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## Original Research

### Seroprevalence of hepatitis B virus infections among health care workers at the Bulle Hora Woreda Governmental Health Institutions, Southern Oromia, Ethiopia

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**Key words:** Health care works, Hepatitis B virus, Bulle Hora

**Abstract**

**Background:** Health care workers (HCWs) are at a great risk of occupational exposure with blood borne pathogens like Hepatitis B virus. The risk of occupational exposure to such infection has been the concerns of HCWs for years. However, there were scarcity of information on prevalence and risk factors of Hepatitis B virus infection in the study area.

**Objective:** This study was aimed to determine the seroprevalence and associated risk factors of Hepatitis B virus infections among Health care workers.

**Method:** A cross-sectional study was conducted among HCWs and NHCWs in the Health Institutions of Bulle Hora Woreda, Southern Oromia from March to April 2012. A structured questionnaire was used to collect information on sociodemographics and other possible risk factors. Venous blood samples were collected from 220 HCWs and NHCWs. Serums were tested for Hepatitis B surface antigen (HBsAg) using rapid test kit. Data were entered and analyzed using SPSS software version 16. Logistic regression analysis was done to see an association between dependent and independent variable and odds Ratio was used to measure strength of the association. P-values of less than 0.05 were considered statistically significant.

**Result:** Of the 110 health care and 110 non health care workers, hepatitis B virus was detected in 8 (7.3%) and 1 (0.9%) of health care and non health care workers, respectively. Significant differences were observed in the detection rate of HBV (OR = 8.54, 95% CI: 1.05-69.55; P= 0.045) in HCWs compared to non health care workers. Needle stick injuries and mucocutaneous exposure were high 25 (22.7%), 21 (19.1%), respectively.

**Conclusions:** The prevalence of HBV infection among HCWs was higher compared to NHCWs. It also found that needle stick injuries and sharp injuries were high, and yet only a small percentage of HCWs were reported, they had vaccinated against hepatitis B virus infection. There is an urgent need to focus efforts on mitigating transmission through improving the work environment and making use of the available vaccine for HCWs who are susceptible.

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## INTRODUCTION

Hepatitis B is a serious and common infectious disease of the liver, affecting millions of people [1]. Worldwide, an estimated two billion people have been infected with hepatitis B virus and more than 240 million have chronic (long-term) liver infections. About 600,000 people die every year due to the acute or chronic consequences of hepatitis B virus. The

hepatitis B virus is 50 to 100 times more infectious than HIV [2]. The burden of hepatitis B virus infection is highest in the developing world particularly in Asia and Sub-Saharan Africa [3, 4]. World Health Organization estimates that the prevalence of hepatitis B virus infection in Africa is on average more than 10% [5, 6].

HBV is considered among infectious occupational hazards. Evidently, every year in the United States

about 200–300 health care workers lose their lives due to hepatitis virus infections acquired at their working place. In 1992, the World Health Organization and the International Labor Organization recognized hepatitis B virus infections as an occupational diseases for those working in the health sectors [7, 8]. Health care workers (HCWs) are potentially exposed to blood and body fluids containing the virus and are at increased risk to acquire these pathogens (9). Among the blood borne pathogens, hepatitis B virus (HBV) has gained the status of global public health threat by being the 10<sup>th</sup> major causes of deaths. Currently, HBV is the leading issue of concern in society and medicine particularly in under-resourced health care systems, which lacks the safety measures necessary to prevent the risks of infections [10].

In Ethiopia, 12% of hospital admissions and 31% of mortalities in medical ward are due to liver disease [11]. Despite the widespread evidences that suggest increasing prevalence of HBV among health care workers, there is paucity of information regarding prevalence and associated risk factors of HBV infection in the study area. Therefore, this study was undertaken to determine the prevalence and associated risk factors of HBV infections among HCWs and NHCWs in Bulle Hora Health Institutions, Southern Ethiopia.

## **MATERIALS AND METHODS**

### **Study area, design and period**

A cross-sectional study was conducted at the Bulle Hora Woreda Health Institutions from March 2012 to April 2012. Bulle Hora Woreda is located in Borana Zone, South Oromia. It is about 467 Km away from Addis Ababa. There are 48 Kebeles in this Woreda with a total population of 308,140. Within the Woreda, there are one Hospital (Bulle Horal) and five health centers namely: Bulle Hora, Gerba, Qilleenso Mekoniissa, Qilleenso Rasa and Suro.

### **Study population**

There were 191 health care workers in the health institutions of Bulle Hora Woreda (96 in Bulle Hora Hospital, 26 in Bulle Hora, 20 in Gerba, 18 in Qilleenso Mekoniissa, 16 in Qilleenso Rasa and 15 in Suro Health Centers. Those health care workers selected by using stratified sampling method were the study population.

### **Sample size and sampling technique**

The required sample size (126) for the study was determined by using a single population proportion formula,  $n = (Z_{\alpha/2})^2 P (1-P) / d^2$ . Where, n = the number of health care workers to be studied;  $Z_{\alpha/2}$  = standardized normal distribution value for the 95%

confidence interval, which is 1.96,  $P = 0.0902$  from previous study in Addis Ababa, Ethiopia [12] and  $d$  = the margin of error taken 5%.

Health care workers were stratified and samples were allocated proportionally based on work institutions and then simple random sampling was done within each health institutions to select the final study subject. This stratification was done thinking that health care workers in the hospital or at the health center have different workload and activities. In brief, 191 HCWs in Bulle Hora Health Institutions were stratified into different work sites and proportional number were selected using simple random sampling technique. Out of 96 HCWs in Bulle Hora Hospital 63 (65.9%) of the total HCWs in the Woreda were selected. By applying the same procedure, 17, 13, 12, 11 and 10 HCWs were selected from Bulle Hora, Gerba, Qilleenso Mekoniissa, Qilleenso Rasa and Suro Health Centers, respectively. Similarly, equal number of non health care workers working in government institution in the Woreda were also enrolled to show the impact health service activities as risk for HBV infections.

### **Data collection and specimen processing**

A structured questionnaire was used to collect information about socio-demographic characteristics (age, sex, religion, educational status, marital status and service years) and potential risk factors (exposure to blood or body fluid in the eye, nose, needle stick and sharp injury, training on infection prevention and wearing of gloves). Trained data collector had interviewed each consented study subjects and completed the questionnaire. After written consents were obtained from study subjects, 3-5 ml of venous blood samples were collected aseptically.

The blood samples were labeled with unique identification numbers. The serum was separated by centrifugation and placed into eppendorf tubes. Samples collected from five of the health centers were transported to Bulle Hora Hospital Laboratory using icebox. Sera were stored at -20 °C until investigations were done.

**HBsAg screening:** An aliquot of each of the sera was thawed to bring to room temperature and tested for the presence of HBsAg. The serological tests were performed using hepatitis B surface antigen rapid test kits (ACON<sup>®</sup> HBsAg, ACON Laboratories, Inc San Diego, USA).

### **Data analysis**

After coding the data was entered, using EPI INFO version 2002 and it was exported and analyzed with SPSS version 16 statistical software. The descriptive statistic and multiple logistic regressions were carried out to compute the different rate, proportion and

relevant association. In all cases p values less than 0.05 were taken as statistically significant and odds ratio was used as measurement of association.

### Ethical consideration

The study was reviewed and approved by the ethical review committee of the School of Biomedical and Laboratory Sciences, University of Gondar. Permission was obtained from the Director of the Bulle Hora Hospital and each Health Centres. Study participants were informed about the study and were assured about the confidentiality, protection and anonymity of data. Informed consent was obtained from the individuals participating voluntarily. Positive individuals were referred to medical doctors for appropriate management.

## RESULT

### Socio demographic characteristics

One hundred ten health care workers and 110 non health care workers were included in the study. The non-respondent rate was 12.7%. The mean age of the health care worker was 28.2 year and SD 4.9 year. Their age ranges from 20 to 48 year. Fifty-eight (52.7%) were Males and 52(47.3%) were females. The male to female ration was 1:1.1. Sixty six (60%) of HCWs were working in Bulle Hora Hospital and the remaining 44 (40%) health care workers were working in the Health Centers. The average service year of health care workers was 4.1 year SD 3.3. The average age of the non health care workers was 32.9 year and SD 7.3 year. The average service year was 4.7 year, SD 2.8 and rage of 19 years. There were 70 (63.6%) females and 40 (36.4%) (Table1).

### Prevalence of Hepatitis B virus

From 110 health care workers and 110 non health care workers, HBsAg were detected in 8 (7.3%) and 1 (0.9%), respectively. There was statistically significant difference in the detection rate of HBsAg (OR: 8.54, 95% CI: 1.05-69.55; P=0.045) in HCWs compared to NHCWs. Among the total of HBV positive health care workers, 4 (50%) of them were working in Bulle Hora Health Centers; however, the observed difference between HCWs from Hospital and Health Centers was not statistically significant (OR= 1.55; 95%CI= 0.35-6.65; P= 0.55). Among the total HBV positive cases higher proportion, 6 (75%) of HBV was detected among unmarried (single) health care workers. However, this finding was not statistically significant compared with their married counter parts (OR= 1.44; 95%CI =0.28-7.50; P=0.67). Analysis of sociodemographic characteristics and their association

with HBV among HCWs were shown in (Table 2).

**Table 1.** Scio-demographic characteristics of HCWs and NHCWs at Bulle Hora Woreda Health Institutions, Southern Oromia, March 2012 to April 2012

| Characteristics     | HCWs (N= %) | NHCWs (N= %) |
|---------------------|-------------|--------------|
| Gender              |             |              |
| Male                | 58 (52.7)   | 40 (36.4)    |
| Female              | 52 (47.3)   | 70 (63.4)    |
| Age                 |             |              |
| 20-29 years         | 79 (71.8)   | 43 (39.1)    |
| 30-39years          | 25 (22.7)   | 45 (40.9)    |
| 40-49 years         | 6 (5.5%)    | 19 (17.3)    |
| 50-59 years         | 0(0)        | 3 (2.7)      |
| Marital status      |             |              |
| Single              | 75 (68.2)   | 46 (41.8)    |
| Married             | 35 (31.8)   | 60 (54.5)    |
| Divorced            | 0(0)        | 4 (3.6)      |
| Religion            |             |              |
| Orthodox Christian  | 54 (49.1)   | 49 (44.5)    |
| Protestant          | 43 (39.1)   | 55 (50)      |
| Muslim              | 13 (11.8)   | 6 (5.5)      |
| Service year        |             |              |
| 1-5 years           | 84 (76.4)   | 80 (72.7)    |
| 6-10 years          | 21 (19.1)   | 27 (24.5)    |
| 11-15 years         | 3 (2.7)     | 1 (0.9)      |
| ≥16 years           | 2 (1.8)     | 2 (1.8)      |
| Health Institutions |             |              |
| Hospital            | 66 (60)     | 61 (55.5)    |
| Health Center       | 44 (40)     | 49 (44.5)    |

### Risk factors and their associations with Hepatitis B virus infection

All of the HCWs studied had no history of Liver disease, tattooing and tooth extraction. Two (1.2%) of the health care workers were vaccinated against HBV. Distribution HBsAg positivity in relation to exposure to risk factors was shown in (Table 3). Of the 110 HCWs 22 (20.0%) of them had history of taking care of patients with hepatitis virus infection and 46 (41.8%) of HCWs had taken training on infection prevention. Among the 110 HCWs included in the study 21(19.1%) reported that they had history of cutaneous (blood or body fluid) exposure at least once in the last 12 months and 21(19.1%) had history of splash (of blood or body fluid) to their mouth, eye or nose at least once in the last 12 months. It was also found that 25 (22.7%) and 8

(7.3%) of HCWs had history of needle stick injuries and sharp injuries at least once in the last 12 months; respectively.

Although not statistically significant, analysis of possible occupational risk factors and their associations with HBV showed notable difference in the rate of infection among various exposures. There was high rate of HBV infection 4 (16.0%) among HCWs with history of needle stick injuries. However, the difference was not statistically significant when compared with those without the risk factor (COR= 3.86; 95% CI=

0.89-16.72; P= 0.07). Similarly, 3 (14.3%) of HCWs, with history of mucocutaneous exposure was infected. However, it was not statistically significant difference compared to those without the risk factor (COR= 2.80; 95% CI= 0.61-12.79; P= 0.18) (Table 3).

Variable that appeared to be associated with the outcome variable during bivariate analysis was taken in to multivariate logistic regression for further analysis. In multivariate analysis, none of the observed risk factors was statistically associated with HBV infection.

**Table 2.** Distribution of HBsAg in relation to Sociodemographic characteristics of Health Care Workers, at Bulle Hora Woreda Health Institutions, Southern Oromia, March 2012 to April 2012

| Characteristics | HBsAg in HCWs |              | Total<br>N=110 | COR (95% CI)      | P-value |
|-----------------|---------------|--------------|----------------|-------------------|---------|
|                 | Positive (%)  | Negative (%) |                |                   |         |
| Gender          |               |              |                |                   |         |
| Male            | 5 (8.6)       | 53 (91.4)    | 58 (52.7)      | 1.54 (0.35-6.79)  | 0.59    |
| Female          | 3 (5.8)       | 49 (94.2)    | 52 (47.3)      | 1.00              |         |
| Age             |               |              |                |                   |         |
| <30 years       | 4 (5.1)       | 75 (94.9)    | 79 (71.8)      | 1.00              | 0.17    |
| ≥30 years       | 4 (12.9)      | 27 (87.1)    | 31 (28.2)      | 2.78 (0.65-11.89) |         |
| Marital status  |               |              |                |                   |         |
| Single          | 6 (8.0)       | 63 (92)      | 75 (68.2)      | 1.44 (0.28-7.50)  | 0.67    |
| Married         | 2 (5.7)       | 31 (94.3)    | 35 (31.8)      | 1.00              |         |
| Religion        |               |              |                |                   |         |
| Orthodox        | 3 (5.6)       | 51 (94.4)    | 54 (49.1)      | 1.00              | 0.25    |
| Muslim          | 2 (15.4)      | 11 (84.6)    | 13 (11.8)      | 3.1 (0.46- 20.75) |         |
| Protestant      | 3 (7.0)       | 40 (93)      | 43 (39.1)      | 1.28 (0.24-6.66)  |         |
| Service year    |               |              |                |                   |         |
| ≤ 5 years       | 4(4.8)        | 80(95.2)     | 84 (76.4)      | 1.00              | 0.09    |
| >5 years        | 4(15.4)       | 22(84.6)     | 26 (23.6)      | 3.64 (0.84-15.72) |         |
| work place      |               |              |                |                   |         |
| Hospital        | 4(6.1)        | 62(93.9)     | 66 (60)        | 1.00              | 0.55    |
| Health center   | 4(9.1)        | 40(90.9)     | 44 (40)        | 1.55 (0.37-6.65)  |         |

**Table 3.** Distribution of HBsAg positivity in relation to potential risk factors among health care workers, at Bulle Hora Woreda Health Institutions, Southern Oromia, March 2012 to April 2012

| Risk factors            | HBsAg status |           | Total<br>(N=110) | COR (95% CI)      | P-value |
|-------------------------|--------------|-----------|------------------|-------------------|---------|
|                         | Positive     | Negative  |                  |                   |         |
| Training                |              |           |                  |                   |         |
| Yes                     | 3(6.5%)      | 43(93.5%) | 46(41.8%)        | 1.00              | 0.79    |
| No                      | 5(7.8%)      | 59(92.2%) | 64(58.2%)        | 1.22 (0.28-5.36)  |         |
| Caring patient with HBV |              |           |                  |                   |         |
| Yes                     | 2(9.1%)      | 20(90.9%) | 22(20%)          | 1.37 (0.26-7.28)  | 0.71    |
| No                      | 6(6.8%)      | 82(93.2%) | 88(80%)          | 1.00              |         |
| Use of glove            |              |           |                  |                   |         |
| Consistently            | 7(8.6%)      | 74(91.4%) | 81(73.6%)        | 2.65 (0.31-22.51) | 0.37    |
| Intermittently          | 1(3.4%)      | 28(96.6%) | 29(26.4%)        | 1.00              |         |
| Cutaneous exposure      |              |           |                  |                   |         |
| Yes                     | 1(4.8%)      | 20(95.2%) | 21(19.1%)        | 1.00              | 0.63    |
| No                      | 7(7.9%)      | 82(92.1%) | 89(80.9%)        | 1.71(0.20-14.68)  |         |
| Mucocutaneous exposure  |              |           |                  |                   |         |
| Yes                     | 3(14.3%)     | 18(85.7%) | 21(19.1%)        | 2.80 (0.61-12.79) | 0.18    |
| No                      | 5(5.6%)      | 84(94.4%) | 89(80.9%)        | 1.00              |         |
| Needle stick injury     |              |           |                  |                   |         |
| Yes                     | 4(16.0%)     | 21(84%)   | 25(22.7%)        | 3.86 (0.89-16.72) | 0.07    |
| No                      | 4(4.7%)      | 81(95.3%) | 85(77.3%)        | 1.00              |         |
| Sharp injury            |              |           |                  |                   |         |
| Yes                     | 1(12.5%)     | 7(87.5%)  | 8(7.3%)          | 1.94 (0.21-18.06) | 0.56    |
| No                      | 7(6.9%)      | 95(93.1%) | 102(92.7%)       | 1.00              |         |

## DISCUSSION

In Ethiopia, studies on seroprevalence of HBV infections among HCWs in comparison to NHCWs are scarce. This study attempted to provide information regarding seroprevalence of Hepatitis B virus infection and risk factors. In the present study the detection rate of HBsAg among health care workers was 8 (7.3%), which was significantly higher when compared with NHCWs 1(0.9%) (OR: 8.54, 95% CI: 1.05-69.55; P=0.045). The likelihood of acquiring HBV infections among HCWs was 8 times higher than NHCWs.

When compared with other studies, the result of the present study was variable. The HBsAg Seroprevalence 8 (7.3%) observed among HCWs in this study was comparable with a study conducted in Addis Ababa (9.0%) [12]. It was also comparable with other studies conducted in Yemen (9.9%) and Uganda (8.1%) [13, 14]. However, the prevalence in the present study was higher compared to findings reported from Turkey (2.7%), Korea (2.4%) and Mexico (1.2%) [15, 16, 17]. On the other hand, it was lower than prevalence reported from Senegal (17.8%) [18]. The difference in the prevalence of HBV infection among health care workers might be explained due to difference in sociodemographic characteristics, epidemiology of hepatitis B virus infections and methodologies used.

In the present study, the prevalence of HBV infection was higher among males (8.6%) compared to females (5.8%). However, the difference was not statistically significant ( $p > 0.05$ ). The higher sex specific prevalence rate of HBV infection in males than females was consistent with other reports from Ethiopia [12, 19] and India [20]. In contrast to the present study, higher proportion of hepatitis B virus infection among females was reported from Iran [21]. It might be difficult to explain why males showed high positivity rate than females as they had similar exposure to risk factors, of course there may be variation in respect to risk behaviors especially in the early years of life [22].

Regarding age, HBsAg prevalence increases with age then fall down after a peak age of 40-49 years. Similar finding was reported from Addis Ababa [22]. In the present study, 50% of positive cases were in the age groups of 20-30 years. This finding was also in line with studies done in Pakistan [23], Iran [24] and India [25]. The high seropositivity rate of HBV among younger health care workers might be due to lack of experience in their work, which increases chance of acquiring the infection.

The present study reported that 25(22.7%) health care workers had history of needle stick injuries. This finding was in agreement with the studies done in Nigeria where needle stick injuries were the commonest forms of exposure to HBV infections [26]. The finding of needle

stick injury was also consistent with findings from Awassa and Sidama Zone, where needle stick injuries were 31%, 32%, respectively [27, 28]. But it was lower compared to the result reported from Italy and Mulago, Uganda, where needle stick injuries was 58.4%, 67.8%, respectively [29, 13]. Regarding splash exposure, the present study found that 19.1% of HCWs were exposed to blood or body fluids. These were in agreement with a result from study done in Italy, where mucous membrane contamination was 11.2% [29]. It was also comparable with findings of studies conducted in United Kingdom [30]. Unlike other studies done in other countries needle sticks, sharp injuries and splash exposures were not found as significant risk factors for HBV infection in this study [31, 32, 33].

In conclusion, prevalence of HBV infection among health care workers was higher compared to non health care workers. It also found that needle stick injuries, mucocutaneous exposure and sharp injuries were high, and yet only a small percentage of HCWs were reported they had history of vaccination against hepatitis B virus infection. Considering the consequence of HBV infection such as liver cirrhosis and hepatocellular carcinoma, there is an urgent need to focus efforts on mitigating transmission through improving the work environments and making use of the available vaccine for health care workers who are susceptible.

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