Factors Relating to Acceptance of Hepatitis B Virus Vaccination by Nursing Students in a Tertiary Hospital, Pakistan

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ABSTRACT

This cross-sectional study aimed at assessing the prevalence of, and factors relating to, the acceptance of hepatitis B virus (HBV) vaccination by nursing students in a tertiary hospital in Pakistan. In total, 210 nursing students of Year 2 to Year 4 were invited to participate in the study; of them, 196 (93.3%) returned completed questionnaires. Overall, the prevalence of acceptance of HBV vaccination among them was 75.0%. Of these, 37.2% (73/196) were completely vaccinated, and 25.0% (49/196) had not been vaccinated at all. More than half (27/49, 55.1%) of the unvaccinated nursing students stated that they would accept vaccination if offered. Multiple logistic regression analysis indicated three variables significantly related to acceptance of HBV vaccination: history of accidental exposure to blood or blood products, acceptable knowledge about HBV infection, and adequate budget for HBV vaccination. Health institutions should allocate adequate budgets to vaccinate their nursing students. Effective intervention programmes designed to increase knowledge about HBV infection and adhering to universally-accepted precautions are needed.

Key words: Cross-sectional studies; Hepatitis B vaccine; Hepatitis B virus; Nursing students; Vaccination; Pakistan

INTRODUCTION

Hepatitis B is an important, infectious, occupational hazard for healthcare workers exposed to human blood (1-3). The high risk of infection is due to the high prevalence of virus carriers in the assisted population (4), the high frequency of exposure to blood and other bodily fluids, and the highly contagious nature of hepatitis B virus (HBV). In Pakistan, the estimated carrier rate of HBV is about 5%, i.e. at least seven million persons are carriers among a population of 140 million (5). Infected victims not only suffer considerable harm, but may sometimes also inadvertently transmit the infection to patients they care for. The consequences of HBV infection are potentially fatal and include chronic liver disease, cirrhosis, and primary hepatocellular carcinoma (2).

Acceptance of vaccination by healthcare workers (HCWs) is an essential issue for hospitals, since staff and medical and paramedical students are at risk of exposure to, and transmission of, vaccine-preventable diseases (6-7). Although the currently-available hepatitis B vaccines are extremely safe (8), unfortunately, rates of vaccination among high-risk groups, i.e. medical, nursing staff, and other healthcare workers, are low. A study in Lahore, Pakistan, found that only 49.0% of healthcare workers and 42.2% of medical students were vaccinated (9). Nurses often have to deal with spilt blood, needlestick and sharps injuries, which can transmit blood-borne infections between patients and healthcare staff, and infection with the HBV is a common result (7,10-16). Although nurses are clearly a high-risk sub-
group for such events, nursing students may be at a similar or even at a greater risk due to their limited clinical experience (14). Despite this, the vaccination coverage among nursing students in Pakistan has not been elucidated. Bolan Medical Complex, Quetta, is a tertiary hospital in Baluchistan province. Nursing students receive HBV vaccinations at the beginning of their clinical rotations. Due to limited budget, not all students can get vaccination on time. During the study period, the hospital had no written policy that all healthcare workers and medical and nursing students are offered free HBV vaccination. Accordingly, this study aimed at examining the prevalence of and factors relating to acceptance of HBV vaccination by nursing students in this tertiary hospital.

**MATERIALS AND METHODS**

This cross-sectional study was conducted during January-February 2007 at Bolan Medical Complex Hospital, Quetta, Balochistan province, Pakistan, a tertiary hospital with a nursing school. A nursing course required four years of training, and the clinical training starts from the second year of study. All 210 nursing students from 2nd to 4th years were recruited for the study. The number of students in each year of study was 73, 70, and 67 respectively. The inclusion criteria were nursing students who attended clinical practice and agreed to participate in the study. Nursing students who had a history of HBV infection in the previous 12 months were excluded. Two experts reviewed the content validity of the questionnaire before it was pretested in a sample of 30 nursing students in another tertiary hospital. Cronbach’s alpha was used for assessing the reliability of the questionnaire. The original version of the questionnaire was in English and was later translated into Urdu. In total, 196 nursing students successfully completed the questionnaire, giving a response rate of 93.3%.

The Ethics Review Committee of the Faculty of Public Health, Mahidol University, Thailand, approved the study. During the study period, there was no Ethics Review Board in the study hospital; only written consent to conduct the study was obtained from the hospital Director provided all the nursing students enrolled into the study gave verbal consent.

**Data analysis**

Data entry and analysis were performed using the SPSS software for Windows version 11.5. All study variables were described by percentage, mean, and standard deviation. In the univariate analysis, each item of nursing care, specimen collection, preventive measures, and social support was treated as one variable. Associations were expressed as odds ratios (ORs) and 95% confidence interval (CI). All variables with a p value of ≤0.05 in the 2×2 univariate analysis and biological plausibility were entered into the multiple logistic regression models. The multivariate model included: age, checking of HBV, history of accidentally exposure to blood or blood products, knowledge of HBV infection, nursing care
(complete bed bath, blood transfusion, resuscitation, operation, wound dressing, assistance to doctor in patient care), preventive measures (adhering to universally-accepted precautions whenever exposure to needlestick injuries), and level of hospital supporting budget for HBV vaccination. Year of study of nursing students was not entered into the final regression model due to its collinearity with age. The significance level was set at $p \leq 0.05$.

**RESULTS**

From a group of 210 students, one HBsAg+ive case was excluded; 196 (93.3%) successfully completed the questionnaires. Ages ranged from 17 to 26 years ($\text{mean} \pm \text{SD} = 21.0 \pm 2.0$ years). 35.7% were from the second year and 33.2% from the third year. 71.9% had never been exposed to patient blood or other bodily fluids on the job during the previous three months, whereas 12.8% had been exposed to needlestick injuries one time, and 3.6% >2 times. Of the 55 nursing students who reported accidental exposure to blood or blood products, 38.2% stated that it occurred while giving an injection and 27.3% while giving an intravenous infusion. About 9.1% had never reported injuries (Table 1).

### Prevalence of HBV vaccination acceptance

Overall, the prevalence of HBV vaccination acceptance was 75.0% (147/196). Only 37.2% (73/196) had received the full three-dose vaccination schedule, 37.8% (74/196) had received at least one dose of vaccine, and 25.0% (49/196) were unvaccinated.

| Characteristic | No. of students | Percentage |
|----------------|-----------------|------------|
| Age (years)    |                 |            |
| 17-19          | 46              | 23.5       |
| 20-22          | 96              | 49.0       |
| $\geq$23       | 54              | 27.5       |
| Mean           | 21.0            | SD=2.0     |
| Range          | 17-26           |            |
| Year of study  |                 |            |
| Second         | 70              | 35.7       |
| Third          | 65              | 33.2       |
| Fourth         | 61              | 31.1       |
| History of accidental exposure to blood or blood products | | |
| Never          | 141             | 71.9       |
| Needlestick injury (times) | | |
| 1              | 25              | 12.8       |
| 2              | 18              | 9.2        |
| $>2$           | 7               | 3.6        |
| Sharp object injury | 1           | 0.5        |
| Conjunctival or mouth wound contact with patient or bodily fluids | | |
| 4              | 2               | 2.0        |
| Common causes of accidents (n=55) | | |
| Injection      | 21              | 38.2       |
| Intravenous infusion | 15          | 27.3       |
| Drawing blood  | 9               | 16.3       |
| Other          | 10              | 18.2       |
| Action taken after accident (n=55) | | |
| Report to resident medical officer | 18          | 32.7       |
| Report to matron | 14            | 25.5       |
| Report to head nurse | 10           | 18.2       |
| Report to night supervisor | 8            | 14.5       |
| Never reported | 5               | 9.1        |

SD=Standard deviation
The proportion of complete student HBV vaccinations increased from 22.9% in the 2nd year to 32.3% in the 3rd year, and 59.0% by the 4th year. The proportion was also higher in older nursing students (Table 2 and 3).

Intention to accept, and reasons for refusing, HBV vaccination

Of the 49 unvaccinated nursing students, 55.1% stated that they would consent to vaccination if it were offered next time. The top three reasons for refusing HBV vaccination the previous time were: high cost (26.5%), afraid of injection (24.5%), and unconvinced about vaccine efficacy (18.4%) in (Table 4).

Factors relating to acceptance of HBV vaccination

Univariate analysis revealed nine variables statistically associated with acceptance of HBV vaccination: older age, accidental exposure to blood or blood products, acceptable knowledge about HBV infection, practising blood transfusion ≥3 days per week, resuscitation nursing care for ≥3 days per week, always using disposable gloves when exposed to contaminated items, always segregating contaminated cotton, gauze and putting it into an infectious waste container, always following procedures whenever exposed to needlestick injuries, and allocating an adequate budget for HBV vaccination (Table 5).

In the multivariate analysis, all variables with a p value of ≤0.05 in the 2×2 univariate analysis and biological plausibility were simultaneously analyzed by multiple logistic regressions. After adjustment for all other variables in the model, the results indicated that three variables were statistically associated with acceptance of HBV vaccination: history of accidental exposure to blood or blood products (adjusted odds ratio [OR] 4.76, 95% confidence interval [CI] 1.61-14.09), having acceptable knowledge of HBV infection (adjusted OR 3.45, 95%CI 1.03-11.54), and

| Table 2. Prevalence of HBV vaccination among 196 nursing students, by study year |
|-----------------------------------|--------|----------------|----------------|----------------|
| Study year | Total | Completely vaccinated | Partially vaccinated | Unvaccinated |
| No. | % | No. | % | No. | % |
| Second | 70 | 16 | 22.9 | 33 | 47.1 | 21 | 30.0 |
| Third | 65 | 21 | 32.3 | 28 | 43.1 | 16 | 24.6 |
| Fourth | 61 | 36 | 59.0 | 13 | 21.3 | 12 | 19.7 |
| Total | 196 | 73 | 37.2 | 74 | 37.8 | 49 | 25.0 |

HBV=Hepatitis B virus

| Table 3. Prevalence of HBV vaccination among 196 nursing students, by student age |
|-----------------------------------|--------|----------------|----------------|----------------|
| Age (years) | Total | Completely vaccinated | Partially vaccinated | Unvaccinated |
| No. | % | No. | % | No. | % |
| 17-19 | 46 | 8 | 17.4 | 19 | 41.3 | 19 | 41.3 |
| 20-22 | 96 | 42 | 43.8 | 34 | 35.5 | 20 | 20.7 |
| ≥23 | 54 | 23 | 42.6 | 21 | 38.9 | 10 | 18.5 |
| Total | 196 | 73 | 37.2 | 74 | 37.8 | 49 | 25.0 |

HBV=Hepatitis B virus

| Table 4. Reasons for refusal of nursing students to have HBV vaccination (n=49) |
|-----------------------------------|--------|----------------|
| Reason | No. | % |
| High cost | 13 | 26.5 |
| Afraid of injection | 12 | 24.5 |
| Unconvinced about efficacy of vaccine | 9 | 18.4 |
| Afraid of side-effects | 6 | 12.2 |
| No time | 4 | 8.2 |
| Have prior immunity | 3 | 6.1 |
| Other | 2 | 4.1 |

HBV=Hepatitis B virus
The acceptance of hepatitis B virus vaccination among HCWs is an important public-health issue. Vaccination not only prevents vaccine-preventable diseases, but also decreases the burden on the government. In this study, the overall acceptance of HBV vaccination among 196 nursing students was 75.0%; of these, 37.2% were completely vaccinated, and 37.8% were partially vaccinated. The overall acceptance rate of vaccination was comparable with allocating an adequate budget for HBV vaccination (adjusted OR 3.07, 95% CI 1.19-7.92) (Table 6).

**DISCUSSION**

The coverage of hepatitis B vaccination among HCWs is an important public-health issue. Vaccination...
nursing students in Taiwan, at 79.2% (95/120) (17). However, the complete vaccination rate was significantly lower (37.2% vs 69.2%). Two possible reasons were: (a) the differences in support policies in each hospital, and (b) a better socioeconomic status and follow-up system, so that a higher proportion of those who missed the scheduled vaccination were encouraged to receive fee-for-service vaccine (18). At several hospitals in many countries, all employees are offered free HBV vaccination (19-21). This suggests the need for further improvement in vaccination policies of hospitals with high levels of risk for their health personnel.

Multiple logistic regression analysis revealed that, after controlling for all other variables in the model, only three variables were significantly related to acceptance of HBV vaccination: history of accidental exposure to blood or blood products, acceptable knowledge about HBV infection, and adequate budget for HBV vaccination. The explanation was that there were partially correlations among predictor variables. Thus, beyond what non-significant predictors share with significant predictors, they did not account for any of the variance in the acceptance of HBV vaccination. For example, a student nurse has a higher level of knowledge simply because she spends more years of service as a nurse and is consequently more frequently exposed to blood and blood products. Her acceptable knowledge about HBV infection and availability of HBV vaccines in the hospital enable the nursing student in deciding to accept vaccination.

This study found that the odds of acceptance of HBV vaccination among nursing students accidently exposed to blood or blood products was 4.76 times higher than for those not accidentally exposed. One possible explanation was that they might be more conscious about HBV infection and its prevention after exposure to patient’s blood. Accidental exposure might change mindset of nursing students towards acceptance of HBV vaccination. This study confirmed the findings of Techapetpibul et al. (21) who reported that exposure to patient blood was associated with acceptance of HBV vaccination by nurses.

The findings also revealed that the odds of acceptance of HBV vaccination for the nursing students with ‘acceptable knowledge of HBV infection’ was 3.45 times higher than ‘unacceptable in knowledge’. It might be that knowledge of HBV infection and HBV vaccination resulted in positive attitudes among the nursing students and sustained their beliefs in the safety and efficacy of vaccine. These ‘acceptable knowledge’ respondents probably believed the information and opinions provided by their teachers, other nurses, and co-workers, or from their physicians. The result was consistent with the findings of McGrane and Staines who reported that obtaining information relating to the benefits of vaccine from an occupational health physician or from a nurse was a significant factor in acceptance of vaccine (22). Bradley and Kristi found that acceptance of HBV vaccine was strongly related to knowledge of HBV disease and HBV vaccination (23). However, in our study, 78.1% (153/196) of the nursing students were at an ‘unacceptable’ level regarding knowledge about HBV infection and vaccination.

| Variable                                      | Crude | Adjusted* |
|-----------------------------------------------|-------|-----------|
|                                               | OR    | 95% CI    | OR    | 95% CI    |
| Accidental exposure to blood or blood products |       |           |       |           |
| Never                                         | 1.00  |           | 1.00  |           |
| Ever                                           | 4.54  | 1.69-12.16| 4.76  | 1.61-14.09|
| Knowledge about HBV infection                  |       |           |       |           |
| Unacceptable                                  | 1.00  |           | 1.00  |           |
| Acceptable                                    | 4.06  | 1.37-12.04| 3.45  | 1.03-11.54|
| Allocated budget for HBV vaccination          |       |           |       |           |
| Inadequate                                    | 1.00  |           | 1.00  |           |
| Adequate                                      | 2.47  | 1.14-5.33 | 3.07  | 1.19-7.92 |
The present study also found that the odds of acceptance of HBV vaccination for the nursing students who perceived that the hospital allocated an adequate budget for HBV vaccination were 3.07 times higher than those who perceived inadequate budgetary support. This might be due to the cost of vaccine such that the nursing students could not afford to buy the vaccine themselves. Mostly, in the study hospital, stocks were limited, and not every student was vaccinated on time or sometimes missed a dose due to a vaccine shortage. The result confirmed the finding of McGrane and Staines who reported that one factor that had a strong positive influence on nurses’ deciding to be vaccinated was the provision of free vaccine to HCWs (22).

This study had three main limitations: (a) although the study was conducted in an accredited teaching hospital in Pakistan, the results may not be generalizable to nursing students in other institutions in other parts of the country; (b) the study relied on self-reported data. However, self-reported data have been shown to have an acceptable sensitivity and specificity when investigating the vaccine coverage in the general population (24); and (c) the design of the study being cross-sectional, the results cannot be used for establishing a causal relationship. A follow-up study overcome this limitation.

In conclusion, the acceptance rate of HBV vaccination among nursing students was still low. All nursing students should be required to be vaccinated with hepatitis B vaccine prior to entry into clinical/practicum nursing, with support from health institutions. Follow-up systems, counselling about HBV, and effective intervention programmes designed to increase awareness relating to HBV infection, the procedures of knowledge and adhering to universally-accepted precautions, are also needed.

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