Original Research Article

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

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6 Abstract

7 Background: Healthcare workers in tertiary hospital are at the risk of exposure and possible 8 transmission of hepatitis B virus infection. Hepatitis B virus (HBV) infection is a major and important 9 occupational hazard among health care workers (HCWs), it is may be 2-10 times higher than in the 10 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 11 of health care workers randomly selected from a tertiary hospital, Jeddah, Saudi Arabia through 12 13 stratified cluster sampling. Results: vaccination coverage among study group was 63.3%. Complete HBV 14 vaccination was significantly associated with age above 30 years, duration of work above 5 years and 15 profession (p=0.002, 0.038 and 0.049, respectively). Our predictors of complete vaccination coverage 16 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 17 18 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 19 20 increasing the vaccine coverage through motivation and education of HCWs about HBV vaccine and the 21 necessity of following the HBV vaccine course. Enforcement makes a valid certificate that the HCW can 22 keep. Furthermore a policy of mandatory hepatitis B surface antigen screening and different 23 communication and discussion about believes and fear.

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

26 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 ¹. 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 transmission²

Many studies among HCWs the average risk of transmission after percutaneous exposure to infected blood has been estimated approximately 0.3% for human papiloma virus (HIV), 1.8% for Hepatitis C virus (HCV) and 6–30% for HBV ³. 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 ⁴.

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 ⁵.

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 hepatitis. The acute and chronic consequences of HBV infection are major problems both in developed as well as developing world ⁶.

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 ⁷.

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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 (>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 ⁸.

55 Pre-vaccination serologic testing is not indicated for most persons being vaccinated, 56 except for those persons and students at increased risk for HBV infection, such as those born 57 to mothers in or from endemic countries⁹.

Providers who are performing exposure-prone procedures also should receive prevaccination testing for chronic HBV infection ¹⁰. Exposure of a patient to the blood of HBVinfected 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)¹¹.

Before 1990, Kingdom of Saudi Arabia (KSA) was considered one of the hyper-endemic 63 countries for HBV infection. At that time, crude prevalence of HBV infection in different 64 provinces of the Kingdom ranged between 5% -12%. The overall prevalence was estimated to 65 be 8.3%¹². In 1990, a National Vaccination Program against HBV was introduced. A Committee 66 for the prevention of HBV infection was constituted and an immunization apparently resulted in 67 significant reduction of HBV infection among Saudi children with reported that the prevalence 68 has dropped to 0.05%¹³. In the current study we detect the hepatitis B vaccination coverage 69 among health care workers (HCWs) at a tertiary hospital, Jeddah, Saudi Arabia and to 70 determine the level of knowledge about the Hepatitis B vaccine, risk of exposure to HBV 71 infection and perception towards HBV vaccine among HCWs 72

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74 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. 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. All health care workers were eligible for the study.

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After informed consent was obtained, 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.

98 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.

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105 Results:

106 A total of 398 health care workers participated in this study and they are randomly 107 selected from different occupation s at a tertiary hospital in Jeddah, Saudi Arabia. Out of 450 108 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 31.51 109 \pm 9.11 years and mean duration of work was 5.92 \pm 6.38 years. Most of study group(72.9%) 110 111 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), 112 113 (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 of completely vaccinated group was 27.4% positive, 44.0% negative and 28.6% don't know their immune status.

118 Comparison between completely vaccinated and non-vaccinated group regarding 119 personal characteristics demonstrated in **table two**. Complete HBV vaccination was significantly 120 associated with age above 30 years, duration of work above 5 years and profession (p=0.002, 121 0.038 and 0.049, respectively). Whereas there was no association observed with gender, 122 nationality and marital status (p >0.05).

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124 Concerning knowledge of hepatitis B virus vaccine, 91.7% of participants were aware of 125 the presence of the vaccine. The majority (95.0%) were of the opinion that the vaccine should 126 be given as part of work place safety measure. while 38.7% thought that hepatitis B vaccine can 127 be administered simultaneously with hepatitis B immunoglobulin (HBIG) when indicated and 128 only 24.4% of participants rightly answered that complete vaccination does not consist of just 2 129 doses of the vaccine **(table 3.**

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As regards knowledge of the risk factors for HBV infection, 90.5%, 78.4%, 73.4% and 131 62.8% believed that hepatitis B virus infection can be transmitted through percutaneous injury, 132 mucous membrane contact with blood, and contact of abraded skin with potentially infected 133 134 tissue, contact of skin afflicted with dermatitis with potentially infected body fluid, respectively. 135 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 136 vaccinated group had significantly higher rates of knowledge than non-vaccinated group 137 regarding their awareness of the existence of hepatitis B vaccination (93.9% versus 70.3%, 138 P=0.000) and rightly indicated that complete vaccination does not consist of just 2 doses of the 139 vaccine (70.0% versus 30.0%, P < 0.002). While no significant difference was observed regarding 140 141 other questions about knowledge of HBV vaccine (P= <0.05). On the other hand regarding 142 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.

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The majority of study group had good perception of the hepatitis B vaccine, 91.7 % of the 147 respondents agreed that the vaccine is safe, 90.7% of respondents would recommend the 148 vaccine to another colleagues and 50.0% of respondents did not know how many of their 149 colleagues that had received hepatitis B vaccine (table 3). Moreover, There was statistical 150 151 significant difference between completely vaccinated and non-vaccinated group regarding their 152 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 153 colleagues had received HBV vaccine (71.4% versus 28.6%, P = 0.001). 154

155 The result of the logistic regression model demonstrated in **table 4**, it indicated that our

156 predictors of complete vaccination coverage among the participants were who had age above

157 30 years (OR= 2.164; 95% CI: 0.678 -3.907), profession group [Lab technicians (OR= 2.533; 95%

158 CI: 0.301-8.356) and Nurses (OR= 2.420; 95% CI: 0.709- 8.258)] and those who had good

159 perception towards HB vaccine (OR= 3.759; 95% CI: 1.582- 8.932)

160	Table 1: demographic characteristics and	I 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:	252 (62.2)
Completely Vaccinated	252 (65.5)
Non-vaccinated	146 (36.7)
Immune status (n=252) :	69 (27.4)
Positive	03 (27.4)
Negative	111 (44.0)
I don't know	72 (28.6)
I GOL L KNOW	, , , , , , , , , , , , , , , , , , ,

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

163 personal characteristics

	Vaccine covera			
	Complete Vaccination (n=252) N (%)	Non-vaccinated (n=146) N (%)	X ²	P -value
Gender Male Female	70(64.8%) 182(62.8%)	38 (35.2%) 108 (37.2%)	0.143	0.727
Age/ year ≤ 30 > 30	141 (57.3%) 111 (73.0%)	105 (42.7%) 41 (27.0%)	9.98	0.002*
Nationality Saudi Non-Saudi	100 (64.9%) 152 (62.3%)	54 (35.1%) 92 (37.7%)	0.283	0.669
Work duration /year ≤ 5 > 5	154 (59.5%) 98 (70.5%)	105 (40.5%) 41(29.5%)	4.750	0.038*
Marital status Single Married	107(59.8%) 145 (66.2%)	72 (40.2%) 74 (33.8%)	1.755	0.210
Profession : Physicians Dentists Lab technicians Nurses	83 (58.5%) 19 (79.2%) 19 (82.6%) 81 (66.4%)	59 (41.5%) 5 (20.8%) 4 (17.4%) 41 (33.6%)	9.474°	0 .049*
Others	50 (57.5%)	37 (42.5%)		

** Significant P >0.0 5

^a Fisher's Exact Test

166 **Table 3: Knowledge of hepatitis BV vaccine, risk factors for HBV infection and perception towards HBV**

167 vaccine among study group.

Knowledge of HBV vaccine		N %
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	Yes	154 (38.7)
immunoglobulin) when indicated	No	43 (10.8)
	DNK	201 (50.5
When indicated as part of post-exposure prophylaxis, it should be	Yes	182 (45.7)
administered within 24 hrs of exposure	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	Yes	250 (62.8)
fluid	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)

- 169 **Continue table3:** Knowledge of hepatitis BV vaccine, risk factors for HBV infection and perception
- 170 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

172 Table 4: Predictors of complete vaccination coverage among the participants: logistic

173 regression analysis

characteristics	OR	95% C.I	P -value
Gender: female	0.270	0.101 -0.727	0.010
Nationality : Non-Saudi	0.464	0.163 - 1.316	0.149
Duration of work / y: > 5 years	0.896	0.288 -2.783	0.612
Age: > 30 year	2.164	0.678 -3.907	0.019
Profession : - Dentists - Lab technicians - Nurses - Others	0.852 2.533 2.420 1.349	0.227-3.200 0.301-8.356 0.709- 8.258 0.508- 3.581	0.812 0.392 0.158 0.548
Perception towards HBV vaccine: - Good	3.759	1.582- 8.932	0.003

HB= hepatitis B, RF= risk factors

Knowledge about HBV vaccine: -Good	1.734	0.780- 3.855	0.177
Knowledge about RF of HBV infection: - Good	0.824	0.376-1.804	0.628
OR : odds ratio, C.I : confidence interval, Significant (<i>P</i> >0.05)			

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178 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.

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The HBV vaccination coverage rate reported in the current study (63.3%) is higher than the 185 rates of 40% reported among selected HCWs in Sweden (fully vaccinated)¹⁴, while vaccination 186 coverage was found to be 48.2% in dental workers in Japan¹⁵ and only 19.9% had full coverage 187 of vaccination among HCWs in South Africa¹⁶. Additionally, the HBV vaccination rates among 188 HCWs in the Middle East and other countries with low socioeconomic status have been 189 reported to be unsatisfactory¹⁴. Studies from India¹⁷, Pakistan¹⁸, Egypt¹⁹, Brazil²⁰ and Nigeria²¹ 190 indicate that only 16-60% of HCWs have received complete HBV immunization. In these 191 countries, paramedics were more often unaware of HBV transmission and received HBV 192 vaccination less often than doctors. However, our rate is less than rates reported among HCWs 193 in other countries such as USA (75%) 22 , France (93%) 23 , Libya (72%) 24 . 194

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 doctors) 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 Nigeria²⁵ and Egypt²⁶ 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.

206 On the contrary, a different finding was reported in Greece²⁷ where younger HCWs were 207 shown to be more likely to complete HBV vaccination. This difference may be due to different 208 methods used or study tools or sample size.

209 Our results revealed most of participants had good knowledge of the risk factors for 210 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. 211 This is in agreement with studies by Kesieme et al.²⁸ reported the most of study group were 212 aware of the modes of transmission of HBV infection but the vaccination coverage among 213 HCWs in Nigeria was low (65%). They noticed 78.9% of respondents assumed that Hepatitis B 214 vaccine is safe and 81.1% would recommend it to another staff. On the opposite, other studies 215 confirmed a very low knowledge of hepatitis B infection ²⁹⁻³². Kamolratanakul reported that lack 216 217 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 218 about hepatitis B virus infection ³³. 219

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On the other hand, regarding knowledge of HBV vaccine although most of study group 221 had good awareness (91.7%) about the vaccine other than they had a lack of knowledge of 222 223 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 ²⁸ observed the majority (86.8%) had the 224 awareness of the existence of Hepatitis B vaccine. 83.8% of respondents believed that the 225 vaccine should be given to the personnel as part of work place safety measures. Other study 226 found 75.5%, were aware of the existence of Hepatitis B vaccine ³². However Quddus et al.³⁴ 227 found 31% of HCWs were aware of vaccine, 45% did not consider themselves among high risk 228 229 group.

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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.

237 Conclusion and recommendation

239 Healthcare workers in the tertiary hospital are at the risk of exposure and possible 240 transmission of hepatitis B virus infection (vaccine preventable disease). Since the majority of 241 them are in continuous contact with the patient or infective material from the patient. 242 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 243 244 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 245 recommend to increasing the vaccine coverage through motivation and education of HCWs 246 247 about HBV vaccine and the necessity of following the HBV vaccine course. Enforcement makes 248 a valid certificate that the HCW can keep. Furthermore different communication and discussion about believes and fear and a policy of mandatory hepatitis B surface antigen screening. 249

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