

**Hepatitis B Vaccination coverage and knowledge among Healthcare Workers  
at a tertiary Hospital in Jeddah, Saudi Arabia**

**Abstract**

**Background:** Healthcare workers in tertiary hospital are at the risk of exposure and possible transmission of hepatitis B virus (HBV) infection. This infection is a major and important occupational hazard among health care workers (HCWs), it is may be 2–10 times higher than in the general population **Objectives:** To detect the hepatitis B vaccination coverage and the level of knowledge among HCWs. **Methods:** A cross-sectional study was performed on a representative sample of health care workers randomly selected from a tertiary hospital, Jeddah, Saudi Arabia through stratified cluster sampling. **Results:** vaccination coverage among study group was 63.3%. Complete HBV vaccination was significantly associated with age above 30 years, duration of work above 5 years and profession ( $p=0.002$ ,  $0.038$  and  $0.049$ , respectively). Our predictors of complete vaccination coverage were age above 30 years (OR= 2.164; 95% CI: 0.678 -3.907), profession [lab technicians (OR= 2.533; 95% CI: 0.301-8.356) nurses (OR= 2.420; 95% CI: 0.709- 8.258)] and those who have good perception towards HB vaccine (OR= 3.759; 95% CI: 1.582- 8.932). **Conclusion:** HBV vaccination coverage among HCWs was low and the participants have lack of knowledge about hepatitis B virus vaccine. So we recommend to increasing the vaccine coverage through motivation and education of HCWs about HBV vaccine and the necessity of following the HBV vaccine course. Enforcement makes a valid certificate that the HCW can keep. Furthermore a policy of mandatory hepatitis B surface antigen screening and different communication and discussion about believes and fear.

**KEYWORDS:** Healthcare worker, Hepatitis B vaccine, knowledge, perception, HBV.

**Introduction**

Hepatitis B virus (HBV) infection is a major and important occupational hazard among health care workers (HCWs), it is may be 2–10 times higher than in the general population<sup>1</sup>. HCWs are always at the risk of acquiring infection from their patients. Accidental needle stick and sharps injuries (NSSIs), which are common among HCWs, are high-risk conditions for blood-borne pathogens transmission<sup>2</sup>

Many studies among HCWs the average risk of transmission after percutaneous exposure to infected blood has been estimated approximately 0.3% for human immunodeficiency virus (HIV), 1.8% for Hepatitis C virus (HCV) and 6–30% for HBV<sup>3</sup>. Injuries with contaminated injection devices are frequent in developing countries due to the lack of knowledge about control practices, the lack of resources for sterilization and buying disposables and cultural issues<sup>4</sup>.

After infection with HBV, 10% of the patients develop chronic hepatitis and about 15%-25% develop cirrhosis. Half of these individuals later develop hepato-cellular carcinoma<sup>5</sup>.

Although the incidence of HBV infection has drastically reduced after the introduction of effective vaccination, modification of high-risk practices and possibly a decrease in the number of susceptible persons, yet about 400 million people worldwide are carriers of HBV. The acute and chronic consequences of HBV infection are major problems both in developed as well as developing world<sup>6</sup>.

In developing countries needle-stick injuries (NSIs) cause a high infection rate of 40% to 60% among HCWs; however, vaccination has reduced the HBV infection rate to less than 10% in developed countries<sup>7</sup>.

According to current CDC recommendations all HCWs and students should receive hepatitis B vaccine. Vaccination (3-dose series) should be followed by assessment of hepatitis B surface antibody to determine vaccination immunogenicity and, if necessary, revaccination. HCWs who do not have protective concentration of anti-HBs (HBsAb) (>10 mIU/ml) after revaccination (i.e. after receiving a total of 6 doses) should be tested for HBsAg and anti-HBc to determine their infection status<sup>8</sup>.

Pre-vaccination serologic testing is not indicated for most persons being vaccinated, except for those persons and students at increased risk for HBV infection, such as those born to mothers in or from endemic countries<sup>9</sup>.

Providers who are performing exposure-prone procedures also should receive pre-vaccination testing for chronic HBV infection<sup>10</sup>. Exposure of a patient to the blood of HBV-infected HCWs should be handled with post-exposure prophylaxis and testing of the patient in a manner similar to the reverse situation (i.e., prophylaxis for providers exposed to the blood of an HBV-infected patient)<sup>11</sup>.

Before 1990, Kingdom of Saudi Arabia (KSA) was considered one of the hyper-endemic countries for HBV infection. At that time, crude prevalence of HBV infection in different provinces of the Kingdom ranged between 5% -12%. The overall prevalence was estimated to be 8.3%<sup>12</sup>. In 1990, a National Vaccination Program against HBV was introduced. A Committee for the prevention of HBV infection was constituted and an immunization apparently resulted in significant reduction of HBV infection among Saudi children with reported that the prevalence has dropped to 0.05%<sup>13</sup>. In the current study we detect the hepatitis B vaccination coverage among HCWs at a tertiary hospital, Jeddah, Saudi Arabia and to determine the level of knowledge about the Hepatitis B vaccine, risk of exposure to HBV infection and perception towards HBV vaccine among HCWs

## Methods

A cross-sectional study was performed on a representative sample of HCWs randomly selected from a tertiary hospital, Jeddah, Saudi Arabia through stratified cluster sampling. It is a referral hospital for training undergraduate and postgraduate students and for research.

The sample size was calculated using WHO manual for sample size determination in health studies considering an anticipated HCWs proportion of vaccination coverage of 50% and an absolute precision of 5% at a 95% confidence, the minimal sample size required for the study was estimated to be 384 HCWs. To overcome for possible non-responses or any missing data, we distributed of 450 questionnaires and returned 400 where two questionnaires excluded due to incomplete data. An informed consent was obtained from each one participated. All HCWs were eligible for the study.

Participating HCWs completed a self-administered questionnaire which was based mainly on the knowledge of hepatitis B virus vaccination, knowledge of risk of exposure, and practice of post-exposure prophylaxis.

The following information was requested: demographic and professional characteristics, duration of work experience, self reported status of immunization, perception of hepatitis B vaccine, and their attitude towards recommending hepatitis B vaccine to other colleagues. Practice of post-exposure prophylaxis was explored.

The participants were classified into two groups, who complete the vaccination course (full vaccine coverage of three doses) and those who had not vaccinated at all or

incomplete the course (one dose or two doses) of vaccination (non-vaccinated group). Ethics committee approval for the study was obtained from the Ethical Review Board and also from the hospital committee.

#### **Statistical Analysis**

The data from all the returned questionnaires were entered into SPSS, version 16, and analysis done. Descriptive statistic in the form of mean and standard deviation for qualitative data and number and percent for qualitative data were done. Chi-square was used to detect the association and logistic regression was used to detect the predictors of complete vaccination coverage. The level of significance was set at  $P < 0.05$ .

#### **Results:**

Out of 450 distributed questionnaires, 400 were returned and 398 were included in this study with a response rate of 88.9 %. As demonstrated in **table one**, the mean age of participants was  $31.51 \pm 9.11$  years and mean duration of work was  $5.92 \pm 6.38$  years. Most of study group (72.9%) were females, 61.3% were Saudi, 51.3% were married, and professional group was 35.7%, 6.0%, 5.8%, 30.7% and 21.9% (Physicians, Dentists, Lab technicians, Nurses and Others, respectively), (other includes dietitian, radiologist and managers).

As displayed in **table one**, vaccination coverage among study group was 63.3% completely vaccinated (full vaccine coverage of three doses) while 36.7% were not vaccinated. Moreover self reported immunity status (HBsAb) of completely vaccinated group was 27.4% positive, 44.0% negative and 28.6% don't know their immune status.

Comparison between completely vaccinated and non-vaccinated group regarding personal characteristics demonstrated in **table two**. Complete HBV vaccination was significantly associated with age above 30 years, duration of work above 5 years and profession group ( $p=0.002$ ,  $0.038$  and  $0.049$ , respectively). Moreover, physicians were had higher percentage of non-vaccinated (41.5%) than dentists (20.8%), nurses (33.6%) and lab technicians (17.4%). Whereas there was no association observed with gender, nationality and marital status ( $p > 0.05$ ).

Concerning knowledge of hepatitis B virus vaccine, 91.7% of participants were aware of the presence of the vaccine. The majority (95.0%) were of the opinion that the vaccine should be given as part of work place safety measure. while 38.7% thought that hepatitis B vaccine can be administered simultaneously with hepatitis B immunoglobulin (HBIG) when indicated and only 24.4% of participants rightly answered that complete vaccination does not consist of just 2 doses of the vaccine (**table 3**).

As regards knowledge of the risk factors for HBV infection, 90.5%, 78.4%, 73.4% and 62.8% believed that hepatitis B virus infection can be transmitted through percutaneous injury, mucous membrane contact with blood, and contact of abraded skin with potentially infected tissue, contact of skin afflicted with dermatitis with potentially infected body fluid, respectively. Eighty six point nine percent (86.9%) of participants thought that they were at a greater risk of becoming infected with HBV than the general population (**Table 3**). Furthermore completely vaccinated group had significantly higher rates of knowledge than non-vaccinated group regarding their awareness of the existence of hepatitis B vaccination (93.9% versus 70.3%,  $P=0.000$ ) and rightly indicated that complete vaccination does not consist of just 2 doses of the vaccine (70.0% versus 30.0%,  $P=0.002$ ). While no significant difference was observed regarding other questions about knowledge of HBV vaccine ( $P>0.05$ ). On the other hand regarding knowledge related to the risk factors for HBV infection, the only significant difference between the two groups as regards Percutaneous injury with blood is considered risk factor for HB infection ( $P=0.035$ ). But there was no significant difference between them ( $P>0.05$ ) regarding the rest of the questions.

The majority of study group had good perception of the hepatitis B vaccine, 91.7 % of the respondents agreed that the vaccine is safe, 90.7% of respondents would recommend the vaccine to another colleagues and 50.0% of respondents did not know how many of their colleagues that had received hepatitis B vaccine (**table 3**). Moreover, There was statistical significant difference between completely vaccinated and non-vaccinated group regarding their agreement that HB vaccine is safe (66.0% versus 34.0%,  $P=0.000$ ), recommendation of HB vaccine to another colleague (66.8% versus and 33.2%,  $P=0.000$ ) and about how many of their colleagues had received HBV vaccine (71.4% versus 28.6%,  $P=0.001$ ).

The result of the logistic regression model demonstrated in **table 4**, it indicated that our predictors of complete vaccination coverage among the participants were who had age above 30 years (OR= 2.164; 95% CI: 0.678 -3.907), profession group [Lab technicians (OR= 2.533; 95% CI: 0.301-8.356)and Nurses (OR= 2.420; 95% CI: 0.709- 8.258)] and those who had good perception towards HB vaccine (OR= 3.759; 95% CI: 1.582- 8.932)

**Table 1: demographic characteristics and Vaccine coverage among study group**

		Study group (N=398) N (%)
Age/ year:	mean ± SD	31.51 ±9.114
Duration of work / year: mean ± SD		5.92 ±6.384
Gender	Male	108 (27.1)
	Female	290 (72.9)
Nationality	Saudi	244 (61.3)
	Non- Saudi	154 (38.7)
Marital status	Single	179 (45)
	Married	204 (51.2)
	Divorced	15 (3.8)
occupations :	Physicians	142 (35.7)
	Dentists	24 (6.0)
	Lab technicians	23 (5.8)
	Nurses	122 (30.7)
	Others	87 (21.9)
Vaccination coverage:		
Completely Vaccinated		252 (63.3)
Non-vaccinated		146 (36.7)
Immune status (HBsAb) (n=252) :		
Positive		69 (27.4)
Negative		111 (44.0)
I don't know		72 (28.6)

**Table2: comparison between complete vaccination and non-vaccinated group regarding personal characteristics**

	Vaccine coverage (N=398)		X <sup>2</sup>	P -value
	Complete Vaccination (n=252) N ( %)	Non-vaccinated (n=146) N ( %)		

<b>Gender</b>	<b>Male</b>	70(64.8%)	38 (35.2%)	0.143	0.727
	<b>Female</b>	182(62.8%)	108 (37.2%)		
<b>Age/ year</b>	<b>≤ 30</b>	141 (57.3%)	105 (42.7%)	9.98	0.002*
	<b>&gt; 30</b>	111 (73.0%)	41 (27.0%)		
<b>Nationality</b>	<b>Saudi</b>	100 (64.9%)	54 (35.1%)	0.283	0.669
	<b>Non-Saudi</b>	152 (62.3%)	92 (37.7%)		
<b>Work duration /year</b>	<b>≤ 5</b>	154 (59.5%)	105 (40.5%)	4.750	0.038*
	<b>&gt; 5</b>	98 (70.5%)	41(29.5%)		
<b>Marital status</b>	<b>Single</b>	107(59.8%)	72 (40.2%)	1.755	0.210
	<b>Married</b>	145 (66.2%)	74 (33.8%)		
<b>Profession :</b>					
	<b>Physicians</b>	83 (58.5%)	59 (41.5%)	9.474 <sup>a</sup>	0.049*
	<b>Dentists</b>	19 (79.2%)	5 (20.8%)		
	<b>Lab technicians</b>	19 (82.6%)	4 (17.4%)		
	<b>Nurses</b>	81 (66.4%)	41 (33.6%)		
	<b>Others</b>	50 (57.5%)	37 (42.5%)		

\*\* Significant  $P < 0.05$

<sup>a</sup> Fisher's Exact Test

**Table 3: Knowledge of hepatitis BV vaccine, risk factors for HBV infection and perception towards HBV vaccine among study group.**

<b>Knowledge of HBV vaccine</b>		<b>N %</b>
Are you aware of vaccination for hepatitis B	Yes	365 (91.7)
	No	33 (8.3)
Hepatitis B vaccine should be given as part of work place safety	Yes	378 (95.0)
	No	10 (2.5)
	DNK	10 (2.5)
Hepatitis B vaccine can be administered simultaneously with HBIG (the immunoglobulin) when indicated	Yes	154 (38.7)
	No	43 (10.8)
	DNK	201 (50.5)
When indicated as part of post-exposure prophylaxis, it should be administered within 24 hrs of exposure	Yes	182 (45.7)
	No	29 (7.3)
	DNK	187 (47.0)
For complete protection, it consists of two doses at 0 and 6 months	Yes	175 (44.0)
	No	97 (24.4)
	DNK	126 (31.7)

Knowledge about the risk factors for HBV infection?		N %
Per-cutaneous injury with blood	Yes	360 (90.5)
	No	38 (9.5)
Mucous membrane contact with blood	Yes	312 (78.4)
	No	86 (21.6)
Contact of abraded skin with potentially infected tissue	Yes	292 (73.4)
	No	106 (26.6)
Contact of skin afflicted with dermatitis with potentially infected body fluid	Yes	250 (62.8)
	No	148 (37.2)
Do you agree you are at risk more than the general population?	Yes	346 (86.9)
	No	28 (7.0)
	DNK	24 (6.0)

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171 **Continue table3: Knowledge of hepatitis BV vaccine, risk factors for HBV infection and perception**  
172 **towards HBV vaccine among study group.**

perception of the HBV vaccine		N %
you agree that HBV vaccine is safe	Yes	365 (91.7)
	No	7 (1.8)
	DNK	26 (6.5)
I will recommend HBV vaccine to another colleague staff	Yes	361 (90.7)
	No	13 (3.3)
	DNK	26 (6.0)
Do you think your colleagues have received HBV vaccination?	KN	199 (50.0)
	DKN	199 (50.0)

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DNK= Do not know

KN= Know

174 **Table 4: Predictors of complete vaccination coverage among the participants: logistic**  
175 **regression analysis**

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characteristics	OR	95% C.I	P -value
Gender: female	0.270	0.101 -0.727	0.010



<b>Nationality :</b> Non-Saudi	0.464	0.163 - 1.316	0.149
<b>Duration of work / y:</b> > 5 years	0.896	0.288 -2.783	0.612
<b>Age:</b> > 30 year	2.164	0.678 -3.907	0.019
<b>Profession :</b>			
- Dentists	0.852	0.227-3.200	0.812
- Lab technicians	2.533	0.301-8.356	0.392
- Nurses	2.420	0.709- 8.258	0.158
- Others	1.349	0.508- 3.581	0.548
<b>Perception towards HBV vaccine:</b> - Good	3.759	1.582- 8.932	0.003
<b>Knowledge about HBV vaccine:</b> -Good	1.734	0.780- 3.855	0.177
<b>Knowledge about RF of HBV infection:</b> - Good	0.824	0.376-1.804	0.628

OR: odds ratio, C.I: confidence interval, Significant ( $P < 0.05$ )

HB= hepatitis B, RF= risk factors

## Discussion

At the time of study, the hospital has policies requiring staff to be vaccinated against HBV, free HBV vaccination was routinely accessible to staff in this hospital. This study surveyed the hepatitis B vaccination coverage among HCWs at a tertiary hospital. Our results show that 63.3% of studied HCWs completely vaccinated with three doses of the HB vaccine while 36.7% had not received the vaccine.

The HBV vaccination coverage rate reported in the current study (63.3%) is higher than the rates of 40% reported among selected HCWs in Sweden (fully vaccinated )<sup>14</sup>, while vaccination coverage was found to be 48.2% in dental workers in Japan<sup>15</sup> and only 19.9% had full coverage of vaccination among HCWs in South Africa<sup>16</sup>. Additionally, the HBV vaccination rates among HCWs in the Middle East and other countries with low socioeconomic status have been reported to be unsatisfactory<sup>14</sup>. Studies from India<sup>17</sup>, Pakistan<sup>18</sup>, Egypt<sup>19</sup>, Brazil <sup>20</sup> and Nigeria <sup>21</sup> indicate that only 16—60% of HCWs have

received complete HBV immunization. In these countries, paramedics were more often unaware of HBV transmission and received HBV vaccination less often than doctors. However, our rate is less than rates reported among HCWs in other countries such as USA (75%)<sup>22</sup>, France (93%)<sup>23</sup>, Libya (72%)<sup>24</sup>.

The current study observed that complete HBV vaccination was significantly associated with age (above 30 years old), duration of work (above 5 years), profession (lab technician then dentists then nurses more than physicians) and good perception of the hepatitis B vaccine. Moreover, logistic regression indicated that our predictors of complete vaccination status among the participants were who had age above 30 years, profession group [lab technicians and nurses] and those who had good perception towards HB vaccine. Our results are in agreement with the findings of a study done in Nigeria<sup>25</sup> and Egypt<sup>26</sup> where vaccination coverage among HCWs was linked with longer years of working duration. In the same study at Egypt because routine HBV vaccine was not offered to HCWs in study sites, it is probable that younger HCWs had poorer vaccine uptake probably due to their lower access to HBV vaccine or poorer knowledge about their need for HBV vaccination as they are high risk group.

On the contrary, a different finding was reported in Greece<sup>27</sup> where younger HCWs were shown to be more likely to complete HBV vaccination. This difference may be due to different methods used or study tools or sample size.

Our results revealed most of participants had good knowledge of the risk factors for hepatitis B virus infection and good perception towards the hepatitis B vaccine. We think that the reason may be due to receiving educational programmes on hepatitis or from the media. This is in agreement with studies by Kesieme et al.<sup>28</sup> reported the most of study group were aware of the modes of transmission of HBV infection but the vaccination coverage among HCWs in Nigeria was low (65%). They noticed 78.9% of respondents assumed that Hepatitis B vaccine is safe and 81.1% would recommend it to another staff. On the opposite, other studies confirmed a very low knowledge of hepatitis B infection<sup>29-32</sup>. Kamolratanakul reported that lack of knowledge and negative attitudes were the major reasons for non-vaccination against hepatitis B virus. These were found to improve significantly after distribution of information about hepatitis B virus infection<sup>33</sup>.

On the other hand, regarding knowledge of HBV vaccine although most of study group had good awareness (91.7%) about the vaccine other than they had a lack of knowledge of some statements for HBV vaccine. Only 24.4% of participants rightly pointed to the right doses of the vaccine. This is similar to other study<sup>28</sup> observed the majority (86.8%) had the awareness of the existence of Hepatitis B vaccine. 83.8% of respondents believed that the vaccine should be given to the personnel as part of work place safety measures. Other study found 75.5%, were aware of the existence of Hepatitis B vaccine<sup>32</sup>. However Quddus et al.<sup>34</sup> found 31% of HCWs were aware of vaccine, 45% did not consider themselves among high risk group.

The explanation between the high level of awareness and low vaccination coverage may be due to lack of time or forgot to take the vaccine. The main strength of this study is that it includes all occupational categories of HCWs and randomly selected. However, this study may have some limitations as it is a cross-sectional study; therefore, the cause-effect relationship may be difficult to establish. Serological test may be needed to define vaccine status of HCWs and detect the reasons of non-vaccination, so further studies in this field needed.

## **Conclusion and recommendation**

Although the hospital had policies requiring staff to be vaccinated against HBV and free HBV vaccination was routinely accessible to staff in this hospital, hepatitis B vaccination coverage among HCWs in the hospital was low. They have a lack of knowledge of some statements for hepatitis B virus vaccine although they had good awareness about the vaccine. So we recommend to increasing the vaccine coverage especially among the physicians as they had a higher percentage of non-vaccinated, through training and the educational program must give to HCWs about HBV vaccine (doses, safety,...) and the necessity of following the HBV vaccine course. Moreover detection of the serum level of HBsAb after a complete vaccine by one or two months could be routine before the employment in the hospital for detection of immunity status and an indication of vaccination again if it is negative. Enforcement makes a valid certificate that the HCW can keep for employment. Furthermore different communication and discussion about beliefs

and fear is effective. A policy of mandatory hepatitis B surface antigen screening is important.

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