

Hepatitis B vaccination among primary health care workers in Northwest Pakistan

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Abstract

Background: We assessed hepatitis B vaccination and its determinants among health care workers (HCW) in rural Northwest Pakistan.

Methods: This cross sectional study was conducted among 485 HCWs from both public and private clinics. Data about hepatitis B vaccination, socio-demographic, knowledge regarding modes of transmission of hepatitis B virus, perceived disease severity and benefits of vaccination was collected through questionnaire. Multivariable logistic regression analysis was performed.

Results: Prevalence of complete hepatitis B vaccination was 40% (among Physicians with MBBS/MD qualification; 86% and lowest among non-qualified Dispensers;16%). Also, prevalence was higher among HCWs from public Dispensaries (77%) than those working in private clinics (35%). Being MBBS/MD Physician (Adj. OR 26.60; 95%CI 9.27-73.23), Non-MBBS/MD Physician (Adj. OR 1.89; 95%CI 0.78-4.59), qualified Dispensers (Adj. OR 3.58; 95%CI 1.34-9.54) compared to non-qualified Dispensers, working in public clinics (Adj. OR 2.54; 95%CI 1.13-5.69) as compared to private, perceived disease threat after exposure to blood and body fluids (Adj. OR 1.11; 95%CI 1.03-1.19) and perceived benefits of hepatitis B vaccination (Adj. OR 1.13; 95%CI 1.09-1.19) were significant predictors of complete hepatitis B vaccination.

Conclusion: Improved perception of disease threat and benefits of vaccination and qualification of HCWs are associated with hepatitis B vaccination among Primary HCWs.

Keywords: Hepatitis B, Hepatitis B vaccination, HCW, Primary health, Clinics, Pakistan

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Introduction

Hepatitis B Virus (HBV) infection is a global public health problem and the tenth leading cause of deaths globally. ⁽¹⁾ According to an estimate, nearly 2 billion of the population is infected with HBV worldwide that results in 350 million chronic cases and 2 million annual deaths. ⁽¹⁾ The number of suspected hepatitis B carriers in Pakistan is approximately five million ⁽²⁾ with a prevalence ranging from 1.4-11% (weighted average 2.4%), ⁽³⁾ thereby ranking Pakistan in the intermediate HBV prevalence zone.

Prevention of HBV is a public health priority and immunization with hepatitis B vaccine is the most effective means of preventing hepatitis B infection and its consequences. ⁽⁴⁾ The hepatitis B vaccine's effectiveness and safety have been rigorously documented: 95-100% of children and 90-95% of healthy young adults receiving the full 3-dose series develop protective antibodies. ^(5,6) The Advisory Committee on Immunization Practices (ACIP) recommends hepatitis B vaccine for everyone 18 years of age and younger as well as for adults over 18 years of age who are at risk of hepatitis B infection. Adults who are at increased risk of infection and who should receive vaccination include: sexually active heterosexual adults with more than one sex partner in the prior 6 months or a history of sexually transmitted disease; men who had sex with men; illicit injection drug users, hemodialysis patients and persons at occupational risk of infection. The health care workers (HCWs) fall in the last category of high-risk groups. ⁽⁷⁾

Occupational exposure to blood and body fluids places healthcare workers at risk of infection with blood borne viruses including hepatitis B, hepatitis C, and HIV. ⁽⁵⁾ The risk of getting HBV infection by HCWs is four fold higher as opposed to adult general population. ⁽⁸⁾ Also, the risk of contracting HBV infection in an unvaccinated person from an HBV-infected needle stick or sharp injury ranges from 6-30%. ⁽⁸⁾ The risk of infection with hepatitis B (with an "e" antigen positive source) and hepatitis C after percutaneous exposure to blood is about 30% and 3% respectively. ⁽⁹⁾ Therefore HCWs are at high risk of HBV infection due to repeated exposures. In addition, high prevalence of HBV infections among the general population, lack of infection

control activities, under-resourced health care system, and poor injection practices without any safety measures at first level care facilities in Pakistan further augment the risk of nosocomial transmission of HBV to HCWs. ⁽¹⁰⁾

The prevalence of hepatitis B surface antigen (HBsAg) positivity among Pakistani HCWs working at tertiary care hospitals has been studied by various authors. ⁽¹¹⁻¹³⁾ The vaccination status of Pakistani primary HCWs has however not been studied before. The present study was undertaken to assess the vaccination status of HCWs and to describe the health facility and personal characteristics associated with vaccination coverage at primary care setting in the rural district of Northwest Pakistan.

Material & Methods

Design and Setting

A Cross sectional study was carried out during 1st July to 31st October 2010 in rural areas of Tehsil Swabi, Khyber Pakhtonkhwa (KPK), Pakistan. The study was carried out in both private and public primary health settings such as Physicians' clinics and public dispensaries.

Selection of health care facilities and HCWs

We compiled a sampling frame of all private clinics and public dispensaries located in Tehsil Swabi. There were total 483 primary health facilities (36 public, and 447 private clinics). A sample of clinics proportional to the total number of clinics in particular stratum was randomly selected (without replacement) from both public and private clinics. At each facility, there was a Physician and in some of the facilities the Physician was also accompanied by his Assistant or Dispenser. We selected both the Physician and the Dispenser (if available) from all the selected facilities. After a written consent, interviews were conducted separately with Physician and Dispenser during the clinic hours.

Sample size and its calculation

Sample size was calculated based on 50% prevalence of hepatitis B vaccination among HCWs at first level care facilities ⁽¹⁴⁾ in Pakistan, assuming 3% bound on error of estimation, 5% level of significance, adjusting for 10% non-response and using the finite

population correction factor, the required minimum sample size for this study was 370 clinics. Out of 370 clinics randomly selected, 363 clinics provided the permission to participate in the study. We interviewed 485 HCWs (363 Physicians + 122 Dispensers) from the selected clinics.

Questionnaire and data collection tool

We developed our questionnaire in English, translated it into local language (Pashto) and translated back into English to check for accuracy. The Pashto version of the questionnaire was pilot tested on 5% of the actual sample size to check for clarity of the questions before initiation of the main study. The questionnaire included socio-demographic characteristics, type of clinic, work experience, professional qualification, complete hepatitis B vaccination status (three doses), compliance with universal/standard precautions (UP), perceived barriers to hepatitis B vaccination, perceived self efficacy in practicing UP, perceived disease threat after exposure to blood and body fluids, perceived benefits of hepatitis B vaccination, and knowledge regarding modes of transmission of hepatitis B virus.

Compliance with UP was measured on an 11 items likert scale with responses never=0, seldom=1, sometime=2, mostly=3, always=4 and a binary response question about complete hepatitis B vaccination status (3 doses) (1=yes, 0=no). Higher score represents higher compliance with practicing UP. Knowledge about modes of transmission of hepatitis B virus was measured through knowledge scale comprising of seven yes/no response items. One point was assigned to each correct response and sum of score was calculated to measure level of knowledge regarding transmission of HBV. Barriers to hepatitis B vaccination was measured through an eleven-item likert scale with responses ranging 0 to 2 (strongly disagree=0, disagree=1, not sure=2, agree=3, strongly agree=4). The higher score represent barriers and vice versa. Perceived disease threat of BBPs after exposures to blood and body fluids was measured through 4 items with responses "strongly disagree=1, disagree=2, not sure=3, agree=4, strongly agree=5". A higher score means higher perceived threat of hepatitis B infection. Perceived benefits of hepatitis B

vaccination were measured through four items using a five point Likert scale (strongly disagree=1, disagree =2, not sure=3, agree=4, strongly agree=5). Higher score reflects higher perception of benefits. Perceived self-efficacy in practicing UPs, in different circumstances was measured through a four item scale with responses 0= "never" to 3= "always". Higher score represented higher perception of self-efficacy. The knowledge scale used in our questionnaire was adapted from the a study conducted in rural Sindh, Pakistan ⁽¹⁴⁾ with reported Cronbach's alpha score for internal consistency of 0.75, scales for compliance with UPs, and barriers to hepatitis B vaccination were adapted from a study in India ⁽¹⁵⁾ and modified according to the local setting and objective of the study. The reported Cronbach's alpha score for UP scale was 0.66. Scales on perceived benefits, perceived disease threat, and self-efficacy were adopted from our previous work conducted in the same population. ⁽¹⁶⁾ The Cronbach's alpha scores were 0.48, 0.80, and 0.83, respectively.

The study was approved my ethical review committee of Aga Khan University, Karachi.

Data analysis

Individual responses on each item were sum up to calculate score for each likert scale. Means with standard deviations were calculated for all continuous scale variables. Prevalence of hepatitis B vaccination with 95% CI was calculated for different types of HCWs and types of clinics.

Predictors for hepatitis B complete vaccination were identified through multivariable logistic regression modeling. Variables found significant at 15% level of significance in the univariate analysis were evaluated in the multivariable regression model. Adjusted odds ratios with 95% confidence interval (95% CI) were calculated. Model adequacy was checked using Hosmer and Lameshow goodness of fit test. The final model was developed based on best subset method.

Results

Participants' profile

Of the 485 health care workers, 75% were Physicians while 25% were Dispensers. Mean (SD) age of the HCWs was 38 (10.4) years

with an average work experience of 12.2 (8.6) years. Only 16% of the HCWs were qualified from any medical school with bachelor of medicine and bachelor of surgery (MBBS) degrees while the other 16% of the HCWs were not holding any professional qualification. 17.5% of the HCWs were holding diploma in homeopathic medical sciences and were practicing as Allopathic Physicians (Table 1).

Hepatitis-B vaccination status

Self-reported complete three doses of hepatitis B vaccination was 40% among the given sample. None of the HCWs underwent antibodies titer after vaccination (Table 1). Prevalence of hepatitis B vaccination was 41% (95%CI 36.6-45.4) among Physicians and 37.7% (95%CI 33.4-42.0) among the Dispensers. The prevalence of vaccination was higher in HCWs working in public Dispensaries (76.8%; 95%CI 73.0-80.6) than those working in private clinics (35.4%; 95%CI 31.2-39.6). Also, the prevalence was highest among Physicians qualified from medical schools (86%; 95%CI 83-89), and lowest among the Dispensers without any formal qualification (16%; 95%CI 13-20) (Table 2).

Determinants of hepatitis B vaccination

Univariate logistic regression revealed significant association between hepatitis B

vaccination and type of the HCWs, type of facility, work experience, age of the HCW, sustaining at least one sharp injury in the last one year, knowledge regarding modes of transmission of hepatitis B virus, compliance with UP, barriers to vaccination, perceived disease threat after exposure to blood and body fluids, perceived self efficacy in practicing UP and perceived benefits of practicing UP (Table 3).

Multivariable logistic regression revealed that Physicians qualified from medical schools (with MBBS/MD qualification) are 26 times more likely to be vaccinated against hepatitis B (Adj. OR 26.06; 95%CI 9.27-73.23), followed by certified Dispensers (Adj. OR 3.58; 95%CI 1.34-9.54) and Physicians without MBBS/MD qualification (Adj. OR 1.89; 95%CI 0.78-4.59) as compared to uncertified Dispensers. Also, HCWs working in public dispensary were 2.5 times more likely to be vaccinated as compared to those working in private clinics (Adj. OR 2.54; 95%CI 1.13-5.69). In addition, HCWs with perceived disease threat after exposure to blood and body fluids and perceived benefits of hepatitis B vaccination were more likely to be vaccinated against hepatitis B as compared to their counterparts (Adj. OR 1.11; 95%CI 1.03-1.19 & Adj. OR 1.13; 95%CI 1.09-1.19 respectively) (Table 4).

Table 1: Descriptive characteristics of primary health care workers in rural North West Pakistan (N=485)

Variables	N=485(%)
Type of Respondent:	
Physician	363 (74.8)
Dispenser	122 (25.2)
Age in years (mean± SD)	38±10.4
Work experience in years (mean± SD)	12.2± 8.6
Professional qualification:	
MBBS/MD	78(16.1)
RN	243(50.1)
DHMS	85(17.5)
None	79(16.3)

Source of training, in case of no professional qualification (n=79):	
Working in clinic	66(13.6)
Attending courses	1(0.2)
Family profession	9(1.9)
Work in hospital	3(0.6)
Antibodies titer after hepatitis B vaccination	0
Hepatitis B complete vaccination (3 doses):	195 (40.2)
At least one sharp injury in last one year	313(64.5)
Knowledge of HBV modes of transmission (Mean score±SD) (Actual Range) <i>possible score 0-7</i>	3.4±1.5(0-7)
Compliance with universal precautions(UP) (Mean score±SD) (Actual Range) <i>possible score 0-45</i>	30±7.8(4-45)
Perceived Benefits of hepatitis B vaccination (Mean score±SD) (Actual Range) <i>possible score 3-15</i>	12.3±1.9(7-15)
Perceived barriers to hepatitis B vaccination(Mean score±SD) (Actual Range) <i>possible score 0-44</i>	14.8±5.5(0-37)
Perceived disease threat (Mean score±SD) (Actual Range) <i>possible score 4-20</i>	15.1±3.1(4-20)
Perceived self efficacy in practicing UP(Mean score±SD) (Actual Range) <i>possible score 0-12</i>	10.4±2.2(0-12)

Table 2: Prevalence of complete hepatitis B vaccination with 95%CI among primary health care workers in North West Pakistan (N=485)

Variables	Prevalence(95%CI)
Type of HCW:	
Physician	41.0(36.6-45.4)
Dispenser/Assistant	37.7(33.4-42.0)
Type of clinic:	
Public	76.8(73-80.6)
Private	35.4(31.2-39.6)
Type of HCW by qualification:	
Qualified Physician (MBBS/MD)	85.88(82.79-88.98)
Non-MBBS Physician (no degree from med. School)	27.34(23.37-31.31)
Certified Dispenser/Assistant	49.37(44.93-53.82)
Un-Qualified Dispenser/Assistant	16.28(12.99-19.57)

Table 3: Univariate logistic regression analysis of complete hepatitis B vaccination among primary HCWs in rural areas of North West Pakistan (N=485)

Variables	Crude OR(95%CI)	P value*
Type of HCW		
Un-Qualified Dispenser/Assistant	1	
Non-MBBS Physician (no degree from med. School)	5.0(1.99-12.61)	<0.001
Certified Dispenser/Assistant	1.94(0.83-4.53)	
Qualified Physician (MBBS/MD)	31.29(11.35-86.24)	
Type of facility		
Private	1	
Public	6.03(3.14-11.56)	<0.001
Work experience (years)		
18-42	1	
5-17	1.65(1.04-2.60)	0.008
<5	2.30(1.35-3.92)	
Age deciles (years)		
≥60	1	
50-59	0.50(0.05-5.51)	<0.001
40-49	1.69(0.45-6.43)	
30-39	3.29(0.92-11.75)	
20-29	5.15(1.43-18.64)	
15-19	6.19(1.58-24.28)	
Sharp injuries in last one year	0.91(0.84-0.98)	0.010
Knowledge regarding modes of transmission of blood borne pathogens	1.09(1.04-1.13)	<0.001
Compliance with standard precautions	1.10(1.03-1.17)	0.004
Barriers to hepatitis B vaccination	0.93(0.89-0.96)	<0.001
Perceived disease threat after exposure to blood & body fluids	1.15(1.08-1.22)	<0.001
Perception of self efficacy in practicing standard precautions	1.17(1.07-1.29)	0.001
Perceived benefits of hepatitis B vaccination	1.16(1.09-1.23)	<0.001

*Two sided p value based on -2log likelihood ratio test.
Dependent variable; Hepatitis B vaccination (1=Yes, 0=No)

Table 4: Multivariable logistic regression analysis showing determinants of complete hepatitis B vaccination among Primary HCWs in North West Pakistan (N=485)

Variables	Adjusted OR(95%CI)	P value*
Type of HCW		
Unqualified Dispenser/Assistant	1	
Certified Dispenser/Assistant	3.58(1.34-9.54)	<0.001
Non-MBBS Physician	1.89(0.78-4.59)	
Qualified Physician (MBBS/MD)	26.06(9.27-73.23)	
Type of facility		
Private	1	
Public	2.54(1.13-5.69)	0.024
Perceived disease threat after exposure to blood & body fluids	1.11(1.03-1.19)	0.006
Perceived benefits of hepatitis B vaccination	1.13(1.09-1.19)	0.030

*Two sided p value based on -2log likelihood ratio test.
Dependent variable; Hepatitis B vaccination (1=Yes, 0=No)
Model adjusted for job experience and all the variables present in the model

Discussion

The prevalence of complete hepatitis B vaccination among primary HCWs in rural areas of North West Pakistan was lower than the prevalence among primary HCWs reported from rural Sindh, Pakistan⁽¹⁴⁾ and North India.⁽¹⁷⁾ In a study at first level care facilities in Sindh Pakistan, 50.2% of HCWs (compared with 40.2% in this study), 83% licensed Practitioners (compared with 85.9% in this study), 36.4% non-licensed Practitioners (compared with 27.3% in this study), and 42% Dispensers/assistants (compared with 37.7% in this study) reported complete hepatitis B vaccination.⁽¹⁴⁾ A study at a community based hospitals in rural India, reported that 87% HCWs were completely hepatitis B vaccinated.⁽¹⁷⁾ We did not find any other literature about the prevalence of hepatitis B vaccination among primary HCWs from the region. However, numbers of studies from Pakistan have reported the prevalence of hepatitis B vaccination among HCWs working in tertiary care hospitals. A study from two university hospitals in Hyderabad Pakistan reported 65% (92.4% licensed Physicians, and 18.9% Nursing Assistants) prevalence of complete hepatitis B vaccination.⁽¹⁸⁾ Another study from a tertiary care hospital in Karachi reported 52% complete hepatitis B vaccination.⁽¹⁹⁾ In addition, a study among HCWs at tertiary care hospital in North Western Pakistan reported that 85% of Physicians and 75.6% of Nursing Assistants were completely vaccinated against hepatitis B.⁽¹³⁾ Differences in vaccination status of HCWs at first level care facilities such as clinics in rural setting, first level care facilities in urban setting and tertiary care hospitals are explained based on the availability of vaccination facility at the clinic, work environment, cost of the vaccine, awareness regarding the effectiveness of vaccination, professional qualification and other motivational factors.

We found significant inverse relationship between age and complete hepatitis B vaccination. Younger HCWs were more likely to be vaccinated as compared to HCWs aged 60 years and above. However, this association disappeared at the multivariable level. Possible explanation for this inverse association between age and vaccination at the univariate level could be the result of higher acceptability of hepatitis B vaccination among younger

HCWs as also observed in India⁽²⁰⁾ and Brazil.⁽²¹⁾ Also, in Pakistan some paramedical, nursing and medical schools of the private sector have recently introduced hepatitis B vaccination for the new entrants which might have resulted in higher vaccination rates among younger HCWs as compared to those aged 60 years and above. Another interesting finding at the univariate level which remained no more significant at the multivariable level was exposure to sharp injury/needle stick injury during the last one year. HCWs who reported sharp injury in the last one year were less likely to be vaccinated against hepatitis B as compared to those who reported no sharp injury. This finding has important implications as needle stick and sharp injuries have been reported to be one of the significant predictors for the transmission of blood borne pathogens including hepatitis B virus.⁽²²⁾ Also, the transmission probability of hepatitis B virus through contaminated needle stick or sharp injury is highest as compared to hepatitis C and HIV^(8, 9, 22, 23) particularly among unvaccinated HCWs. Most probably the lower rate of hepatitis B vaccination among HCWs with previous exposure to needle stick or sharp injury at primary health centers might be due to lack of perception of disease threat or/and benefits of hepatitis B vaccination and lack of knowledge regarding modes of transmission of blood borne pathogens. We did not find any study from primary or tertiary care setting which could have assessed the association between previous exposure to needle stick injuries and hepatitis B vaccination. However, a study among student nurses at a tertiary care hospital in Baluchistan Pakistan⁽²⁴⁾ and a study among HCWs at a tertiary care hospital in North India⁽²⁰⁾ reported higher acceptability of hepatitis B vaccine among those with a previous history of accidental exposure to blood or blood products. Our finding is not consistent with the given literature. Future studies in both primary and tertiary care settings are recommended to evaluate the association between vaccination and previous exposure to blood or blood products among HCWs.

Our final model revealed that qualification of HCWs when adjusted for other predictors was significantly associated with hepatitis B vaccination. Physicians with graduation from a medical school (MBBS/MD) had highest odds

of vaccination, followed by certified Dispensers, and then Physicians without any professional qualification as compared to Dispensers without any formal qualifications. A study on universal precautions among HCWs at first level care facilities in rural Sind, Pakistan also reported highest proportion of hepatitis B vaccination among licensed Practitioners, followed by non-licensed Practitioners and then Assistants/Dispensers. However, they could not report independent predictors of hepatitis B vaccination. Besides, we could not find any literature showing association between qualification of HCWs and odds of hepatitis B vaccination among HCWs at primary care setting in Pakistan. A study among primary health care workers in Brazil also reported positive association between higher level of schooling and hepatitis B vaccination.⁽²⁵⁾ Possible explanation of hepatitis B vaccination and higher qualification of HCWs could be the result of better health awareness, knowledge, accessibility to vaccination, and less financial barriers to afford the cost of hepatitis B vaccination. Thus, HCWs with no formal qualification working at primary care setting in rural areas should be targeted for hepatitis B vaccination.

Another independent predictor at the multivariable level was the type of clinic such as state owned public Dispensary versus private clinic. The odds of hepatitis B vaccination were more than two times higher among HCWs working in public facilities as compared to those in private settings. Possible explanation could be the availability of free of cost universal hepatitis B vaccination for the HCWs working in public sector as compared to private owned facilities⁽²⁶⁾ in Pakistan. Although, literature is not available regarding the hepatitis B vaccination status of HCWs working in public and private primary care setting but a study among primary health care workers in Brazil reported almost similar findings of negative association between unsecure/unstable job status and hepatitis B vaccination.⁽²⁵⁾

We found that HCWs who perceived the threat of getting bloodborne infections including hepatitis B at workplace were more likely to receive complete doses of hepatitis B vaccination as compared to those who had no perception of getting blood borne infection while at work. To the best of our knowledge no

study has investigated this association among primary health care workers however the finding is consistent with studies from tertiary care hospitals in North India⁽²⁰⁾ and Republic of Georgia.⁽²⁷⁾ Also, the odds of hepatitis B vaccination were higher among HCWs with perceived benefits of hepatitis B vaccination as compared to the HCWs who lack perception regarding the benefits of Hepatitis B vaccination against preventing hepatitis B infection. Thus perception of disease threat and benefits of hepatitis B vaccination among HCWs together can increase the likelihood of seeking vaccination against hepatitis B virus.

The risk of acquiring hepatitis B infection is very high among poorly vaccinated primary HCWs in rural areas of North West Pakistan. In order to improve hepatitis B vaccination, it is recommended to target HCWs working in private clinics and especially those who are not formally qualified from any medical, nursing or paramedical school. Also, awareness regarding the risk of acquiring hepatitis B infection after exposure to blood and body fluids and benefits of hepatitis B vaccination should be created among HCWs working in rural areas through mass media, dissemination of pamphlets, brochures and organizing health awareness sessions on village level.

The cross sectional design of this study and self reported status of hepatitis B vaccination are important limitations of this study. Therefore, results should be interpreted with caution.

Conclusion

HCWs without formal qualification working in rural areas of North Western Pakistan are poorly vaccinated against hepatitis B virus. Improved perceptions of disease threat, perceived benefits of hepatitis B vaccination, working in public clinics, and qualification of HCWs can improve hepatitis B vaccination status among primary HCWs.

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