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ORIGINAL RESEARCH

A Cross-sectional Study on Hepatitis B Vaccination Status and Post-exposure Prophylaxis Practices Among Health Care Workers in Teaching Hospitals of Mangalore

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Abstract

BACKGROUND Health care workers (HCWs) are at high risk for acquiring hepatitis B virus infection because of needle stick injury (NSI) and occupational exposures to potentially infectious bodily fluids. Hepatitis B vaccination confers protection against the infection. Very little information is available in India about current vaccination status and postexposure prophylaxis (PEP) practices among HCWs.

OBJECTIVES This study had 2 objectives. The first was to characterize current vaccination coverage among HCWs, and the second was to define PEP practices among HCWs after NSI and exposures to potentially infectious bodily fluids.

METHODS A questionnaire-based, cross-sectional study was conducted in hospitals attached to Kasturba Medical College, Mangalore. We selected 297 individuals. A pretested, semistructured questionnaire was devised to collect information from study participants. After obtaining permission from the Institutional Ethics Committee, data were collected by interviewing HCWs in the hospitals. Analysis was done using SPSS.

FINDINGS Nearly all (93.8%) of the HCWs surveyed had taken 1 dose of hepatitis B vaccine. However, only 57.1% completed the primary series of 3 doses and only 26.4% had taken 1 or more booster doses. Of the HCWs questioned, 24.8% had experienced NSIs, exposure to potentially infectious bodily fluids, or both. Local measures were the PEP practices most commonly used (85.5%) by the HCWs.

CONCLUSION The present study demonstrated that there is a need in Mangalore to improve the vaccination coverage and train HCWs in appropriate PEP practices. This will protect the workers from acquiring hepatitis B infection.

KEY WORDS health care workers, hepatitis B vaccination status, postexposure prophylaxis practices

INTRODUCTION

Two billion people worldwide have been infected with hepatitis B virus (HBV), and about 600,000 people die annually as a result of the consequences of hepatitis B. In India, hepatitis B surface antigen (HBsAg) prevalence among the general population ranges from 2% to 8%, which places India in an intermediate HBV endemicity zone. With 50 million cases, India is also the second largest global

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pool of chronic HBV infections.[1] It has been reported that about 10% of the health care workers (HCWs) in India have acquired HBV infection.[2] The risk for developing serologic evidence of HBV infection was 37% to 62% if the blood was positive for both HBsAg and hepatitis B e antigen, and 23% to 37% if the blood was positive for HBsAg and negative for hepatitis B e antigen.[3] HCWs exposed to needle stick injuries (NSIs), blood containing HBV, or both are at risk for developing clinical hepatitis.[3,4]

The hepatitis B vaccine has been available since 1982 and has generally been described as safe and effective with a protective efficiency of 90% to 95%.[1] Complete vaccination against hepatitis B is achieved by administration of a 3-dose regimen, with the doses 2 and 3 being given 1 and 6 months after the initial dose. A test for hepatitis B surface antibody should be carried out 6 to 8 weeks after the final dose of the primary course of vaccination.[5-7]

Low vaccination rates among HCWs have been reported in Nigeria, South Africa, and India.[8-10] To our knowledge, the reasons for low vaccination rates have not been explored. Studies to characterize the vaccination status among HCWs and to explore the reasons for not taking or completing the vaccination are therefore important and can provide guidance for planning interventions to improve coverage rates.

Poor or incorrect postexposure prophylaxis (PEP) practices after exposure to HBV-contaminated blood or bodily fluids have been reported in Lebanon, Egypt, and India.[9,11,12] A study on PEP practices would provide guidance for training staff and reducing risk for seropositivity after an exposure.

The present study was undertaken with the objective of determining the vaccination characteristics among the HCWs, including the reasons for not taking or completing the vaccination and to define PEP after exposure to HBV-infected blood or bodily fluids among HCWs of a tertiary care hospital.

MATERIALS AND METHODS

Background. The present study was conducted in tertiary care teaching hospitals of Kasturba Medical College, Mangalore. The hospitals provide outpatient and inpatient services for all medical, surgical, specialty, and super-specialty services.

Study Design and Sample Size. This was a questionnaire-based, cross-sectional study conducted with HCWs of the aforementioned hospitals. Health care workers (whose activities involved contact with patients' blood or other bodily fluids while providing care) such as doctors (including postgraduates and interns), nurses, lab technicians, and blood-bank workers were considered for the study. Using the formula for infinite population (ie, $N = Z^2\ pq/d^2$), assuming coverage of 59%,[13] for 95% confidence intervals and power of 90%, the sample size was computed to be 267. Accounting for 10% nonresponse rate, we arrived at a total sample size of 297.

Study Instrument Development and Pretesting. An appropriate questionnaire was prepared to collect the following components of information:

1. Basic sociodemographic information of the study population.
2. Hepatitis B vaccination status, details about doses, reasons for not taking or completing the vaccination.
3. PEP practices.

The questionnaire was pretested to determine its appropriateness and feasibility of use. The following changes were made: One question was revised to a closed-ended question, and we reordered the questions.

Data Collection. Permission was obtained from the Institutional Ethics Committee to conduct the study. It was made clear that the participation was voluntary. Questionnaires were distributed to the participants in their respective workplaces to ensure maximum participation. The completed forms were collected and the data analyzed.

Data Analysis. The data were entered into a Microsoft Excel spreadsheet and analyzed using SPSS version 12. The results were expressed as proportion in appropriate tables and graphs. Comparison was made between doctors and paramedical personnel. Chi-square test was used to determine whether the observed differences were statistically significant. $P < 0.05$ was considered significant.

RESULTS

In all, 291 HCWs responded, giving a response rate of 97.9%. Of the respondents, 57.2% were women. Most (42%) were between the ages of 24 and 29 years; 37.8% were aged 18 to 23 years. The distribution according to designation of the participants was as follows: 32% doctors, 24.7% interns, 35.1% nurses, and 8.2% lab technicians. Nearly one-fourth (21.3%) of the doctors were postgraduate students.

In all, 273 of 291 HCWs had taken at least 1 dose of vaccine, resulting in a vaccination rate of 93.8%. Although 93.8% of them had taken at least 1 dose, only 57.1 completed the primary series of 3

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doses and only 26.4% had taken booster doses. Vaccination characteristics are presented in Table 1. Reasons given for not completing the primary series was a lack of time (66.9%), the HCW forgot (28.5%), or other reasons (4.6%). The reasons stated for not completing booster doses were forgot (25.8%), adequate titer values (23.5%), the date for booster dose had not occurred yet (21.4%), lack of time (11.2%), lack of medical benefits (3.4%), and others (14.7%).

In all, 24.8% of HCWs had NSIs, exposure to potentially infectious bodily fluids, or both. The procedures during which the exposures occurred were drawing of blood or securing an intravenous line (42.2%), making an incision for a minor surgical procedure (21.9), carrying out a minor procedure (like lumbar puncture, intercostal drainage) (12.5%), suturing other wounds (12.5%), giving an intramuscular or intravenous injection (7.8%), or recapping the needle (3.1%). Of these respondents, 31.7% experienced exposure in the past 1–6 months; 28.6% within the past 6–12 months; and 22.2 within the past 1–5 years. The distribution of participants according to nature of exposures was as follows: prick/exposure with gloves on, 68.1%; exposure of blood or bodily fluids to intact skin, 26.1%; transcutaneous exposure by an injection needle, 20.6%; transcutaneous exposure by a suturing needle, 13%; and exposure of blood or bodily fluids to skin with a cut or abrasion, 7.2%. The PEP practices followed by the HCWs are presented in Table 2. Slightly more than half (55.5%) knew that the NSI or exposures had to be reported to the hospital authorities. The outcomes after NSI or exposure were as follows: 75.9% were seronegative, 22.4% made no attempt to find out, and 1.7% had acute hepatitis B followed by seropositivity.

Comparison revealed that doctors had better vaccination characteristics and PEP practices compared with paramedics (Tables 3 and 4). Some of these differences were statistically significant.

Table 1. Vaccination Characteristics of Health Care Workers

Participants' Characteristics	n (%)
Time since vaccination (n = 242)	
Within 1 mo	18 (7.4)
Within 1–6 mo	7 (2.9)
>6 mo to <1 y	26 (10.7)
1–5 y	103 (42.6)
5–10 y	58 (24)
10–15 y	24 (9.9)
>15 y	6 (2.5)
Vaccination schedule (n = 273)	
Dose 1	10 (3.7)
Dose 2	25 (12.8)
Dose 3	156 (57.1)
Booster	72 (26.4)
Interval between doses 1 and 2 (n = 221)	
1 mo	156 (70.6)
1–6 mo	59 (26.7)
>6 mo	6 (2.7)
Interval between doses 2 and 3 (n = 185)	
1 mo	17 (9.2)
1–6 mo	158 (85.4)
>6 mo	10 (5.4)
Antibody titre value (n = 232)	
<10	6 (2.6)
10–100	31 (13.4)
>100	40 (17.2)
Does not remember	27 (11.6)
Did not check	128 (55.2)
Interested in learning titer value (n = 186)	
Yes	150 (80.6)
No	36 (19.4)
No. of booster doses taken (n = 77)	
1	59 (76.6)
2	7 (9.1)
3	11 (14.3)
Time since last booster dose taken (n = 62)	
<1 y	17 (27.4)
1–5 y	26 (41.9)
6–10 y	17 (27.4)
>10 y	2 (3.2)

DISCUSSION

Although 57.1% of the HCWs had taken all the 3 doses, the 93.8% who had taken only a single dose were not protected against HBV infection. One study from Delhi reported that about 55.4% of HCWs were vaccinated.[10] The study did not provide the break down nor specified the proportions that had received 1, 2, or 3 doses, so the results cannot be compared with the present study. The United States and Australia report high levels of coverage, at 75% and 77%, respectively.[14,15] Low

Table 2. Post-Exposure Prophylaxis Practices

Actions Taken After NSI/Exposure (n = 68)	n (%)
Local measures taken	59 (85.5)
Blood sample evaluated for seropositivity	34 (50)
Follow up with the report	27 (39.7)
Reported the incident	19 (27.9)
Took immunoglobulin therapy	1 (1.5)

NSI, needle stick injury.

Table 3. Comparison of Vaccination Characteristics between Doctors and Other Paramedic Staff

Vaccination Characteristics	Study Participants: All Doctors Including PGs and Interns, n (%)	Study Participants: Other Paramedic Staff, n (%)	χ^2 (*P*)
Vaccination status			
Yes (n = 277)	155 (56)	122 (44)	1.299 (0.254)
No (n = 14)	10 (71.4)	4 (28.6)	
No of doses			
1 (n = 10)	8 (80)	2 (20)	9.124 (0.028)
2 (n = 35)	16 (45.7)	19 (54.3)	
3 (n = 156)	80 (51.3)	76 (48.7)	
Booster (n = 71)	48 (67.6)	23 (32.4)	
Interval between doses 1 and 2			
1 mo (n = 155)	117 (75.5)	38 (34.5)	84.769 (0.000)
1–6 mo (n = 59)	5 (8.5)	54 (91.5)	
>6 mo (n = 6)	2 (33.3)	4 (66.7)	
Interval between doses 2 and 3			
<5 mo (n = 16)	14 (50)	14 (50)	3.376 (0.185)
5–6 mo (n = 158)	92 (63)	54 (37)	
>6 mo (n = 10)	4 (40)	6 (60)	
Checked antibody titer value			
Yes (n = 101)	68 (67.3)	33 (32.7)	10.341 (0.016)
No (n = 172)	85 (49.4)	87 (50.6)	
Booster dose taken			
Yes (n = 78)	52 (66.7)	26 (33.3)	10.946 (0.012)
No (n = 141)	84 (59.6)	57 (40.4)	
Not due yet (n = 28)	9 (32.1)	19 (67.8)	
No of booster doses taken			
1 (n = 58)	42 (72.4)	16 (27.6)	6.629 (0.036)
2 (n = 7)	6 (85.7)	1 (14.3)	
3 (n = 11)	4 (36.4)	7 (63.6)	

PG, postgraduate.

levels of coverage with 3 doses among HCWs have been reported in Africa, Sweden, and Japan.[15-17] These findings demonstrate that vaccination coverage among HCWs is generally lower, with exception of those in the United States and Australia. The reasons given by HCWs—forgot and lack of time—are similar to those reported in Nigeria.[8]

Of the respondents, 24.8% had NSIs or exposure to potentially infectious bodily fluids. HCWs from tertiary care hospitals in Delhi reported very high levels (80.1%) of NSIs.[11] A study from Lebanon reported that about 30% of HCWs experienced NSIs or exposure to potentially infectious bodily fluids.[12] About 35% of HCWs from Egypt reported NSIs or exposure to potentially infectious bodily fluids.[9] The variation in NSI rates might be attributed to work conditions, patient load, and awareness among HCWs, which differ from place to place. Despite NSI rates being lower than those observed in Delhi, the pattern of clinical procedures that result in NSIs is the same as observed in the present study.[11] As most of the HCWs are "not protected" (low levels of 3-dose coverage), even low NSI rates are a cause for concern.

The majority of the HCWs in the present study resorted to local measures and only 50% had opted to have their blood checked for seropositivity. PEP practices reported in Delhi indicated that most of the HCWs undertook local measures, although the practices were incorrect.[11] Similar incorrect practices have been reported in Lebanon and Egypt.[9,12] The low number of HCWs who followed the correct PEP practices demonstrates a lack of knowledge about the correct procedures that should be followed. Doctors have better vaccination rates

Table 4. Comparison of PEP Practices between Doctors and Other Paramedic Staff

PEP Characteristics	Study Participants: All Doctors Including PGs and Interns, n (%)	Study Participants: Other Paramedic Staff, n (%)	χ^2 (*P*)
Sustained NSI/exposure			
Yes (n = 69)	55 (79.7)	14 (20.3)	17.685 (0.000)
No (n = 212)	108 (50.9)	104 (49.1)	
Nature of exposure			
Prick or exposure with gloves on (n = 46)	36 (78.3)	10 (21.7)	*
Exposure of blood or bodily fluid to intact skin (n = 18)	18 (100)	0	
Exposure of blood or bodily fluid to skin with cut or abrasion (n = 5)	4 (80)	1 (20)	
Transcutaneous exposure by a suturing needle (n = 9)	9 (100)	0	
Transcutaneous exposure by an injection needle (n = 14)	11 (78.6)	3 (21.4)	

NSI, needle stick injury, PEP, post-exposure prophylaxis; PG, postgraduate.
* χ^2 not computed.

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and PEP practices than paramedics. This is similar to reports from Delhi, Lebanon, and Egypt.[9,11,12] There is a need to train HCWs not only about the correct PEP practices to follow after exposure but also to motivate them to complete the vaccination program. Incorrect practices reported from various studies also highlight the need for a coherent hospital policy toward HCWs.

Limitations. The present study was limited by the fact that it was conducted in tertiary-care hospitals without including hospitals providing primary and secondary care. This resulted in an underestimation of the magnitude of low coverage with 3 doses, NSI, and poor PEP practices. There might have been response bias, which is common in any questionnaire-based study.

CONCLUSION

The number of HCWs effectively protected with 3 doses of HBV vaccine is very low. NSI rates are less than those reported in other studies. Incorrect PEP practices indicate a lack of adequate knowledge among the HCWs. Findings from the present study demonstrate the need to vaccinate and train HCWs to reduce the chance of acquiring HBV infection.

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