Vaccination status and Seroprevalence of Hepatitis B surface Antigen among Health Care Workers in Taiz, Yemen Republic

Waheed A. M. Ali 1*, Riyadh Abdulmajid S. Thabit1, Mansoor Alkhulaidi1, Ahmed Abdullah M Ahmed1

1 Medical Lab. Department, Faculty of Medicine and Health Sciences. Taiz University, Yemen and Medical Lab. Department, Faculty of Medical and Health Sciences, Al-Saeed University, Taiz, Yemen

Received: 07.11.2020 • Accepted: 12.20.2020 • Published: 31.12.2020 • Final Version: 31.12.2020

Abstract: Background: Exposure to Hepatitis B virus (HBV) infection is one of the most common occupational diseases among the providers of the health care services. During the course of their clinical work; Health Care Workers (HCWs) are at risk of acquiring HBV infection or transmitting it to their patients. Vaccination for medical personnel against HBV in republic of Yemen is recommended but not strictly enforced. Detection of the viral hepatitis B surface antigens (HBsAg) one of the accurate and cheap methods to assess HBV prevalence. This method is used in this study to assess HBV prevalence among HCWs in Taiz; in order to improve methods of interventions to control this infection among them. Objectives: The objective of this study was to assess the vaccination status and the seroprevalence of HBsAg among HCWs in Taiz; Yemen. Methods: This cross-sectional study was conducted between January and March, 2018, and from April and July, 2019, in the part of Taiz City; Yemen. 362 HCWs were included in this study and are selected through repeated casual visits to hospitals and medical centers. A questionnaire was made to get information on the participants’ characteristics and their vaccination status, medical history and risk factors for HBV transmission. Five ml venous blood was then collected from every participant to assess HBsAg. Results: the overall vaccination percentage was 21.54% (27.5% in male and 17.9% of female). The seroprevalence of HBsAg was 2.76%, all vaccinated participants were HBsAg negative. Needle stick and sharp object injury was an important risk factor of HBV infection.

Keywords: vaccination; prevalence; hepatitis B virus; Hepatitis B surface antigen; health care workers.

1. Introduction

Hepatitis B virus infection is one of most serious public health problems. It represents one of the most common viral infections worldwide. It is estimated that; more than three hundred million people are chronically infected with this virus around the world (Trepo et al., 2014, Kazemiet al., 2008). The carrier rate of HBV is varying considerably from one area to the another and ranging from less than 1% to more than 20%. (Aghakhanieal et al., 2011). More than 6.00.00 annual deaths are resulted from the complications of the liver diseases that caused by this virus (Fourati and Pawlotsky, 2016).

Fortunately; a safe, effective, and cost-efficient vaccine is available, however universal immunization especially for infants are not yet available in all low-income countries (Locarniniet
Many countries do not offer adult HBV vaccination; this lack of adult vaccination means that even that countries with high childhood vaccination rates still have high proportion of vulnerable and infected adults (Zoker et al., 2017). Many antiviral medications prove effectiveness and can be used to treat chronic infection once it is diagnosed; however, cost of these medications is relatively high, so many people in low-income areas with chronic HBV are not offered treatment (Locarnini et al., 2015, WHO, 2009).

Diagnosis of HBV infection can be accomplished by detecting serological markers, which varies depending on whether the infection is acute or chronic. In acute infection HBsAg appears 1to 7 weeks before the appearance of the biological markers that indicates liver disease or before jaundice become evident, in almost half of the infected patients this marker remains even for more than 3 weeks after the onset of the disease (Trupti et al., 2018). After the initial acute or asymptomatic infection, a proportion of patients becomes chronic carriers as they fail to clear the infectious material (viruses) from their blood stream and in these patients HBsAg persists for long periods, sometimes for life. The severity of the symptoms varies from one infected individual to another, a large proportion of infected individuals by HBV remain asymptomatic but can transmit the infection to healthy individuals (Quadri et al., 2013). Detection of HBsAg is routinely used either for diagnosing acute state or for detecting carriers. The most common methods for detecting HBsAg are either Immunochromatography assays (ICA) which are simple to perform, economical and do not require special instrumentation for analysis or enzyme-linked immunosorbent assays (ELISA) which are relatively expensive, needs more time, special equipment and trained lab personnel for analysis. On comparison of these two methods ELISA was shown to be more sensitive for the detection of HBsAg than ICA (Zoker et al., 2017, Quadri et al., 2016).

Blood, serum and other body fluids, represent the main sources for HBV transmission, transmission of the virus from mother to child (vertical transmission) is also one of the common methods for transmission of this virus as well as sexual rout, and exposure to unsafe injections, including intravenous drug use (Alter et al., 1986, Kingsley et al., 1990). Close household contact and occupational exposure to blood or blood products and hemodialysis are also important risk factors (Lauer et al., 1979, Hu et al., 1991). The highest occupational risk for HBV infection was reported among HCWs (Hutinet et al., 2003). It is estimated that, there are more than 35 million HCWs worldwide and percutaneous (PCIs) injuries have been estimated to result in approximately 66,000 infections with HBV annually (WHO, 2016). Data reported from the United States in 1990 suggested that, the unvaccinated HCWs had serological evidence of current or past HBV infection three to five times greater than the general population (Prüss-Ustun 2005, WHO, 2013).

Unfortunately, there is no sufficient data about the situation of HBV infection among general population or among the HCWs in Taiz, Yemen or in the whole country, so the risk factors and the mode of transmission of this virus “especially in HCWs” in Yemen were not adequately elucidated. Few studies (Al-Nassiri and Raja’a, 2001, Al-Shamahy, 2000, Shidrawi et al., 2004) suggest that horizontal transmission represents the major mode of infection with blood transfusion, age progression, male sex and health care occupation being significant risk factors.

This study aimed to evaluate the risk factors, the vaccination status and the prevalence of HBV infection among HCWs in Taiz City; through participants interviewing, questionnaire and laboratory examination of participants blood to measure HBsAg positivity.
2. PATINTA AND METHODS

This cross-sectional study was conducted between January and March, 2018, and from April and July, 2019, in the part of Taiz City. The population of this study included all doctors, dentists, nurses and lab technicians working in different hospitals and Medical Centers in addition to medical student at the final (clinical) years. The 362 participants included in this study were those present in hospitals and medical centers at the time of the repeated casual visits and those give consent after explanation of the aim of the study. The actual number of HCWs in the area of study was not known due to the war in the country and the emigration of several HCWs from Taiz to other cities in the country or to other countries, so to make sure that the results will be representative, a relatively large percentage of HCWs in Taiz were included in this study through two consecutive years.

A questionnaire was made to get data about the participants’ characteristics and their vaccination status, medical history then taken to detect if the participants are exposed to any risk factor.

From every participant, 5 ml venous blood was collected from the cubital fossa via venipuncture. Samples were then transported to the biochemical laboratory in faculty of medical and health sciences Al-Saeed University, blood sample then left to clot at room temperature, and then centrifuged for 10 minutes, serum then separated and stored in eppendorf tubes at -20°C at Al-Rawdha hospital until the time of testing.

Testing for HBsAg was then performed to all samples by using ELISA {bioxefars, unit 2C antrum technology park, Antrum, BT41 1QS (United Kingdom)}. In any sample, levels of HBsAg less than 1 s/c (signal per cutoff) were considered negative, while a level more than 5 s/c was considered positive.

All collected data were checked, data were then entered into the computer, cleaned and analyzed. Means and percentages were calculated. SPSS version 21.0 software package was used to determine differences (P < 0.05) performed by Cramer’s value and K² test.

3. RESULTS

A total of 362 participants with mean age of 28.5 years (range from 20 to 59), 138 (38.1%) males and 224 (61.9%) females, were included in this study. The distribution of participant according to their occupation is summarized in table 1. Results, table 2 explains the number and the percentages of vaccinated participants according to their age and sex.

| Occupation     | Frequency | Percentage |
|----------------|-----------|------------|
| Physician      | 68        | 18.8%      |
| Dentists       | 38        | 10.5%      |
| Lab. Technician| 142       | 39.2%      |
| Pharmacist     | 26        | 7.2%       |
| Nurse          | 88        | 24.3%      |
| Total          | 362       | 100%       |
On examination of participant’s blood for HBsAg; 10 of 362 (2.76%) were gave positive results, the incidence of HBsAg positivity found to be relatively higher in female, 8 of 224 (3.57 %) than males, 2 of 138 (1.44%) (table 3). According to age groups, the percentage HBsAg positivity was 5.56% (4 of 72) in age group over 30 years while it was 2.07% (6 of 290) among participants 20 and 30 years old (table 4).

Only 78 (21.54%) of the participants were knew that they had taken the three doses of HBV vaccine, all of them were HBsAg negative.
Table 5. HBsAg among vaccinated and non-vaccinated participants

| Categories          | Vaccinated | Non-vaccinated | Phi & Cramre's value |
|---------------------|------------|----------------|----------------------|
|                     | No | %           | No | %           |                          |
| Total               | 78 | 21.54%      | 284 | 78.45%      |                          |
| HBsAg positive      | Zero | 0%         | 10 | 3.52%       | R Q = - 0.1              |
| HBsAg negative      | 78 | 100%        | 274 | 96.48%      |                          |

Of the 362 participants included in this study, thirteen (3.6%) had previously received blood transfusion in at least one situation; no direct correlation was found between blood transfusion and the prevalence of hepatitis B among HCWs in Taiz; since only one of these 13 participants is HBsAg positive. 63 of participants (17.4%) had accidentally exposed to needle stick injury (NSIs) at least once during their work, four of them are HBsAg positive.

Table 6. Prevalence of HBV according to the history of NSIs

| Categories          | History of NSIs | No history of NSIs | Phi & Cramre’s value |
|---------------------|-----------------|--------------------|----------------------|
|                     | No | %     | No | %          |                          |
| HBsAg positive      | 4 | 6.35% | 6 | 2%         | R Q = 0.1005             |
| HBsAg negative      | 59 | 89.75% | 293 | 98%        |                          |
| Total               | 63 | 100%  | 299 | 100%       |                          |

4. DISCUSSION

The study assessed vaccination status and the prevalence of HBV through the measuring of HBsAg in HCWs in Taiz city, Yemen Republic. The importance of this study referred to the fact that HBV is one the major occupational infectious diseases in the medical staff (Hutin et al., 2003) and the paucity of studies on epidemiology of HBV infection both in general and at risk population in Yemen.

The number of female participants in this study was more than males. This could be attributed to the increase rate of immigration between male HCWs to the outside of the city compared to female. This reason could also be responsible for the decrease in participants’ age ratio science more chances for immigration are given to the more experienced HCWs.

In spite the fact that hepatitis B is preventable disease it represents one of the major causes of morbidity and mortality throughout the world including Yemen. Vaccination against this virus is highly effective and protect populations especially those at high risk if the vaccination programs are properly implemented (Mast et al., 2005). World health organization reported that, hepatitis B vaccination coverage varies among HCWs in different areas of the world. This vaccination coverage was about 18% in Africa and about 77% in Australia and New Zeland (Pruss-Ustun et al., 2005).

In this study about 2.5% of health professionals have received the full three doses course of HBV vaccine (mean of male and female percentages), this percentage is even less than that reported from Ethiopia (28.7%) the neighbor countries with relatively same socioeconomic and income level.
The mean of vaccination coverage among HCWs in this study is less than that reported in Iran, India and also less than that reported from Burkina Faso, which indicates vaccination coverage of 48.2, 51.2 and 47.7, respectively (Ouedraogo et al., 2013, Nagao et al., 2008, Jalaleddinet al., 2014).

Unavailability of the vaccine was the most common mentioned reason by HCWs participates in this study for not being vaccinated; the second common mentioned reason was the vaccine cost. The fact that most of the participants in this study were young and had few years of practice could also responsible for the low rate of vaccination as it found in this study that the rate of vaccination is less in participants with age group less than 30 than those over 30.

In this study the overall prevalence of HBV infection was 2.8%, it was higher in female 3.57 % than in male 1.44. This is equal to that reported in Nigeria in 2017 (Alese et al., 2016) but higher than that reported in study conducted in India (0.4%) (Singhal et al., 2016). In African countries, 3 studies conducted in Rwanda (Kateera et al., 2014) 8.1% in Uganda (Ziraba et al., 2010) and 6.32% in Cameroon (Fritzsche et al., 2013) and the prevalence of HBV in HCWs in these studies can be said to be higher compared to that reported in the present study.

The higher prevalence of HBV infection in females in this study compared to male may be attributed to the relatively decrease vaccination rate in female than males and to the fact that most of workers in nursing (higher exposure rate) are female. Prevalence of HBV infection was more in age group more than 30 years old than those less than 30 years, this could be attributed to the increase rate of exposure.

The present study’s obvious statistically significant inverse correlation was seen between vaccination state and HBsAg positivity, which means that; vaccination program against HBV is highly effective in preventing HBV infection and the need to ensure that all HCWs should be vaccinated.

Sixty three of 362 participants (17.4%) included in this study said that they had needle and/or sharp object injury at least once during the previous one year. This finding is lower than that reported by study conducted in Ondo state, Nigeria, where 55.8% of HCWs encounter needle stick and/or sharp object injuries (Oluwatosin et al., 2016). However, it is relatively similar to that reported by a study done in Ethiopia, where 19.1% had needle stick and/or sharp injury (Bekele et al., 2015).

This low percentage in the our and in Ethiopian studies compared with that reported from a country with relatively same socioeconomic and demographic characteristics could be attributed to training programs that advocate for proper self-care as well as for study time differences. Strong statistically significant positive correlation was seen between the rate of needle stick and/or sharp injury and the prevalence of HBsAg seropositivity. It is well known that safe handling and disposal of needles sticks and sharp materials by health care professionals decreases blood born infection including HBV.

5. CONCLUSION

According to the relatively higher prevalence of HBsAg among HCWs; test for screening HBV infection should be performed in primary evaluation before giving permission to every HCW to be enrolled in hospital and health centers. HBV vaccination showed good coverage protective rate against HBV. Therefore, it should be compulsory to all HCWs. Needle stick and/or sharp object injuries are important risk factors for HBV infection, therefore, HCWs should enrolled in periodic
training programs to fill the skill gap, and to be enforced to apply universal precaution during health providing procedures.

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