

# Predictors and Vaccination Status of Nurses against Hepatitis B Virus at Public Hospitals in Addis Ababa, Ethiopia

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## Abstract

**Background:** Health care workers (HCWs) are at increased risk of acquiring hepatitis B infection due to occupational exposure. A range of measures can contribute to reduce HBV transmission to HCWs. There is effective vaccine against hepatitis B infection throughout the world. However, many Nurses in resource poor countries remain at risk because they are not vaccinated against hepatitis B Virus (HBV). Therefore, this study is aimed to assess predictors and vaccination status of Nurses against HBV in Addis Ababa.

**Methods:** Facility-based cross-sectional study was conducted among Nurses working in public hospitals in Addis Ababa from March to April 2015. A total of 272 Nurses were included in the study. Data was collected by using self-administered questionnaire. Binary logistic regression technique was used to identify important predictors.

**Results:** Among the study participants only 67(24.4%) were vaccinated at least once in their life time. Out of those respondents who were vaccinated, only 35.8% were fully vaccinated. More than half of study participants (51.8%) had poor knowledge about hepatitis B vaccine.

Nurses who earn 148-183 \$USD was less likely to be vaccinated against HBV. Nurse with history of needle and sharp injuries were 7.78 times more likely to be vaccinated against HBV when compared to those without history of needle and sharp injury. Knowledgeable Nurses about HBV vaccination were 6.3 times vaccinated against HBV when compared to those with poor level of knowledge.

**Conclusion:** This study determined a low level of HBV vaccination status of Nurses in Ethiopia, which implies higher risk of Nurses to be infected by hepatitis B virus. Monthly income, history of exposure to needle and sharp injury, and level of knowledge towards hepatitis B vaccination were the most important predictors of vaccination status. Each concerned body should give special attention to make available/accessible the vaccine for all professional Nurses.

**Keywords:** HBV vaccination; Nurses vaccination status; Addis Ababa public hospital nurses

**List of Abbreviations:** AOR: Adjusted Odds Ratio; HBV: Hepatitis B Virus; HBeAg : Hepatitis B e Antigen; HCV: Hepatitis C virus; HCWs : Health Care Workers; HIV: Human Immunodeficiency Virus; NSSIs: Needle Stick and other Sharp Injuries; WHO: World Health Organization

## Introduction

The occupational risk of transmission of blood-borne pathogens, such as hepatitis B virus, hepatitis C virus (HCV) and human immunodeficiency virus (HIV) to HCWs is well recognized. Among them, HBV is far more infectious than HCV, which is in turn considerably more infectious than HIV. Especially hepatitis Be antigen (HBeAg) positive individuals are highly infectious [1]. The disease is one of the most serious of the 20 blood borne pathogens which are the major threat to HCWs. The most common routes of transmission from patient to HCW are needle stick and other sharps injuries (NSSIs), followed by muco-cutaneous exposure. Persons with chronic infection also serve as the main reservoir for continued HBV transmission [1-3]. The annual proportion of HCWs exposed to blood borne pathogens was 5.9% for HBV, corresponding to about 66,000 HBV infections in HCWs worldwide [4].

Evidences indicated around 5%-10% of HBV infected workers become chronically infected. Estimated 100-200 health-care personnel have died annually during the past decade because of the chronic

consequences of HBV infection [5]. According to a European survey of occupational exposure of HCWs to NSSIs, Nurses were found to be exposed more commonly (91%) than doctors (6%) and phlebotomists (3%) [6]. A study conducted in the United States found that HCWs had a prevalence of HBV infection approximately 10 times higher than the general population [7]. The world health organization (WHO) Report estimates that 40% of HBV infection is a result of occupational exposure, it has been estimated that 14.4% of hospital workers are infected with HBV. Nurses were most commonly exposed to infection (41%) than other HCWs [8].

A range of measures and interventions can contribute to reduce HBV transmission to HCWs to low levels and such measures include adoption of standard precautions and the use of safety devices. The introduction of HBV vaccines in the 1980s, however, is to be considered

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the major achievement in terms of prevention of HBV infection. HBV vaccination of HCWs and aiming at optimum immunization coverage is therefore a wise strategy [1]. 90% of healthy adults and 95% of infants, children, and adolescents have protective serum anti-HBV antibody concentrations after the vaccine series has been completed. Among immune-competent persons in whom antibody levels of at least 10 mIU per milliliter develop, the efficacy of the vaccine is nearly 100% [9]. Anti-HBs was found in 61.6% of respondents, with significant differences ( $p=0.01$ ) between subjects who received at least one dose of vaccine (76.7%) and those who reported never having been vaccinated (50.3%) [10].

In spite of availability of safe and effective vaccine against HBV throughout the world many HCWs especially in resource poor countries remain at risk because they are not vaccinated against HBV [11]. The reason for not being vaccinated may be lack of knowledge about the vaccine. In Ethiopia there are only few studies conducted on knowledge and vaccination status of hepatitis B vaccine among HCWs, none of which are conducted specifically on Nurses who are at increased risk in comparison to other HCWs. Therefore, this study assessed predictors and vaccination status of Nurses against HBV at governmental hospital in Addis Ababa. The result of this would assist policy makers, the ministry of health, hospital and clinical facility managers, governmental and non-governmental organizations to be aware of the barriers and Nurses status of vaccination against the virus in governmental hospitals in Addis Ababa and help them to develop strategies for promoting vaccine utilization amongst Nurses. The outcome of this study could also be used as a base line evidence for further study.

## Materials and Methods

### Study area

This study was conducted in hospitals of Addis Ababa which is the capital city of Ethiopia. The city has 12 public hospitals. These are Black lion hospital, St. Paul's hospital, Yekatit 12 hospital, Gandhi memorial hospital, Rasdesta hospital, Zewditu hospital, Menilik hospital, St. Peter's hospital, Tirunesh-Beijing hospital, Alert center, Federal police hospital, and Army hospital.

### Study design and period

Facility-based cross-sectional study was conducted from March to April 2015.

### Study population

All registered professional Nurses working at selected governmental hospitals of Addis Ababa during the study period and willing to participate in the study. Those who were absent from the hospitals for different reasons during study period were excluded.

### Sample size determination and sampling technique

The sample size was calculated using single population proportion formula considering the following assumptions: Confidence level=95%, the corresponding normal probability distributions score for the given confidence level=1.96, Degree of precision=0.05, the population proportion is taken as 62% of those HCWs who were knowledgeable about the vaccine according to a study conducted in Bahirdar, Ethiopia [12]. Accordingly the sample size was 324. However, using infinite population correction formula the sample size was reduced to 267, since the target population is less than 10,000. Total number

of Nurses in the selected hospitals was found to be 1500. After considering 10% for non-response rate the final sample size was 294. Five government hospitals in Addis Ababa (Black lion, Zewditu, Gandhi, St. Paul, and Ras Desta) were selected by simple random sampling technique using lottery method. The sample size was proportionally allocated to determine the required number of Nurses from each hospital.

### Data collection methods

The data was collected using self-administered structured questionnaires developed by the researcher after reviewing similar literatures. The questionnaire consisted of questions related to socio-demographic characteristics, knowledge of respondents about the vaccine, history of needle and sharp injury, service year, training status, and vaccination status. The questionnaire was pretested for its accuracy and consistency prior to the actual data collection process. The pretest was done on 5% of the sample size on a government hospital of Addis Ababa other than the selected hospitals for the study one week before the actual data collection period. The data collection process was supervised by trained Nurses, who were selected from other hospitals not involved in the study.

### Operational definitions

**Poor knowledge about the vaccine:** Refers to those study participants who scored less than the mean score of knowledge questions about the vaccine.

**Fully vaccinated:** Refers to those study participants who received the recommended doses of the vaccine (three doses on specified time gap).

**Partially vaccinated:** Refers to those study participants who received less than the recommended doses of the vaccine (only one or two doses).

**Unvaccinated:** Refers to those study participants who received no vaccine.

### Data processing and analysis

The collected data was coded, cleaned, entered and analyzed by using statistical package for social science (SPSS) version 20 statistical software. The data was analysed in terms of descriptive and analytical statistics. Frequencies and Percentages were used to present descriptive findings. Binary logistic regression analysis was used to characterize the association between the variables.  $P$ -value  $\leq 0.05$  was used for statistical significance. The result of the study was presented in the form of texts, tables and figures.

## Results

### Socio-demographic characteristics of study participants

From the total of 294 Nurses, 272 were responded the questionnaire and included in the analysis, making a response rate of 92.5%. Socio-demographic characteristics of respondents were showed in (Table 1), with this regard sixty three percent (63.6%) were females by sex. More than half (66.2%) of the respondents were in the age group of 20-29 years and the mean ( $\pm$  SD) age of respondents was 30.3 ( $\pm$  8.2) years. Hundred sixty two (59.6%) of respondents were followers of orthodox Christianity followed by protestants (20.6%) and Muslims (19.1%). Most of respondents (58.5%) were single on marital status. The mean ( $\pm$  SD) service year of respondents was 6.9 ( $\pm$  7.5) years.

Socio-demographic characteristics	Frequency	Percentage (%)
<b>Sex</b>		
Male	99	36.4
Female	173	63.6
<b>Age group</b>		
20-29	180	66.2
30-39	59	21.7
40-49	11	4
≥ 50	22	8.1
<b>Marital status</b>		
Single	159	58.5
Married	108	39.7
Separated/divorced	5	1.8
<b>Religion</b>		
Orthodox	164	60.3
Protestant	56	20.6
Muslim	52	19.1
<b>Academic status</b>		
Degree (BSc)	199	73.2
Diploma	67	24.6
Master degree	6	2.2
<b>Service years</b>		
<10	216	79.4
Oct-19	33	12.1
≥ 20	23	8.5
<b>Monthly income in Birr</b>		
<2600	71	26.1
2600-3445	106	39
3446-4289	39	14.3
≥ 4290	56	20.6

**Table 1:** Socio-demographic characteristics of nurses at Addis Ababa Governmental Hospitals, June, 2015.

## History of occupational exposure to conditions that predispose to HBV infection and training on infection prevention

Regarding exposure to conditions that might lead to HBV infection 176 (64.7%) of participants said they had history of exposure to blood or body fluids on intact skin in the past 12 months. Eighty seven (32%) said they had history of splash of blood or body fluids to eye or mouth in the past 12 months, and 105 (38.6%) of the respondents said they had history of blood on cut or unprotected skin. Concerning exposure to needles and sharp injury 115 (42.3%) had exposed to such a type of injury from the total 272. One hundred seventy one (62.9%) of respondents said they had taken training on infection prevention. Out of those who took training the majority (61.4%) had taken the training only once but the rest had trained more than once.

## Knowledge about hepatitis B vaccine

Regarding the level of knowledge of respondents about HB vaccine, respondents were asked 15 item questions to assess their knowledge about HBV vaccine. The mean knowledge score for HBV vaccine was 8.38 with standard deviation of 2.5. Overall assessment of knowledge of respondents about HB vaccine indicated 131 (48.2%) had good knowledge about the HBV vaccine and the rest 141 (51.8%) had unfavorable knowledge.

## Vaccination status

Regarding the vaccination status of respondents only 67(24.6%) was

Variable	Vaccination Status		Odds Ratio(95% CI)	
	Vaccinated	Unvaccinated	Crude	Adjusted
<b>Sex</b>				
Male	23	76	0.89(0.49-1.58)	
Female	44	129	1	
<b>Age Group</b>				
20-29	44	136	1.45(0.46-4.53)	
30-39	17	42	1.82(0.53-6.17)	
40-49	2	9	1.00(0.15-6.53)	
≥ 50	4	18	1	
<b>Marital Status</b>				
Married	27	81	1	
Single	38	121	0.94(0.53-1.66)	
Others	2	3	2(0.31-12.61)	
<b>Academic status</b>				
Diploma	13	54	0.67(0.34-1.33)	
Degree & Msc	54	151	1	
<b>Monthly income in \$USD (p-value=0.032)*</b>				
<111	18	53	0.66(0.30-1.42)	1.34(0.32-5.57)
111-147	24	82	0.57(0.27-1.16)	1.29(0.43-3.83)
148-183	6	33	0.35(0.12-0.99)	0.19(0.05-0.75)
≥ 184	19	37	1	
<b>Service year</b>				
<10	52	164	2.11(0.60-7.40)	
Oct-19	12	21	3.81(0.93-15.53)	
≥ 20	3	20	1	
<b>History of needles and sharp injuries*</b>				
Yes	52	63	7.81(4.09-14.92)	7.78(3.73-16.24)
No	15	142	1	
<b>Taken training on infection prevention</b>				
Yes	45	126	1.28(0.71-2.29)	
No	22	79	1	
<b>Knowledge about HB vaccination*</b>				
Good	52	79	5.53(2.92-10.48)	6.30(2.96-13.37)
Poor	15	126	1	

**Table 2:** Predictors of vaccination status among nurses working at Addis Ababa Governmental Hospitals, Addis Ababa. June, 2015.

vaccinated at least once in their life time. Out of those respondents who were vaccinated, only 35.8% were fully vaccinated The reasons for not being vaccinated among those who were not vaccinated included not able to afford cost of the vaccine (35.1%), unavailability of the vaccine at governmental hospitals (29.8%), not feeling the vaccine protective (17.1%), not knowing presence of vaccine for HBV infection (15.1%), and other reasons (2.9%) like being new employ, negligence and fear of side effects of the vaccine. Among those study participants who were vaccinated, the majority (40.3%) received three doses followed by two doses (37.3%) and one dose (22.4%).

## Predictors of vaccination status

Monthly income, history of exposure to needle and sharp injury, and level of knowledge towards hepatitis B vaccination were remained significant predictors of vaccination status in multivariable logistic regression analysis adjusted to sex, age group, marital status, academic status, service year, and training status (Table 2). With regard to monthly income those who earn 148-183 \$USD were less likely to be vaccinated against HBV (adjusted Odds Ratio (AOR)=0.19, 95% CI=0.05- 0.75). Nurse with history of needle and sharp injuries were 7.78 times more likely to be vaccinated against HBV when compared to those without history of needle and sharp injury (AOR=7.78, 95%

CI=3.73-16.24). Knowledgeable Nurses about HBV vaccination were 6.3 times vaccinated against HBV when compared to those with poor level of knowledge (AOR=6.30, 95%CI=2.96-13.37).

## Discussion

Our findings suggested that only 67(24.6%) of the study participants were vaccinated against HBV. Out of the vaccinated 67 respondents only 24 (8.82%) were fully vaccinated but the rest 43(15.51%) were partially vaccinated. This finding is a bit higher when compared to a study conducted in Bahir Dar, Ethiopia, where only 37(10%) were vaccinated and out of which only 20(5.4%) were fully vaccinated [12]. The result is very low as compare to different previous studies [10,12-16], which implied as Nurses working in Ethiopian public hospitals are high risk for Hepatitis B virus infection. The reasons for this difference might be the differences in the health care system of the countries, differences in the cost of the vaccines, and most importantly differences in the composition of professions of participants; most of the studies mentioned were conducted among health care workers in contrast to this study which picked only Nurses as study participants.

Regarding the reasons not to be vaccinated against HBV out of those 205 (75.4%) unvaccinated respondents 72(35.1%) mentioned unaffordable cost of the vaccine, 61(29.8%) mentioned unavailability of the vaccine through government channels, 35(17.1%) mentioned not feeling the vaccine as protective, 31 (15.1%) mentioned not knowing the presence of vaccine, and the remaining 2.9% mentioned being new employ, negligence and fear of side effect as reasons for not being vaccinated. The reasons mentioned were more or less similar to the reasons mentioned on studies conducted in North India, Pakistan, and Nigeria; in which negligence, lack of knowledge about the vaccine, work pressure, unaffordable cost, unavailability of the vaccine, and fear of side effect were the frequently mentioned side effect [17-19]. The main reason for not being vaccinated in the Bahirdar study was also unavailability of the vaccine through government channels which is also one reason for not being vaccinated in our study [12].

The result of this study revealed among those 67 vaccinated participants 27(9.93%) received three doses but the rest received either two doses 25(9.20%) or one dose 15(5.51%). But a study conducted in North India indicated among vaccinated health personnel 40% received the full three doses and 20% received either two doses or one dose [17]. A study conducted among dental surgeons in Nigeria also indicated out of those vaccinated study participants 20% had received the full three doses and 48.6% received either two doses or single dose of the vaccine [19]. With this regard as well the number of participants who took the full protective dose of the vaccine is low in this study. The reasons mentioned above like differences in the composition of health professionals involved in the studies, living standards and style of living and even differences in the sample size may be attributable to these differences.

In our study the frequently mentioned reasons for not taking the full dose of vaccine were: unaffordable cost of vaccine (42.5%), not knowing the presence of additional dose (17.5%), not feeling intake of additional dose important (17.5%), unavailability of the vaccine at governmental health facilities (15.0%), and other reasons (7.5%) like fear of side effects, and waiting for the next dose. Even though there magnitude is different the reasons mentioned in this study are similar to the findings of the studies conducted in India (where 45% cited lack of knowledge about the total no of doses to be taken for full protection) [17] and Pakistan (where the participants mentioned work pressure (39.8%), negligence (38.8%), un-affordability (20.9%) and

unavailability of the vaccine (0.5%) as reasons for not taking the full three protective doses) [18].

The finding of this study indicated that vaccination status of respondents was significantly associated with monthly income, history of needle and sharp injuries, and knowledge of nurse about HBV vaccine. Significantly higher vaccination status was found in those Nurses, who can earn a monthly income of greater than 184\$USD. This finding is supported by one of the frequently mentioned reasons for not taking vaccination - unaffordable cost, which mentioned by 35.1% of the respondents. The presence of significant association between monthly income and vaccination status is also reported by a study conducted in Amhara region, Ethiopia [20].

This study also revealed those study participants who has had history of needles and sharp injury were 7.78 times more likely to be vaccinated than those who do not had the injury. The reason for this might be those individuals who have had needle and sharp injuries were more likely to search for methods of prevention of diseases that are acquired through needles and sharp injury. These shows Nurses seek medical care for HBV only when their perceived exposure level is high. The finding is also reported by a study conducted in Serbia, in which higher rates of hepatitis B vaccination were observed in HCW who had at least one episode of sharps injury [21].

Knowledge of Nurses about HBV vaccine was also important predictors of their vaccination status. Accordingly, those study participants who have had good knowledge about the vaccine were 6.30 times more likely to be vaccinated than those who had poor knowledge. The reason for this might be those study participants who were well informed about the vaccine were more likely to utilize it, which implies the need for refreshment training for Nurses. This finding suggests that education aimed at improving HCWs' HBV-related knowledge is likely to be a crucial component in increasing hepatitis B vaccination acceptance. This finding replicates the findings of several studies conducted in Amhara Region Ethiopia, Saudi Arabia, and North India [20,22,23].

The present study had some limitations. The results of the present study may not be generalizable to nursing staff present in other hospitals in other parts of the country. The cross-sectional design of the study limits the results to be used for establishing a cause-effect relationship.

## Conclusion

This study found the vaccination status of respondents to be very low. It is very low even in comparison to fellow African countries. Among those study participants who were considered vaccinated more than half had not receive the full protective dose. The finding of this study indicated that vaccination status of Nurses was significantly associated with their monthly income, history of needle and sharp injuries, and knowledge towards HBV vaccine.

## Recommendations

Based on the finding from this study, the following recommendations are made. The National Ministry of Health should work towards mainstreaming Hepatitis B vaccinations with the routine EPI program for health care workers, especially for Nurses. Employing Hospitals should take the responsibility of increasing their Nurses knowledge towards Hepatitis B vaccination. Especial effort is also required to make available the vaccine free of charge in every public hospital.



## Declarations

Ethics approval and consent to participate: Before the start of the data collection process, letter of ethical clearance was secured from Institutional Review Board (IRB) of the College of Health Science, Addis Ababa University. Confidentiality of the information provided by the study participants was maintained throughout the study period. The objective of the study was clearly explained for participants prior to data collection, and written consent was obtained from each participant after voluntary participation feature of the study and the right of participants to withdraw at any time was explained.

## Availability of data and material

All data generated or analyzed during this study are included in this published article

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