and prevent the spread of pathogens. Preventing the spread of blood borne pathogens like HBV, Hepatitis C virus, and HIV is a basic expectation anywhere health care is provided. This applies to protection of both the patient and the health care provider. This will require a multi-faceted approach that focuses on surveillance, oversight, enforcement, and continuing educational efforts aimed at ensuring aseptic practices and standard infection control practices in all settings.

The State lacks a policy to regulate and control private clinical laboratories. Very few clinical laboratories in India have been found to participate in external quality assurance programs.[16] Accreditation of clinical laboratories is not mandatory in India and the country lacks a comprehensive, mandatory laboratory accreditation framework. It is high time for a national health laboratory policy to be developed; emphasizing quality assurance and such a policy should be backed by legislation.

There are only a few studies from India which studied risk factors of HBV transmission. In a study to find risk factors for HBV infection in southern India, HBsAg was significantly associated with family history of exposure to hepatitis and use of disposable needles during injection.[17] Another study in sexually transmitted disease clinic patients in

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northern India found that tattooing was associated with presence of antibody.[18] A study among blood donors in southern India found associations with patronage of local barbers as a significant risk factor for HBV infection.[19] None of these studies have specifically looked for blood investigations from clinical laboratories as a risk factor.

It is estimated that unsafe injections may cause 8–16 million HBV infections each year worldwide, most of which occur in developing countries.[20]The unsafe injections has been identified as a cause for many outbreaks of hepatitis B in the country.[21,22] The similar high proportion of cases and controls who received injections might be the reason for the lack of association between injections and HBV status in this study. About 31% of the controls have received an injection in last six months. There is a need to educate community as well as the health workers to reduce the unnecessary use of injections.

The risk of transmission of HBV through the dental practice remains an issue.[23] In the current study, though not statistically significant, 13.2% of the cases had a history of visit to a dentist while the figure was 4.4% among the controls. Four cases had a surgery in last six months. These two risk factors have to be evaluated further in a study with a larger sample size.

Immunization with Hepatitis B vaccine is the most effective means of preventing infection and the consequences and integrating the vaccine to childhood vaccination schedule has been shown to interrupt transmission.[24,25] In this region, Hepatitis B vaccine has been introduced into routine childhood immunization recently.

The strengths of the study include being organized in a community setting, standardization procedures and the appropriate design. However the study has several limitations. Recall bias and interviewer's bias would have affected the study results. Risk factors were assessed with a time frame related to the date of diagnosis of the HBV infection and the exact time of disease onset may not be the same. The standardization procedure and the structured questionnaire would have helped to reduce the bias to some extent. There may have been associations between risk factors and HBV status that we were unable to detect due to inadequate statistical power engendered by the sample size. The small sample size also explains the wide confidence intervals. Also it would have been better if the disease status was ruled out in controls through appropriate blood investigations, but we could not do it for logistics reasons. The surveillance system of the district would not have captured the entire cases of hepatitis b. But the district surveillance unit is a reasonably well performing unit with nearly 100% reporting units reporting on daily and weekly basis from hospitals, field and laboratories. But even with these limitations, the study has many public health implications.

Conclusion

Having done a blood investigation from a clinical laboratory in last six months was significantly associated with hepatitis B cases in Kollam district, Kerala and a comprehensive strategy to prevent blood borne pathogen transmission is urgently needed. The strategy should include a program targeting HBV prevention efforts, including raising public awareness and demands for safety and promotion of infection control standards in clinical laboratories.

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