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Research Article

HEPATITIS B VIRUS VACCINATION STATUS AND ASSOCIATED FACTORS AMONG HEALTH CARE WORKERS IN HEALTH INSTITUTIONS OF EAST WOLLEGA ZONE, WEST ETHIOPIA

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Abstract:

Background: Hepatitis B virus [HBV] infection is a serious and common infectious disease of the liver, affecting millions of people throughout the world. World Health Organization [WHO] has recommended vaccination for all health care workers [HCWs]. In addition to this center for disease control and prevention and WHO guidelines recommend that all healthcare providers and trainees should be knowledgeable about Hepatitis B infection; however, previous studies reported that knowledge of hepatitis B was unsatisfactory and vaccination coverage was low among HCWS.

Objective: To assess the knowledge about HBV infection and vaccination status of health care workers in Health Institutions of East Wollega Zone, West Ethiopia.

Methods and materials: Institution based cross-sectional study was conducted on randomly selected 513 HCWs. Multi stage sampling technique was used. Self-administered questionnaire was used to collect the data. Then the data was entered into Epi-data 4.2 version and exported to Statistical Package for Social Science [SPSS] version 20 for analysis. All covariates that are significant at p value < 0.05 in bivariate analysis were considered for further multivariate logistic regression analysis to detect true predictors of vaccination status.

Result: The questionnaire was distributed to 513 HCWs and only 500[97.5%] of them returned it. Out of the total respondents 316[63.2%] were knowledgeable and 184[36.8%] were not knowledgeable. The finding of this study also revealed 299[59.8%] of the HCWs were vaccinated and 201[40.2%] of them were unvaccinated. However, only 34.2% of HCWs were fully vaccinated. Work experience, type of health institution and training on infection prevention were the factors associated with Knowledge level. On the other hand educational level, working unit, history of occupational exposure, type of health institution and vaccine unavailability were the factors associated with vaccination status of HCWs [p value < 0.05].

Conclusion and Recommendation: The finding of the present study generally shows insufficient knowledge about HBV and low rate of HBV vaccine coverage among health care workers. This shows that there is still a need to improve the knowledge and vaccination coverage of health care workers. Therefore, it is recommended that a deliberate programme of training on Hepatitis B infection and vaccine provision should be implemented for all health care workers.

Keywords: Health care workers, knowledge level, fully vaccinated, unvaccinated, partially vaccinated

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INTRODUCTION:

Hepatitis B virus [HBV] infection is a serious and common infectious disease of the liver, affecting millions of people throughout the world and it is transmitted by being exposed to infected blood and other body fluids such as semen and vaginal fluid [1]. The common modes of transmission of this virus include mother to infant, sexual contact, unsafe injection practices and transfusions of infected blood [2]. Health care workers [HCWs] are at a greater risk to acquire hepatitis B Virus with reasonably anticipated risk for exposure to blood or blood-contaminated body fluids [3]. A study conducted in Kenya on susceptibility of health care workers to hepatitis B shows the annual incidence of needle stick injury was 0.97 per health care worker [4].

Hepatitis B virus is a major global health problem causing approximately 686,000 deaths worldwide annually. Sub-Saharan Africa is considered as area of high endemicity with HBsAg sero-prevalence of 8% or higher [5]. According to meta-analysis findings done on prevalence of hepatitis viruses in Ethiopian population, the HBsAg prevalence among healthcare professionals in Ethiopia was 7.3–9.0% [6].

According to World Health Organization, the global burden of Hepatitis B infection due to occupational exposure accounted 2.5% [7]. Many studies revealed that needle stick injury prevalence is high in Ethiopia and this is one of the occupational risks that expose health care workers in Ethiopia to hepatitis B infection [8].

HBV can be effectively prevented by vaccination; because effective vaccine has been available since the 1980s and the complete vaccine series induces protective antibody levels in more than 95% of infants, children and adults. Hepatitis B vaccine has been included in the childhood immunization programme, alongside the targeted immunization programme for those individuals who are at increased risk of HBV because of their occupation, lifestyle or other factors.

World Health Organization [WHO] and Centers for Disease Control and Prevention [CDC], have recommended vaccination for all HCWs who are at occupational risks of acquiring hepatitis B virus infection [9].

Health care workers [HCWs] have a great tendency to be exposed to blood while on the job; therefore they should be offered a full 3 doses of hepatitis B vaccine. A deep intramuscular [IM] injection into the deltoid muscle is recommended for adult hepatitis B vaccination [10].

Center for disease control and prevention and WHO guidelines recommends that all healthcare providers and trainees should be knowledgeable about Hepatitis B infection. According to these guidelines they should receive comprehensive training concerning blood borne pathogens to adhere to the principles of Standard Precautions, including hand washing, the use of personal protective barriers, and proper disposal of sharp materials. Healthcare care workers should also follow the current guidelines for disinfection and sterilization medical instruments used in patient care [8, 10].

The Ethiopian Federal Ministry of Health [FMOH] infection-prevention guidelines also recommend that all health care workers should get vaccinated against hepatitis B virus prior to clinical attachments at their school. However the WHO estimate showed that HBV vaccination coverage among HCWs is only 18–39% in developing countries compared to 67–79% in developed countries [11]. Therefore this study assessed HBV infection knowledge, vaccination status and their associated factors among health care workers in East Wollega zone health institutions.

Though there is a vaccine against Hepatitis B virus available since 1982, the global prevalence of HBV infection in the general population in 2015 was 3.5% [12]. Prevalence was the highest in the African [6.1%] and Western Pacific regions [6.2%] and this puts health care professionals at a risk of acquiring hepatitis

B infection; because they serve the whole population [12]. A study conducted in the United States shows that the prevalence of HBV infection in HCWs was 10 times higher than the general population [13].

The World Health Organization [WHO] also estimated that 6200 HBV infections occur each year among sub-Saharan African HCWs [11]. The prevalence of HBV among HCWs of Ethiopia is also high according to meta-analysis findings done on prevalence of hepatitis viruses, which revealed the HBsAg prevalence among healthcare professionals in Ethiopia 7.3–9.0% [4]. Due to this hepatitis B infection is an important public health problem in Ethiopia, with healthcare workers at increased risk of acquiring hepatitis B infection because of job related exposure. These workers are often in direct contact with infectious material, especially HBV-infected blood or, via a needle stick injury, with HBV-contaminated body fluids [12,13].

According to center for disease control and prevention and WHO guidelines all healthcare providers and trainees should be knowledgeable about Hepatitis B infection and also recommends vaccine for all health care workers [8, 10]. However few studies conducted in Ethiopia revealed significant number of health care workers were not knowledgeable about hepatitis B infection and low coverage of hepatitis B virus vaccine. Several studies conducted in different areas of the world shows, factors affecting the knowledge and vaccination status of health care workers were age, sex, work experience, type of health institutions, training on standard precaution, and profession of the health care workers. Some factors related to knowledge [type of health institution and training on standard precaution] and vaccination status of health care workers [history of occupational exposure and working unit] were not included in the previous studies in Ethiopia. In addition to this no studies conducted among HCWs in private and governmental health institutions at a zonal level in Ethiopia. Therefore this study assessed the knowledge about HBV infection, vaccination status against hepatitis B infection and their associated factors among HCWs working in health institutions of Eastern Wollega zone, west Ethiopia.

METHODS AND MATERIALS:

Study area and period

The study was conducted in East Wollega Zone Health institutions from March to April 2018.

Study design

Institution based cross sectional study was conducted from March to April, 2018

Population

Source population

All health care workers who were working in East Wollega zone health institutions.

Study population

All HCWs having direct contact with patients, in randomly selected health institutions in East Wollega zone.

Sample population

All randomly selected health care workers in randomly selected health institutions of East Wollega zone.

Eligibility Criteria

Inclusion Criteria

Health care workers who have direct contact with patients [i.e. physicians, nurses, clinical laboratory technologists, Anesthetists and midwives] and permanent employees of the health institutions.

Exclusion Criteria

Health care workers who are not available at the time of data collection due to different reasons [annual leave, sick leave, maternity leave...]

Sample size determination

The sample was determined using the formula for single population proportion by considering 62 percent proportion of knowledge level of hepatitis B vaccine among health care workers of Bahir Dar City Administration[17] since it increases the sample size, 95% level of confidence, 5% margin of error and 10% non-response rate.

$$n = \frac{[Z\alpha/2]^2 P [1-p]}{d^2}$$

Where:

- ✓ n = Sample size
- ✓ P = Proportion of knowledge 62%
- ✓ d= margin of error
- ✓ Z [$\alpha/2$]² = confidence interval and significance level

$$n = \frac{[1.96]^2 0.62[1 - 0.62]}{[0.05]^2}$$

$$= 363$$

Since the population is less than 10,000 correction formula should be used

$$nf = \frac{n}{1+n/N} + \text{non-response rate}[10\%], \text{ where } N=2212$$

$$= \frac{363}{1+363/2212} + \text{Non-response rate } [10\%], \text{ where,}$$

$$N=2212$$

$$= 312 + 32$$

$$= 342$$

Considering the design effect = 1.5, the final sample size is:

$$= 342 \times 1.5$$

$$= 513$$

Sampling technique:

A multi stage sampling technique was used. The health facilities were stratified to hospitals, health centers and private clinics. After stratification of the health facilities a two stage sampling technique was used. The first stage involves the selection of the Health Facilities from each strata using Simple Random Sampling [SRS] technique. The second stage involves the selection of eligible health care workers in each strata using simple random sampling technique by applying probability proportional to size [PPS] allocation to each health facility [fig. 2]. There are 5 hospitals [2 referral and 3 general], 60 health centers and 65 private clinics in East Wollega zone. From these health facilities two hospitals [one general and one referral hospital], 8 health centers and 10 private clinics [medium and higher clinics] were randomly selected [table 1]. In these selected health facilities there are a total of 606 health care workers [general hospital=148, referral hospital=222, health center=140, private clinics=96]. After the selection of these health facilities only eligible health care workers were randomly selected from each health facilities by using the principle of proportional allocation. Finally a total of 513 [general hospital=125, referral hospital=188, health center=119, private clinics=81] health care workers were selected.

Operational definitions:

Health-care workers [HCWs]:- individuals who are directly involved in patient care including doctors, midwives, nurses, health officers, anesthetists and laboratory technicians [technologists].

Knowledge level: - the knowledge level of health care workers was divided into two depending on the mean score of the knowledge questions as knowledgeable and not knowledgeable.

Knowledgeable about hepatitis B infection: -those study participants who scored greater than or equal to the mean score of knowledge questions about HBV.

Not knowledgeable about hepatitis B infection: - those study participants who scored less than the mean score of knowledge questions about HBV.

Vaccination status: - depending on the number of doses they received it is categorized into fully vaccinated, vaccinated, partially vaccinated and unvaccinated.

Fully vaccinated: - Those health care workers who received a full course [3 doses] of hepatitis B vaccine

Partially vaccinated: - Those health care workers who received only 1 or 2 doses of hepatitis B vaccine.

Unvaccinated: - Those health care workers who didn't received any doses of hepatitis B vaccine

Vaccinated: - Those health care workers who received any doses of hepatitis B vaccine.

Variables**Independent variables**

- ✓ Age
- ✓ Sex
- ✓ Marital status
- ✓ Religion
- ✓ Educational status
- ✓ Income
- ✓ Current working unit
- ✓ Profession of the participants
- ✓ Work experience
- ✓ Accessibility of HB vaccine
- ✓ Training on standard precaution
- ✓ History of occupational exposure
- ✓ Knowledge HBV

Dependent variables

- ✓ Knowledge of HBV infection
- ✓ Vaccination status

Data Collection Methods**Data Collection Instruments**

The data collection instrument was a structured pretested self-administered questionnaire. The questions were adapted from other prior similar study conducted in Ethiopia[21] and it was prepared in English language. It contains three parts: socio-demographic characteristics, knowledge of Hepatitis B infection and factors related to knowledge of hepatitis B infection and vaccination status. The questionnaire comprised a total of 42 questions. The first part is questions regarding socio-demographic characteristics of the participants, the second part is about knowledge of Hepatitis B infection which contains three sub-categories [ten questions is knowledge about transmission, seven questions about natural history and diagnosis and 4 questions about prevention of HBV] and the part is 11 questions about factors related to knowledge of hepatitis B infection and vaccination status.

Data Collectors and Data Collection Procedure:

The data was collected by a total of ten data collectors who have a minimum of diploma in nursing. Two supervisors with BSc in Public Health or nursing were selected from the health facilities. Data collectors and supervisors were trained for 1 day by principal investigator with the objectives of standardizing the data collection instrument. The responsibility of the supervisors was to check whether the questionnaires are correctly filled out during data collection period. Supervisors collected the translated and completed questionnaire and through research assistants handover it to the principal investigator on the day data collection are conducted. Each questionnaire filled was checked for completeness of the information's by

the principal investigator and was analyzed subsequently.

Data Quality Control:

Data collectors and supervisors were provided with intensive training on the objective of the study, contents of the questionnaires and how to maintain confidentiality and privacy of the study subject. Pre-test was conducted on 26 health care workers in Wollega University referral Hospital before the actual data collection begins and necessary correction was made on the questionnaires. The collection of data was checked by principal investigator on daily basis for any incompleteness and /or inconsistency. Each questionnaire is identified by the ID given for it.

Data Processing and Analysis:

All the data was checked for completeness and internal consistency by cross checking and then coded and double entered into Epi Data version 4.2 computer software packages and cleaned for inconsistency. For further analysis the data was exported to Statistical Package for Social Science [SPSS] version 21 software. The descriptive analysis of data was indicated using numerical summary measures and the data was presented using frequency tables, figures and graphs. Bivariate and Multivariate logistic regression was used to show association between dependent and independent variables. All covariates that was significant at p value < 0.05 in bivariate analysis was considered for further multivariate analysis guided by conceptual framework to control all possible confounders and to detect true predictors of vaccination status. Finally, those variables that showed p<0.05 in multivariate analysis will be taken as important predictors of the vaccination status of health care workers. To measure the strength of

association between dependent and independent variables, Crude Odd Ratio [COR] and Adjusted Odd Ratio [AOR] with 95% Confidence interval [CI] was calculated.

Finally, the variable which shows statistical significance [p-value < 0.05 cut point] in multivariate analysis was considered as important variables. Bar graph and pie chart was used for diagrammatic summarization of categorical variables and tables were used for summarization of variables.

RESULTS:

Socio-demographic characteristics:

The questionnaire was distributed to all 513 HCWs, but 13 of them not returned the questionnaire making the response rate of 97.5%. From these participants 305[57.8%] were Males and the remaining were females. Majority of the health care workers were in the age group of 18-29 and the mean age of the health care workers was 31 years with a standard deviation of 6.7 and range of 35. More than half of the health care professionals 296[59.2%] were married and more than two-third 329[65.8%] of the health care professionals were protestant religion followers. Most of them 354[70.8%] were first degree holders and majority 169 [33.8%] and 139[27.8%] of the HCPs had monthly income of 3000-5000 and 5000-7000 respectively. Most 230[46%] of the health care professionals were nurses [fig. 3] and majority 304[60.8%] of the HCWs were working in Hospitals. The average year of experience was 7.2 with SD of 6.2 and range of 35. Three-fourth 375[75%] of the HCWs had less than 10 years of work experience and 183[36.6%] of the HCWs were working in outpatient department [table 2].

Table 1 Socio-demographic characteristics of health care workers in health institutions of East Wollega Zone, 2018[n=500]

Socio-demographic characteristics	Frequency	Percentage [%]
Sex	Male	305
	Female	195
	Total	500
Age	18-29 years	289
	30-39 years	162
	>40 years	49
	Total	500
Marital status	single	200
	married	296
	divorced	0
	Widowed	4
	total	500
Religion	Orthodox	133

	Muslim	24	4.8
	Protestant	329	65.8
	Catholic	4	0.8
	Others	10	2
	Total	500	100
Educational status	Diploma	112	22.4
	Degree	354	70.8
	Master degree	22	4.4
	Specialist	12	2.4
	Total	500	100
Monthly Income	<3000	66	13.2
	3000 – 5000	169	33.8
	5000 – 7000	139	27.8
	>7000	126	25.2
	Total	500	100
Work experience	0-4 years	179	35.8
	5-9 years	196	39.2
	≥10 years	125	25
	Total	500	100
Type of health institution	Hospital	304	60.8
	Health center	118	23.6
	Private	78	15.6
	Total	500	100
current working unit	Inpatient	99	19.8
	Outpatient	183	36.6
	Laboratory	87	17.4
	Delivery	51	10.2
	Injection room	34	6.8
	Others	46	9.2
	Total	500	100

Knowledge of health care workers about hepatitis B infection:

Knowledge about transmission of HBV:

Out of the total respondents about half 257[51.4%] of them said HBV can't be transmitted by touching a person with HBV, Similarly majority 478[95.6%] said sharing injecting needles with infected individuals can transmit HBV [table 3].

Knowledge about Natural history and Diagnosis:

A total of 500 HCWs responded to the questions. Out of these respondents majority 398[79.6%] of them said

HBV can cause liver cancer. More than half of the respondents answered correctly all the questions related to the natural history and diagnosis of Hepatitis B virus infection [table 3].

Knowledge about prevention of HBV:

Out of the respondents majority 470[94%] of them know that there is an effective vaccine that can prevent hepatitis B virus infection [table 5]. Two hundred twenty two [44.4%] of the respondents said hand washing couldn't reduce the transmission of HBV infection [table 3]

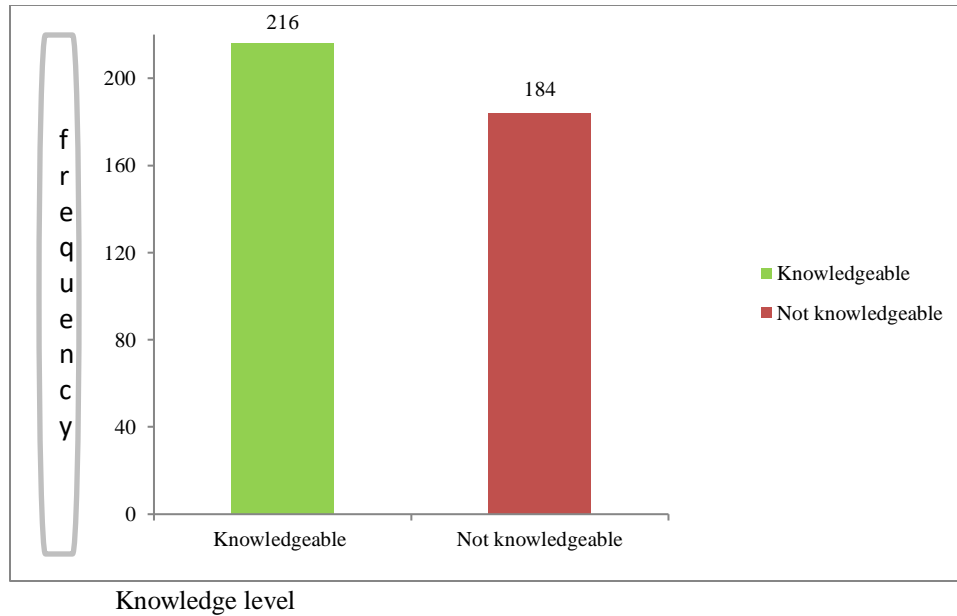
Table 2 Knowledge of health care workers in health institutions of East Wollega Zone march, 2018 [n=500]

Variables	Correct answer N [%]	Incorrect answer N [%]
Hepatitis B virus can be transmitted		
By touching a person with hepatitis B	257[51.4]	243[48.6]
By kissing a person with hepatitis B	394[78.8]	106[21.2]
By eating food prepared by a person with hepatitis B	403[80.6]	97[19.4]
By sharing eating utensils	391[78.2]	109[21.8]
Through air when coughing or sneezing	191[26.2]	369[73.8]
By sharing foods	421[84.2]	79[15.8]
By sharing toothbrushes	443[88.6]	57[11.4]
By sharing injecting needles	478[95.6]	22[4.4]
By having unprotected sex with a person with hepatitis B	465[93]	35[7]
From mother to child at birth	450[90]	50[10]
Natural history and diagnosis		
Hepatitis B can cause liver cancer	398[79.6]	102[20.4]
Hepatitis B can cause death	455[91]	45[9]
Most people infected with Hepatitis B have no symptoms	403[80.6]	97[19.4]
People with hepatitis B can be infected for life	418[83.6]	82[16.4]
There is an effective medicine to cure hepatitis B disease	376[75.2]	124[24.8]
There is an effective treatment for hepatitis B disease	340[68]	160[32]
People with Hepatitis B do not need regular check up	443[88.6]	57[11.4]
Regarding prevention		
There is a vaccination to prevent hepatitis B virus	470[94]	30[6]
Hand washing can reduce transmission of hepatitis B virus	278[55.6]	222[44.4]
People with hepatitis B should use condom when having sex	458[91.6]	42[8.4]
People hepatitis B should tell their family members to get tested	466[93.2]	34[6.8]

Knowledge level of health care workers about hepatitis B virus infection:

A total of 500 HCWs responded to the questions. There were 21 items concerning knowledge of hepatitis B virus infection. The correct answer to each item was scored as 1 and the incorrect answer were scored as 0. The range of score by the respondents was 6-20 and the mean was 15.9[75.7%] with a standard

deviation of 2.3. The health care workers those scored above the mean [above 75.7% of the knowledge questions] were considered as knowledgeable and those scored below the mean [15.9] were considered as not knowledgeable. Out of the total respondents 316[63.2%] were knowledgeable and 184[36.8%] were not knowledgeable [as shown in Fig. 3]



History of occupational exposure to conditions that predispose HCWs to HBV infection:

More than half 271[54.2%] of the health care workers responded to the questions had history of exposure to

blood or body fluids on their intact skin and a significant number 94[18.8%] of health care professionals had history of exposure to blood or body fluids on unprotected skin [table 4].

Table 3 History of occupational exposure to conditions that predispose health care workers of East Wollega zone health institutions to HBV infection march, 2018[n=500]

Questions	Responses	
	Yes N [%]	No N [%]
Have you ever had history of exposure to blood or body fluids on intact skin?	271[54.2]	229[45.8]
Have you ever had history of splash of blood or body fluids to eye or mouth in the past 12 months?	97[19.4]	403[80.6]
Have you ever had history of exposure to blood or body fluids on unprotected skin?	94[18.8]	406[81.2]
Have you ever had history of exposure to needle stick injury?	180[36]	320[64]

Training on infection prevention:

Out of the respondents only 193[28.6%] of them received training on infection prevention, among these

only 86[17.2%] received more than once and the majority [307[61.4%]] never received training on infection prevention [as shown in table 5].

Table 4 History of training on infection prevention of health care workers of East Wollega zone health institutions to HBV infection march, 2018[n=500]

Variables	Frequency [%]
Ever received training on infection prevention	107[21.4]
Never received training on infection prevention	307[61.4]
Received more than once on infection prevention	86[17.2]
Total	500[100]

Vaccination status of health care workers:

Out of 500 respondents 299[59.8%] of them were vaccinated and 201[40.2%] of them were unvaccinated. Only 34.2% of them were fully vaccinated and 25.6% were partially vaccinated [as shown in Fig. 4].

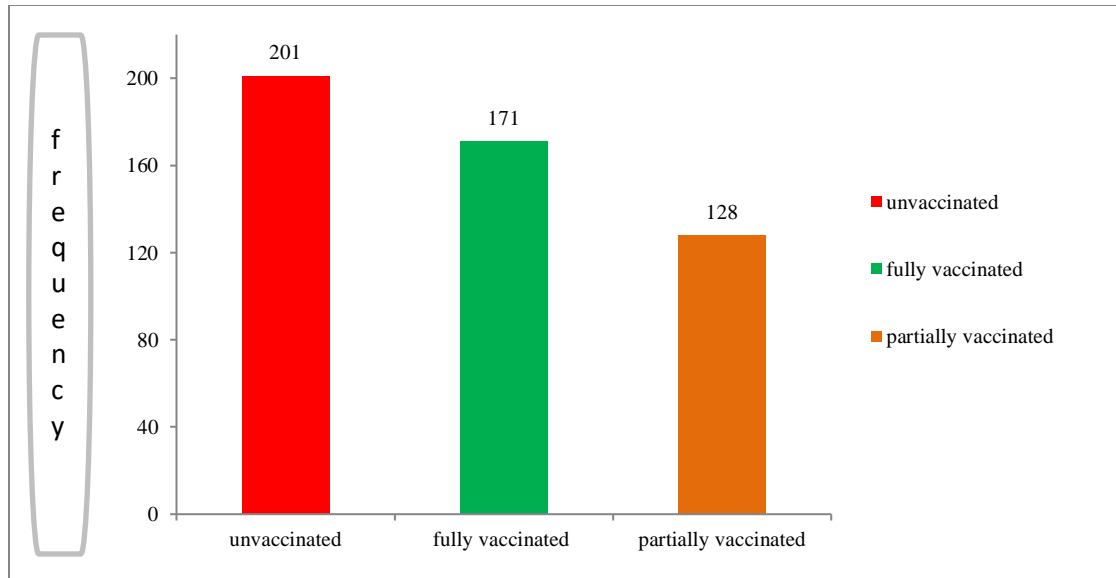


Figure 1 vaccination status of health care workers of East Wollega zone health institutions to HBV infection march, 2018[n=500]

Factors associated with Knowledge of health care workers:

In bivariate analysis the factors like age, work experience, educational level, profession, type of health institution and training on standard precaution were associated with knowledge of HCWs regarding Hepatitis B infection. To control for possible confounders further multivariate analysis was done and only three factors [work experience, training on standard precaution and type of health institution] were identified as having statistically significant association [p value < 0.05, 95% CI] with knowledge level of health care workers.

The finding of this study shows knowledge level of HCWs increases with a corresponding increase in their

year of experience. The work experience of ≥ 10 increases the odds of the knowledge about hepatitis B infection by 3.8 fold as compared to those who had <5 years of experience with AOR=3.8[CI=1.8-7.9]. The knowledge level of health care workers in governmental health institution was higher than those in private health institutions; being in governmental health institution increases the odds of the knowledge about hepatitis B infection by 2.1 fold with AOR=2.4[CI=1.4-4.0] and Training on standard precaution also increases the odds of knowledge level of health care workers by 2.1 fold with AOR=2.1[CI=1.4-3.2] [table 6].

Table 5 Factors affecting Knowledge of health care workers in health institutions of East Wollega Zone march, 2018 [n=500]

Covariates	Category	Knowledge level		COR[CI]	AOR[CI]
		Knowledgeable	Not knowledgeable		
Work experience	<5 years	95[53.1]	84[46.9]	1	1
	5-9 years	126[64.3]	70[35.7]	1.6[1.05-2.4]*	
	≥ 10 years	95[76]	30[24]	2.8[1.6-4.6]***	3.8[1.8-7.9]***
Type of health institution	Governmental	280[66.4]	142[33.6]	2.3[1.4-3.75]***	2.4[1.4-4.0]***
	Private	36[46.2]	42[53.8]	1	1
Training on standard precaution	Yes	144[74.6]	49[25.4]	2.3[1.55-3.42]***	2.1[1.4-3.2]**
	No	172[56]	135[44]	1	1

AOR= Adjusted Odd Ratio; CI= Confidence Interval, COR= Crude Odd Ratio; *= p-value <0.05, **= p-value <0.025, ***= p-value <0.001

Factors associated with vaccination status of Health care workers:

In bivariate analysis the covariates: Age, educational level, type of health institution, current working unit, vaccine availability, training on standard precaution and history of occupational exposure were associated with vaccination status of the HCWs. Multivariate logistic regression were done to control for confounders and finally only six variables were significantly associated with vaccination status of the health care workers. These variables were type of health institution, vaccine availability, working unit, standard precaution training, history of occupational exposure and educational level. Educational level is significantly associated with vaccination status of HCWs with [p value < 0.05, 95% CI]. Being a degree holder increases the odds vaccination of health care workers by 2.9 fold with [AOR =2.9[CI=1.5-5.4]] and

regarding working unit, being in an outpatient unit reduces the odds of vaccination by 66% with [AOR=0.44[0.22-0.86]].

HCWs working in health institution in which the vaccine was available were about 5 times more vaccinated than those working in health institution in which the vaccine was not available with AOR of 5.3[95% CI 3.2-8.7]. Being in governmental health institutions increases the odds of vaccination rates by 10.7 fold with an AOR of 10.7 [95% CI 5-23], training on standard precaution increases the odds of vaccination rate of health care workers by 2.1 fold with an AOR of 2.1[95% CI 1.2-3.6] and history of occupational exposure to Blood or other body fluids increases the odds of vaccination rates of HCWs by 2.1 fold with 2.1[95% CI 1.2-3.6] [table 7].

Table 6 Factors associated with vaccination status of health care workers of East Wollega zone health institutions march, 2018[n=500]

Covariates	Category	Vaccinated		COR[CI]	AOR[CI]
		Yes	No		
Educational level	Diploma	36[32.1]	76[67.9]	1	1
	Degree	245[69.2]	109[30.8]	4.7[3-7.4]***	2.9[1.5-5.4]**
	Master degree	12[54.5]	10[45.5]	2.5[1.01-6.4]*	
	Specialist	6[50]	6[50]	2.1[0.64-7]	
Type of health institution	Hospital	289[68.5]	133[31.5]	14.7[7.3-29]***	10.7[5-23]***
	Private	10[12.8]	68[87.2]	1	1
Current working unit	Outpatient	97[53]	86[57]	1.01[0.64-1.58]	0.44[0.22-0.86]*
	Inpatient	74[74.7]	25[25.3]	2.6[1.5-4.6]**	
	Lab	59[67.8]	28[32.2]	1.8[1.07-3.3]*	
	Others	69[52.7]	62[47.3]	1	
Infection prevention training	Yes	143[74.1]	50[25.9]	2.76[1.87-4.10]***	2.1[1.2-3.6]**
	No	156[50.8]	151[49.2]	1	1
Vaccine available	Yes	201[85.2]	35[14.8]	9.73[6.28-15.06]***	5.3[3.2-8.7]***
	No	98[37.1]	166[62.9]	1	1
History of occupational exposure	Yes	183[67.5]	88[32.5]	2.02[1.4-2.9]***	2.1[1.2-3.6]***
	No	116[50.7]	113[49.3]	1	1

AOR= Adjusted Odd Ratio; CI= Confidence Interval, COR= Crude Odd Ratio; *= p-value <0.05, **= p-value <0.025, ***= p-value <0.001

DISCUSSION:

Despite there is an expectation that all HCWs should be knowledgeable about Hepatitis B virus infection about 184[36.8%] of the health care workers in the recent study were not knowledgeable about HBV infection and the remaining 316 [63.2%] were knowledgeable. It is higher than a study conducted in Brazil on assessment of hepatitis B knowledge of health care workers which revealed about half 133 [49.6%] of HCWs had low knowledge level of

Hepatitis B virus infection [14] and very low when compared to study conducted in Nigerian tertiary hospitals among HCWs that revealed 96% of the respondents were knowledgeable about HBV infection. However, it is in line with a study conducted in HCWs of Bahr Dar city administration in which 62% of them were knowledgeable about Hepatitis B virus infection [15]. These discrepancies in the level of knowledge of health care workers might be due to the difference in the provision of trainings on infection

prevention among these countries. In this study three factors [work experience, type of health institution and training on standard precaution] were significantly associated with the knowledge level of HCWS about HBV infection with a [p value < 0.05, 95% CI].

The knowledge of Health care workers increases with a corresponding increase in their year of work experience. In the present study those health care workers ≥ 10 years of work experience were about 4 times more likely to be knowledgeable about HBV infection than those HCWs who had work experience of < 5 years with AOR=3.8[CI=1.8-7.9]. In the same way in a study conducted in Healthcare Workers in North Central Nigeria the knowledge of health care workers about HBV infection found to increase with increasing year of experience[16]. This implies that stayed in the health institutions had a more chance of getting training on infection prevention [standard precautions].

Regarding the type of health institution where the HCWs were working, being in governmental health facilities increases the knowledge of health care workers by 2.1 fold as compared to those working in private health institutions with an AOR=2.4[CI=1.4-4.0]. This discrepancy might be due to the initiation of implementation of Hepatitis B vaccination program in only governmental health institutions and another reason may be HCWs in private health institutions had a little chance of getting trainings.

Another factor found to be associated with the knowledge of HCWs in this study was training on standard precaution. Training on standard precaution increases the odds of knowledge of health care workers by 2.1 fold with an AOR=2.1[CI=1.4-3.2]. In contrast to this in a study conducted among HCWs in University of Gondar Training on infection prevention/standard precaution was not associated with knowledge of HBV infection[17]. The difference may be because of the fact that the present study included HCWs in private health institutions and the previous study didn't include health care workers in private health institutions.

Health Care Workers have a greater risk of acquiring Hepatitis B infection, because they are prone to occupational exposure. Therefore A priority should be given to health care workers to protect them from this disease since there is an effective vaccine with 95% sero-conversion rates.

The present study revealed that 299[59.8%] of HCWs were vaccinated with one or more doses of HBV

vaccine, however only 171[34.2%] of the HCWs were fully vaccinated from a total of 500 respondents. The World Health Organization has estimated that the average HBV vaccination rate among HCWs ranges from 18 to 39% in developing countries to 67–79% in developed countries [10]. Therefore, the percentage of fully vaccinated HCWs in Health institutions of East Wollega Zone [34.2%] was within the range of WHO's estimation of vaccination rates of HCWs in developing countries which indicates very low coverage.

Comparison of result of the recent study with a cross sectional study conducted to assess Hepatitis B vaccine Coverage among health care workers of a tertiary care center in North India showed comparable results in which only 38.8% of the health care workers were fully vaccinated[18]. However, it is very low when compared to studies conducted among HCWs in a tertiary care hospital in Pakistan and a study in India which revealed fully vaccinated rates as 606 [73.2%] and 224[50.2%] respectively[18,19]. The reasons for the lower rate of vaccination among HCWs in the recent study compared with other studies might be the difference in availability of the vaccine and the difference in the focus given to the prevention of HBV infection by the government in these countries.

Another cross sectional studies conducted among HCWs of Bahr Dar City Administration, North West Ethiopia, HCWs of Shashemene Zonal town, and Health Care Workers in a Tertiary Hospital in Ethiopia have reported full vaccination rates of 5.4%, 12.9%, and 28.7% respectively [20, 21 and 22]. The vaccine coverage in the recent study was found to be higher when compared to these studies. This might be due to the time the studies were conducted, because currently the vaccine is available free in some of the governmental health institutions.

In the present study educational level, working unit, unavailability of vaccine, history of occupational exposure, training on standard precaution and type of health institution were significantly associated with vaccination status of health care workers with [p value < 0.05, 95% CI].

Regarding educational level HCWs who were degree holders were more vaccinated than diploma holders with AOR=3.2[95%CI 1.6-5.3]. It supports a study conducted in Nigeria which revealed HCWs with higher educational level had higher vaccination coverage[15]. Similarly, a study conducted in HCWs of tertiary hospitals in Ethiopia revealed that HCWs

who are degree holders had higher vaccination coverage[21];

HCWs from governmental health institutions had higher vaccination coverage rates than those from private health institutions with AOR of 10.7 [95% CI 5-23]. This finding is similar with a study done in Ethiopia among HCWs of Shashemene zonal town health care workers from governmental were more likely vaccinated than those from private health institutions[24]. However it is much higher in the present study; the reason may be currently the vaccine is available free in many of governmental health institutions and unavailable in any of the private health institutions; but previously the vaccine had been given in few hospitals as campaign.

According to the finding from the present study unavailability of vaccine in health institutions reduces the odds of vaccination in HCWs by 83%. Similarly a study conducted in health care professionals working in Hospitals of Amhara Regionals state reported unavailability of vaccine reduces the odds of vaccination by 75% [22].

On the other hand Training on standard precaution increases the odds of vaccination of HCWs by 2.1 fold with AOR of 2.1[95% CI 1.2-3.6]; similarly, a study conducted in health care professionals working in Hospitals of Amhara Regionals state revealed that training on standard precaution increases the odds of vaccination by 14.75 fold [22].

In this study history of occupational exposure to blood or body fluids also increases the odds of vaccination rate by 2.1 fold [[AOR=2.1[1.2-3.6]]. This result supports a study conducted in Indian health care workers which shows history of accidental exposure to blood or body fluids increases the vaccination rates of health care workers by 5.2 fold[23].

STRENGTH AND LIMITATION OF THE STUDY:

Strength of the study:

In this study a multi stage sampling technique was used this made relatively a larger sample size included in the study compared to previous studies conducted in Ethiopia because it includes all the health care workers working in both governmental and private health institutions of the Zone. In addition to this the response rate in the present study is also high.

Limitation of the study:

Vaccination status was self-reported; because of this recall bias could happen and this may led to over- or

underestimation of vaccination coverage. The other limitation of this study is inadequacy of literatures especially on factors affecting health care workers' knowledge of HBV infection.

CONCLUSION:

Despite there is a fact that all HCWs should be knowledgeable about HBV infection; in the present study the knowledge level of HCWs regarding hepatitis B infection were unsatisfactory because 36.8% of health care workers were not knowledgeable. The factors associated with low knowledge level of HCWs were shortage of trainings, low level education and short duration of work experiences.

On the other hand the finding of the present study generally shows low rate of HBV vaccine coverage among health care workers of East Wollega zone health institutions, since 40.2% of the HCWs never received the vaccine. The major reason for not being vaccinated were unavailability of vaccine in health institutions and Vaccination status significantly varies based on level of education, type of health institution and working unit of HCWs. Unavailability and having no training on standard precaution were also identified as the major barriers for vaccination. This shows that there is still a need to improve the vaccination coverage of health care workers in order to protect them from acquiring hepatitis B infection.

RECOMMENDATION:

Based on the study findings, the following recommendations were forwarded for the policy makers, regional health bureau, zonal health department, for health care workers, Hospital, health center and clinic managers and researchers.

Policy makers:

The vaccination status of the HCWs in private health institution is very low when compared to those in governmental health institutions; therefore the policy makers need to consider implementation of the hepatitis B virus vaccine in private health institutions. On the other hand more than half of [271[54.2%]] of the HCWs were exposed to conditions that expose them to HBV infection; so the policy makers need to expand sustainable infection control and prevention strategies.

Regional Health Bureau and Zonal Health Department:

The knowledge of HCWs about HBV infection was unsatisfactory; so the regional health bureau and zonal health department needs to consider the importance of trainings so as to protect them from acquiring the

infection. The vaccination rate is also low; therefore, regional health bureau need to raise the coverage by providing direction for the Zonal health department on the strategies to improve the vaccination implementation program. Since the vaccine is unavailable in most of the health care institutions they need to make the vaccine available in all health care institutions in order to improve vaccination coverage.

Hospital, health center and clinic managers:

Since the vaccination rates of the HCWs varies by their working unit they need to consider the importance of regular monitoring and evaluation during the implementation of the vaccination program.

Health care workers:

They need to adhere to the principles of standard precautions and immunization against Hepatitis B virus.

Researchers:

It is better to investigate the vaccine coverage with laboratory confirmation of vaccination status of HCWs because only using self-administered questionnaire may lead to recall bias.

Ethical Considerations:

To conduct the study, an ethical clearance and supporting letter was obtained from Addis Ababa University College of health Sciences, School of Nursing and Midwifery Institutional Review Board [IRB]. All eligible HHCWs were approached and asked to give informed consent to participate in the study.

Consent for publication:

Necessary permission was obtained from Addis Ababa University College of health science for publication of the data.

Competing interests:

The authors declare that they have no competing interests.

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Authors' contribution:

MD made substantial contributions to conception and design, or acquisition of data, or analysis and interpretation of data. **ET** involved analysis and interpretation of data. **AH** involved in drafting the manuscript or revising it critically for important intellectual content. All authors read and approved the

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