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RESEARCH ARTICLE

HEPATITIS B VACCINE COVERAGE, KNOWLEDGE AND ATTITUDES AMONG HEALTH CARE PROVIDERS IN AL-MADINAH AL-MUNAWWARAH'S - KINGDOM OF SAUDI ARABIA

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ABSTRACT

Objectives: The Hepatitis-B virus (HBV) causes severe and often fatal liver disease. Since 1982, vaccination has proven remarkably successful in terms of effectiveness and safety; thus, it is administered to every primary healthcare worker (PHCW) to safeguard them against occupational exposure. The aim of this study is to investigate Saudi Arabian PHCWs' hepatitis B vaccination coverage, knowledge, and attitude.

Method: This descriptive, cross-sectional study employed a self-administered questionnaire, which was distributed to 645PHCWs in four primary healthcare divisions affiliated to Al-Madinah Al-Munawwarah's Directorate General of Health Affairs, Kingdom of Saudi Arabia.

Results: 542 completed questionnaires were returned (response rate 84%). Outcomes indicated that 73.8% PHCWs were fully vaccinated, 15.9% were partially vaccinated, and 10.3% never received vaccination.

Conclusions: Some PHCWs remain unprotected from HBV; therefore, primary preventive strategies like universal precaution and immunization must be implemented more fully.

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INTRODUCTION

The Hepatitis B virus (HBV) causes an acute andoften fatal liver disease that constitutes a global health issue. HBV initiates chronic liver problems, resulting in death from liver cancer and cirrhosis (Gust 1996; WHO 2000; WHO 2002). Approximately 2 billion individuals worldwide are estimated to be HBV-infected, and over 350 million develop chronic liver diseases (WHO 2000).The backbone of HBV-protection is vaccination. In 1991, the World Health Organization (WHO) recommended it to all nations, and by 2009, 177 nations reported that all babies received the vaccine. Worldwide estimated HBV-vaccine coverage was approximately 69% in 2008 (GID 2009; Zanetti 2008). Nearly 0.5-1.2 million individuals succumb to HBV-complications per annum (Lee 1997; Mahoney 1999). Since 1982, the HBV vaccine hasproven remarkably successful in terms of effectiveness and safety; over a billion HBV-vaccines have been administeredglobally. Immunization has decreased chronic infection in several nations, wherein 8-15% children would contract chronic HBV-triggered infection. This first-ever vaccine for a major form of cancer offers lifelong (minimum 20-years') protection (WHO 2013).The drop in HBV-infection occurrence and associated morbidity/mortality rates owing to the vaccine led the Centers for Disease Control and Prevention (CDC) to mandate HBV-inoculation for all HCWs in 2015 (Workers IoHc 2015).However, there is poor compliance in numerous healthcare settings, particularly in developing nations, and Saudi Arabia's HCW-immunization status is yet unclear. The country presents no recent HCW HBV-vaccine coverage study; only one prior study exists, portraying 39% coverage (Al-Turki and Abu-Gad 2000). HCWs are directly exposed to infected patients (blood pathogens/body fluids) in

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healthcare facilities and labs (CDC 2001). HB-infection constitutes an occupational hazard that is chiefly transmitted via contaminated body fluids/blood (Bolyard et al., 1998).Saudi Arabian vaccination recommendations are identical to CDC recommendations (CDC 1997), i.e., HB-vaccine administration in 3 doses, with second and third doses administered 1 and 6 months after the first dose to at-risk HCWs. Most Saudi Arabian research on HBV-vaccination involve dentists, other specific healthcare segment' specialists (Ayman et al., 2012), or special Hajj-season HCWs (Tariq et al., 2007). To our knowledge, this is the first research investigating Saudi Arabian PHCWs' hepatitis B vaccination coverage, knowledge, and attitude.

Patient-to-HCW-transmission

HBV-impregnated needles are the leading HBV-transmission mode among HCWs. Average inoculated-blood volume via needle-pricks determines HBV-transmission risk. Research involving HCWs exposed to HBV in this manner showed 6-14% contracting the disease and 27-45% developing serologic HBV-infection evidence (Mast and Alter 1993).

HBV Prevalence

HBV distribution can be segregated into 3 levels (low-intermediate-high) depending on disease endemicity. Developing areas such as China, Sub-Saharan Africa, the Amazon Basin, and South-East Asia are highly endemic (>8% HBV-carriers)Japan, the Middle East, Mediterranean countries, and eastern European nations are moderately endemic (2-8% carriers);other regions in these zones including southern Europe some South American areas have 10–60% carriers;[3]and US, Australia, other South American regions, and Western and Northern Europe have low endemicity (0.5-2% carriers, with 5–7% infected individuals) (CDC 2010).Saudi Arabia has moderate-to-high HBV-rate (>2% carriers) (Ziad et al., 2009). A Saudi Arabian study on 8-year hepatitis A/B/C-sero-positivity occurrence trends in the population used King Abdul-Aziz Medical City's surveillance system. Study outcomes depicted the average annual HBV-seropositivity occurrence to be 104.6 per 100,000 individuals (Ziad et al., 2009). HBV is estimated to affect over 2 billion individuals globally, with approximately 360 million suffering chronic infection, acute illness, and mortality risks (primarily from HCC and liver cirrhosis). Mathematical modeling projected annual global HBV-associated deaths in 2000 at around 600,000 (Goldstein et al., 2005).

Prevention and control

Key interventions for the reduction and prevention of HBV's global prevalence concentrate on highly-endemic, developing nations. The leading intervention has three components: behavior change for control/reduction of infection spread, active immunization, and passive immunoprophylaxis. The first generation of the HBV-vaccineobtained from inactive plasma was introduced in 1982; in 1986, its second generation became available to the public (Abraham et al. 1999; Lavanchy 2004). The vaccine forms the core of HB-prevention (95% effectiveness) (Rani et al., 2009). In 1991, the WHO recommended it to all babies, particularly in countries with ≥8% carrier prevalence (Lavanchy 2004). It is administered in 3 doses across a 6-month duration (0-1-6). HCWs in contact with patients' body fluids/blood must be HBV-vaccinated in three doses. Anti-HB tests must be conducted for recording immunity after 1–2 months post-immunization:

- Positive: ≥10mIU/mL (milli-international units per milliliter) anti-HBs indicate that HCW is immune and requires no additional immunization/serologic testing.
- Negative: <10mIU/mL anti-HBs indicates HBV-vulnerability, necessitating revaccination (another 3 doses), followed by retesting anti-HBs. If retest also indicates negative outcomes, individual is non-responder.

Non-responders are HBV-vulnerable and must be extra-cautious and take HBIG prophylaxis after probable/known HBV-exposure.[1] Non-responders may (possibly) already be HB-carriers and should be tested. HBV-affected HCWs must be guided and evaluated medically. Immunized HCWs (untested 1-2 months post-original-immunization) donot require regular anti-HBs testing unless exposed to body fluids/blood. HCWs with negative outcomes are at risk.

What is known?

A 2002-2003 U.S. cross-sectional study conducted to ascertain HCWs' HBV-vaccination coverage and policies systematically surveyed 425 out of 6,116 hospitals belonging to the American Hospital Associations. Of the 75% surveyed HCWs, 81% nurses/physicians, 71.1% phlebotomists, and 70.9% nurse aides/other patient-care personnel received ≥3 HBV-vaccine doses.79.5% white HCWs and 67.6% black HCWs received immunization. Low-risk HCWs who only required inoculation were considerably less-covered (76.6%) than at-risk HCWs (exposed to potentially-contaminated substances) (Edgar et al. 2007). Cross-sectional research in Greece's military hospitals for estimating HCWs' HB-immunization and establishing coverage-linked factors gave 245 nurses from 7 military hospitals self-administrated questionnaires. 75.5% respondents self-reported vaccine coverage; the RNs' coverage was more than that of the nurse aides. Positive beliefs/attitudes were associated with immunization acceptance or compliance; HCWs were aware of HBV being a crucial occupational hazard. These results proved the need for increased coverage and compliance through developing targeted immunization programs for non-vaccinated, at-risk HCWs (Dimitris and Apostolopoulou 2009).

A cross-sectional study of 485 public and private sector HCWs in rural Tehsil Swabi, Northwest Pakistan in 2010 evaluated vaccination status and investigated facilities to discover that personal characteristics were linked to vaccination coverage. A questionnaire obtained socio-demographic information and data on HBV-vaccination, knowledge of transmission modes, perceived vaccination benefits, and disease severity. Participants were chosen from 483 primary healthcare centers (447 private, 36 public). 75% of participants were physicians, and the rest were dispensers. Mean HCW age was 38 years (10.4), while average experience in the field was 12.2 (8.6) years. 40% of respondents self-reported complete

immunization. HBV-immunization prevalence included 41% physicians and 37.7% dispensers. Public HCWs showed higher vaccine compliance (76.8%) than private workers (35.4%). Qualified physicians showed the highest coverage (86%), while dispensers without formal qualification showed the lowest coverage (16%) (Yousafzai et al., 2014). HCWs from 2 Georgian hospitals in Kaspi and Batumi participated in a cross-sectional survey in 2007 tomeasure HBV-vaccination rates and determine vaccine compliance factors among them. They were given self-administered questionnaires with questions on demographic characteristics, HB-immunization status, vaccination barriers, and inclination to recommend HB-vaccine to peers. Laboratory tests identified HB-infected, immune, and at-risk individuals. 91% of HCWs responded (173 nurses, 124 physicians). Vaccine coverage was 12%; 54% of participants agreed to recommend it to peers; 72% regarded the vaccine as safe (of which 70% recommended it to others). 66% of HCWs perceived cost to be an obstacle to vaccination and believed it was imperative to offer free/economical vaccination. The probability of recommendation was linked to coworkers' completion of vaccination; 37% formed attitudes and acquired knowledge on the vaccine from a harmful-event reporting mechanism; 27% from medical literature; 22% from vaccine testing for identifying contaminants; and 7% from vaccine effectiveness reports (Topuridze et al., 2010).

A descriptive, cross-sectional HCW survey for evaluating their attitudes, behavior, and knowledge regarding HBV-protection/transmission was conducted in Kuwait's capital and Farwaniya Governorate in 2011.A specially-designed questionnaire drawn from other published research was administered to 534 individuals. The response rate was 55%. 76.2% of respondents knew that HBV can be transmitted to them via patients; 57.7% knew that worker-to-patient transmission was also likely; 81.5% knew of vaccination; 65% had information on overall vaccination schedule; and 44.4% had knowledge regarding the time gap between doses.74.7% PHCWs reported being vaccinated; of these, 84% received complete vaccination, 73.8% reported requiring more information on the disease, and 79.3% individuals were never vaccinated with no specific cause for missing immunization (Soad et al., 2012). In order to outline prevention priorities based on institutional injury data and highlight the risk of sharp-object injuries, a 2008 cross-sectional study in Syrian University Hospitals involving HCWs' HBV-immunization status chose participants via computerized randomization. A self-formulated researcher-administered questionnaire from 316 HCWs showed the following results: 76.6% HCWs received ≥1 needle-stick injury in one year; 23.4% were non-immunized; 56.1% completed vaccination course; and 20.6% were incompletely-immunized. Housekeepers, a high-risk group, depicted low HBV-vaccine coverage (4.5%)(Yacoub et al., 2010). A cross-sectional study assessed Hajj-time HCWs' (Arafat and Mina nurses and doctors) compliance in obtaining HBC, meningococcal, and influenza immunization. Anonymous, self-administered, researcher-supervised questionnaires obtained demographic/ vaccination history-related information. 392 HCWs enrolled in Hajj-medicine training. The response rate was 100% (45.2% doctors, 54.8% nurses), and 82.4% HCWs were meningitis-immunized, 5.9% were influenza-immunized, and 66.3% were administered a complete HBV course (of these, 51.5% were anti-HB-tested post-vaccination). 12.2% received only two HB-vaccine doses, 7.1% received only one dose, and 14.3% were non-immunized. No significant difference was seen between the compliance of nurses and doctors (Madani and Ghabrah 2007). A 2012 cross-sectional survey at Faculty of Dentistry, King Abdul-Aziz University assessed HBV-vaccination coverage and infection controls among Saudi dentists. A questionnaire to obtain information on post, service length, demographic data, HBV-vaccine status, anti-HB tests, needle-stick-injury history, disease history, and infection control precautions was administered to 402 dentists (226 female, 176 male). 80.5% received HB-immunization; 48.5% reported needle-stick injuries; none reported HBV-infection. Younger dentists used protective wear routinely and were vaccinated. A link was found between vaccination and protective barriers but not between vaccination and needle-stick injuries (Al-Dharrab and Al-Samadani 2012).

MATERIALS AND METHODS

Study Design

A descriptive cross-sectional research was carried out using a quantitative method: a self-administered questionnaire was given to subjects.

Study Setting

The research was performed at Al-Madinah Al-Munawwarah. Al-Madinah has 43 government health facilities with 1200 PHCWs.

Sampling method

There are 4 administrative divisions in Al-Madinah. The 645 consented HWCs were proportionally allocated among sectors depending on the PHC centers per sector. 43 PHCCs exist in Al-Madinah. Therefore, 645/43=15, multiplied by total PHCCs in individual sectors gives HWCs chosen from each. The average of HCWs in individual PHCCs in individual sectors was utilized for determining number of PHCCs to be studied; PHCCs were chosen randomly.

Inclusion criteria

HCWs having job experience over 6 months, PHCWs available during data collection, and Health Professionals from PHCCs were included.

Data Collection Tools

A structured, self-administered, anonymous questionnaire developed in English and translated into Arabic was used. Pilot study and iterative translation checks were applied to ensure equivalence. Both English and Arabic questionnaires were distributed among PHCWs. The questionnaire explained survey significance, participation significance, voluntary participation, respondent benefit, confidentiality, and estimated completion time. Questions were clarified before participants. The questionnaire had 4 sections:

1: Demographics: Participant gender, age, nationality, job category, and job experience (years).

2: Knowledge: Participant knowledge of HBV-vaccine's significance, effectiveness, complete dosage, route of immunization, and time gap between doses (months).

3: Attitude: Views on occupational risk from HBV; mandating of HBV-vaccination; perception of personal risk because of precautions during patient-contact and procedures; perception of pain inflicted by vaccine [on a 5-point strongly disagree--strongly agree scale]

4: Practice: Protection from and exposure to HBV; immunization; number of doses administered; immunity check post-vaccination; contaminated sharp-object injury history; obstacles to vaccine completion/administration.

Data Analysis

We used Microsoft Access for entering gathered data; analysis was done via EPI INFO. PHCWs' vaccine coverage attitudes, knowledge, and obstacles to completion and administration was analysed using descriptive analysis. Five questions assessed HBV-vaccine-related knowledge on a 0-5 scale [<2=poor; 2-4=moderate; 4-5=good). Correct replies scored 1, while wrong replies/'Don't-knows' were marked 0. HCWs' attitudes were measured through four questions via aLikert scale [*positive statements*: 0=strongly disagree, 5=strongly agree; and *negative statements*: 0=strongly agree, 5=strongly disagree]. Overall potential scores scaled from 0-20 [Negative attitude: 0-11; neutral attitude: 12-15; positive attitude: 16– 20].

Study Validity

A pilot study with 20 participants was conductedto test questionnaire reliability, question validity, clarity, and information validity. These participants were omitted from the final study due to sensitization to questions. The formulation of the questionnaire was done such that all variables' elements (attitudes, knowledge, and coverage) were accounted for to ensure content validity.

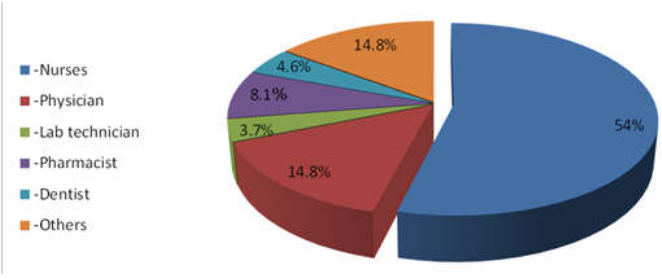
Ethical Considerations

The research Ethics Committee 14/4014/IRB of King Saud University's Institution Review Board gave ethical consent for the study (Research Project No.E-14-1077), and Al-Madinah's Directorate General of Health Affairs approved the study. A separate respondent consent form explicitly indicated voluntary participation and stated research summary (title, goals, and objectives), societal benefits, and respondents. Identification details of respondents were not sought, thereby ensuring confidentiality and anonymity.

RESULTS

645 questionnaires were distributed among all PHC sectors of Al-Madinah [Northern sector (4 PHCCs, 135 HCWs), Southern sector (6 PHCCs, 165 HCWs), Western sector (7 PHCCs, 165 HCWs), and Eastern sector (7 PHCCs, 180 HCWs). HCWs were randomly chosen based on inclusion criteria. 542 completed questionnaires were returned; thus, response rate was 84% [54% nurses, 14.8% physicians, 14.8% other specialty health workers, 8.1% pharmacists, 4.6% dentists and 3.7% laboratory technicians] (Figure 1).

Figure 1. Pie chart of distribution based on Job category



Descriptive statistics

Respondents' socio-demographic characteristics

Most participants were male (57.7%) Saudi nationals (90.6%) aged 23-63 (mean age=34.3 years, SD=7.37). In terms of occupation, nurses constituted the majority sample (54%). Experience in the sector was from 1-37 years (mean=10.6 years; SD=7.4). Sector-wise, the majority of participation was by eastern sector HCWs (26.8%)

PHCWs' HBV-vaccine coverage

73.8% HCWs received complete vaccination, 15.9% were incompletely immunized, and 10.3% never received vaccination (Table1). 89.7% reported being administered no less than one dose; 81.1% completed three doses; 9.3% completed two doses; 4.9% were only administered one dose; and 1.2% received >3 doses (Fig2). Of the 48.1% HCWs with anti-HB testing history and 95.3% tested positive.

Table 1. HCW's vaccine compliance distribution

Vaccine level status	Frequency	Percent
1- Completely vaccinated	400	73.8%
2-Incomplete vaccination	86	15.9%
3- Never vaccinated	56	10.3%
Total	542	100.0%

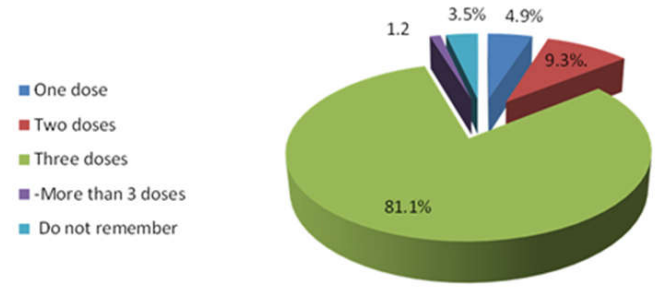


Figure 2. Pie chart depicting HCW's HB vaccine doses

HBV-vaccination-related knowledge

Scores were on a 0-5 scale (mean=3.93;SD= 1.03). 74.2% of respondents possessed high knowledge; 23.1% possessed moderate knowledge; and 2.7% possessed weak knowledge (Table2).Table 6 depicts HCWs' knowledge levels; clearly, most participants were aware of the HBV vaccine's significance (96.5%), 48% knew its effectiveness, 90.4% knew number of doses for total protection, 82.5% knew the HB-route, and 76.2% were familiar with the time gap between doses.

Table 2. HCW's knowledge level

Knowledge Levels	Frequency	Percent
high knowledge	402	74.2%
Moderate knowledge	125	23.1%
Low knowledge	15	2.7%
Total	542	100.0%

HCWs' attitudes towards HBV vaccination

The actual overall score range indicated a good overall attitude (mean=16.23, SD=2.02). 67.2% depicted a positive attitude, 31% depicted a neutral attitude, and 1.8% showed a negative attitude.

Needle stick/sharp-object injury occurrence and instrument type

39.7% of respondents reported sharp-object injuries at work, and 60.3% reported no injuries. Needles caused 88.8% injuries, blades caused 7.9% injuries, and other sharp instruments caused 3.3% injuries. Nurses reported the highest number of sharp-object injuries (69.3%).

Vaccination Barriers

36% respondents cited shortage of time as the reason for failure for immunization; 34.5% indicated negligence, 14.8% reported lack of awareness, 7% reported fear of adverse effects, 6.3% reported others obstacles, and 1.4% reported unimportance of vaccine in their view as reasons for non-compliance.

DISCUSSION

The response rate was 84%, which is lower than that of a Georgian study (91%)(Topuridze et al. 2010) and higher than that of a Kuwaiti study (55%) on the same subject (Habiba et al. 2012). Response rate results adequately represent target population with frequent researcher-respondent interaction at the workplace.

Vaccination coverage

The study showed satisfactory vaccination coverage/ acceptance: 89.7% HCWs received ≥1 dose, and 73.8% were administered full course (3+ doses). Vaccine coverage in Saudi HCWs is in line with a 2010 Pakistani study (73.42%).[26]48.1%of HCWs with vaccination history undertook anti-HB testing; this percentage is less than the Hajj-time study (51.5%) (Goldstein et al. 2005).HBV-immunity among vaccinated respondents was 95.3%. Only 10% respondents reported non-immunization (Knowledge 2002).The Saudi Ministry of Health gives free HB-vaccines to all HCWs.

Knowledge

96.5% of study respondents were aware of HBV-vaccine's significance, 90.4% knew correct vaccine dosages for total protection and 76.2% had knowledge of the necessary time gap between doses. The time-gap knowledge percentage is greater than that depicted by the Kuwaiti study (Habiba et al. 2012). PHCWs probably obtained this information via an infection control initiative in all of Al-Madinah's PHCs.

Attitude

The study showed encouraging results with regards to HBV-vaccine-related attitudes: 67.2% participants reported a positive view, while 70.8% believed their job made them HBV-susceptible. 83.4% HCWs strongly believed in the need for mandating HBV-vaccine for all HCWs; 61.2% disagreed/didnot strongly agree to not being HBV-susceptible due to precautions during patient-contact, and 47% respondents strongly disagreed/disagreed that HBV-vaccine may cause harm. Non-immunized/incompletely-immunized respondents cited time constraints (36%) and negligence (34.5%) as key barriers. This result is similar to a Georgian study that reported the main barrier to HBV-vaccine as concerns regarding vaccine safety (Topuridze et al. 2010).Occupational exposure concern was expressed by39.7% of participants who reported needle-stick/sharp-object injuries at work as opposed to the results of a Syrian study (76.6% with ≥1 injury in previous year) (Yacoub et al., 2010).

Study Limitations

Bias-induced errors were minimized via a statisticallypowerful sample. Respondent anonymity and consent form collection prior to questionnaire administration ensures questionnaire validation. Recall bias is likely as past experiences are needed. For error reduction, the study employed random sampling and an increased sample size.

Conclusion

There is still a need for improved HBV-vaccine coverage among PHCWs. Coverage is affected by lack of knowledge/awareness, attitude in addition to other factors. PHCWs' high infection transmission risks necessitate increased protection, which may be achieved through enhanced vaccine availabilityfree-of-cost to all HCWs. Completion of a full HBV-immunization course must be made compulsory for HCWs prior to job commencement. National guidelines and policies endorsing mandatory HBV-vaccination should be implemented.

Recommendations

The following recommendations are made from the results of this study:

1- Increase HCWs' HBV-vaccine-related knowledge;
2- Increase HCWs' vaccination coverage (particularly dentists and nurses);
3- HBV-related education must continue targeting HCWs with negative attitudes;
4- Offer anti-HBs testing post-vaccination and improve PHCWs' adherence to it;
5- Strengthen HCW supervision on good workplace practices.

Compliance with Ethical Standards: This study is funded by the College of Nursing Research Center at King Saud University

Conflict of interest: Authors have no conflict of interest

Ethical Approval: IRB approval was obtained. Informed consent was obtained from all participants in this study.

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