Predicting Hepatitis B Preventive Behaviors among Hospital Staff: The Role of Knowledge, Risk Perception and Behavioral Intention

Abstract

Aims: Hepatitis B virus (HBV) infection is a major public health concern. Aimed to determine the relationship between knowledge, risk perceptions and behavioral intention in predicting preventive behaviors toward HBV.

Methods: This descriptive–analytical cross-sectional study was conducted on 662 healthcare workers between April and August in 2025. Participants were selected through proportionate stratified random sampling based on predefined inclusion and exclusion criteria. Data were collected using a four-part questionnaire covering demographic characteristics, HBV-related knowledge, and items assessing personal and general population risk perceptions, behavioral intention, and behavior. Data were analyzed in SPSS version 25 using descriptive statistics, independent t-tests, Pearson correlation, analysis of variance (ANOVA), and multivariable linear regression.

Findings: The mean age of participants was 32.38 ± 6.53 years. Mean (±SD) scores were for knowledge (5.98 ± 1.16), personal risk perceptions (7.96 ± 1.63), general population risk perceptions (18.20 ± 2.77), and behavioral intention (10.68 ± 2.22). Multivariable regression analysis showed that knowledge (β=.188, P=.000), personal risk perceptions (β= 0.134, P=.001), intention (β=.097, P=.012) and general population risk perceptions (β= .157, P=.000) explained the behavior scores.

Conclusion: Regular education on HBV infection prevention through structured workshops and retraining courses which can yield favorable outcomes in enhancing disease prevention is essential for the continuous empowerment of these high-risk occupational groups.

Keywords: Hepatitis B, Intention, Risk perceptions, Healthcare workers, Knowledge, Behavior

Introduction

Hepatitis B is a serious and potentially life-threatening hepatic infection caused by the hepatitis B virus (HBV) [1, 2]. HBV infection remains a major global public health concern [3]. According to World Health Organization (WHO) estimates, 254 million individuals were living with chronic hepatitis B in 2022, with 1.2 million new infections and approximately 1.1 million associated deaths reported annually [4]. Globally, one in 15 people is infected with HBV [1]. Chronic infection significantly increases the risk of severe long-term complications, such as liver cirrhosis and hepatocellular carcinoma, which are well-established primary drivers of HBV-related mortality [5]. Due to occupational exposure, the incidence of HBV infection among healthcare workers (HCWs) is approximately 2 to 10 times higher than that observed in the general population. Globally, it is estimated that sharps and needlestick injuries (NSIs) account for approximately 66,000 HBV infections among HCWs each year [6].

In Iran, the overall prevalence of hepatitis B is estimated at 1.5% to 5.0%, categorizing the country as an area of intermediate (moderate) endemicity. HCWs represent a high-risk population for this infection, underscoring the critical need for primary prevention strategies, as occupational contact with contaminated body fluids is a primary route of transmission [7]. The transmission of nosocomial infections to healthcare personnel poses a critical challenge in clinical settings. Consequently, the Centers for Disease Control and Prevention (CDC) recommends universal HBV vaccination for HCWs owing to their heightened vulnerability to NSIs and exposure to infectious blood and body fluids [8].

Although more than 200 distinct pathogens can be transmitted via blood contact, only approximately 30 infectious agents are recognized as occupationally transmissible to HCWs through blood or body fluid exposures. Sharps and needlestick injuries represent one of the most critical occupational hazards in healthcare facilities, predisposing personnel to bloodborne infections, including human immunodeficiency virus (HIV), hepatitis B, and hepatitis C [9–11]. The reported prevalence of NSIs among healthcare personnel varies widely across settings: 76% in Turkey, 17% in Colombia, 10% in the United States, and 58% in Iran [12–16].

Several factors contribute to the high frequency of occupational sharps exposures and subsequent transmission of infections such as HBV. These include non-adherence to injection safety guidelines, improper use of personal protective equipment (PPE), inadequate segregation of biomedical waste, occupational fatigue and reduced concentration, time pressure, high workload, uncooperative or critically ill patients during procedures, improper disposal into sharps containers (safety boxes), and an absence of regular educational programs resulting in knowledge deficits [17–19]. Blood contains the highest viral titers of HBV among all body fluids, with the risk of transmission following percutaneous exposure ranging from 1% to 6% for hepatitis B e-antigen (HBeAg)-negative sources to 22%–31% for HBeAg-positive sources [3].

Enhancing awareness regarding the etiology, signs, and symptoms of HBV infection constitutes a critical strategy for mitigating disease transmission. Effective prevention relies heavily on adequate knowledge, positive attitudes, and optimal adherence to preventive practices [20]. Accordingly, assessing baseline knowledge, attitudes, and practices (KAP) in target populations is an essential prerequisite for designing educational interventions. Risk perception is widely regarded as a central construct in predicting and promoting health-protective behaviors [21]. Within the framework of the Health Belief Model (HBM) which posits that behavioral change is driven by modifications in cognitive beliefs perceived threat is a core dimension. Under this construct, individuals must first recognize their personal vulnerability to a condition (perceived susceptibility) and subsequently understand the seriousness and potential clinical consequences of that outcome (perceived severity). Furthermore, behavioral intention defined as an individual's conscious plan or motivation to perform a specific action serves as the immediate proximal determinant of actual behavior [22].

Given that hepatitis B represents a major occupational risk for healthcare personnel, targeted preventive measures within this vulnerable cohort are paramount [23]. Therefore, this study was conducted to evaluate the associations among knowledge, perceived risk, and behavioral intention in predicting hepatitis B preventive behaviors among HCWs in hospitals affiliated with Qazvin University of Medical Sciences.

Materials & Methods

Study Design and Participants

This descriptive–analytical cross-sectional study, approved by the Ethics Committee of Qazvin University of Medical Sciences (ethics code: IR.QUMS.REC.1403.439), was conducted between April and August 2025. The study population consisted of HCWs from four teaching hospitals Velaiat, Rajaee, Ghods, and Bu-Ali affiliated with Qazvin University of Medical Sciences, located in northwest Iran. Participants were recruited from various hospital departments, including support and paraclinical wards, internal medicine, emergency and observation units, service units, surgery and urology wards, operating rooms and ophthalmology, ICU, and CCU.

The required sample size was calculated using Cochran's formula, with a 95% confidence level, d = 0.05, z = 1.96, P = 0.5, and accounting for a 10% attrition rate, resulting in approximately 682 participants. Sampling was performed using proportionate stratified random sampling based on the total number of employees in all teaching hospitals in Qazvin, in accordance with the study's inclusion and exclusion criteria. Inclusion criteria were employment in one of the four teaching hospitals affiliated with Qazvin University of Medical Sciences, willingness to participate, and provision of informed consent. Exclusion criteria included incomplete response to the questionnaire and unwillingness to continue participation.

Data Collection Tool

Data were collected using a four-part questionnaire:

1. Demographic characteristics (5 items): age, gender, education level, work experience, and job position

2. Knowledge: Seven items assessing knowledge of HBV prevention and control, developed by Tafti et al. [24]. For example: *"Hepatitis B can be transmitted through eating food prepared by an infected person."* Correct responses were scored as 1 and incorrect responses as 0, yielding a total score range of 0–7.

3. Perceived risk constructs and behavioral intention, developed by Gonzales et al. [25]:

General population risk perceptions (GPRP): Assessed with five items, e.g., *"Hepatitis B affects people of all ages."* Each item was rated on a five-point Likert scale from *strongly disagree* (1) to *strongly agree* (5). The total score ranged from 5 to 25, with higher scores indicating a perception that the general population is at risk for HBV (Cronbach's α = 0.77).

Personal risk perceptions (PRP): Measured with two items, e.g., *"I am at risk of contracting hepatitis B."* Rated on the same five-point Likert scale as above; scores ranged from 2 to 10 (Cronbach's α = 0.51).

Behavioral intention: Measured with three items, e.g., *"How likely are you to contact your physician to obtain more information about hepatitis B vaccination?"* The first two items used a Likert scale from *very unlikely* (1) to *very likely* (5), and the third item used a scale from *strongly disagree* (1) to *strongly agree* (5). Total score range: 3–15 (Cronbach's α = 0.56).
4. Behavior: Assessed with two items regarding receipt of the hepatitis B vaccine and performance of HBsAg testing. "Yes" responses were scored 1, and "No" responses were scored 0.
Researchers provided participants with information about the study's purpose, assured them of questionnaire anonymity and confidentiality of data, and obtained written informed consent before proceeding. Participants then completed the questionnaires.

Data Analysis

After data collection, statistical analysis was conducted using SPSS version 25. Data normality was assessed with the Kolmogorov–Smirnov (*k–s*) test. Descriptive statistics (mean, standard deviation, frequency, and percentage) were calculated. Inferential analyses included independent *t*-tests, Pearson correlation coefficients, analysis of variance (ANOVA), and multivariable linear regression.

Findings

Of the 682 completed questionnaires, 20 were excluded due to missing data. Ultimately, data from 662 participants were analyzed. The mean age of the participants was 32.38±6.53 years, with the majority (47.4%) aged between 30 and 39 years. Most participants were female (60.9%) and held a bachelor's degree (61%) (Table 1).
As shown in Table1, the mean±SD scores for the study constructs were as follows: knowledge of hepatitis B, 5.98±1.16; PRP, 7.96±1.63; GPRP, 18.20±2.77; and behavioral intention, 10.68±2.22. Significant associations were found between education level and knowledge (P=000), PRP (P=.001), behavioral intention (P=.001). Job position was significantly associated with knowledge (P=.000) and behavior (P= .007), while gender was significantly associated with behavior (P=014). No significant associations were observed between other demographic variables and the studied constructs (Table 1).

Table 1. Relationship between constructs and demographic characteristics of participants (n = 662)

Variables	No. (%)	Kn M±SD	PRP M±SD	GPRP M±SD	BI M±SD	Be M±SD
Education level						
Less than high school diploma	١٨(٢.٧)	٤.٨٣±١.٧٥	٧.٧٢±١.٤٨	١٦.٩٤±٣.٩٧	٩.٢٢±١.٩٢	1.94±0.23
Diploma	٦٠(٩.١)	٥.٠٣±١.٧٠	٧.٢٩±١.٧٩	١٨.٣٧±٢.٧٥	١٠.٠٥±٢.٥٨	1.88±0.32
Associate	٣٨(٥.٧)	٥.٧٦±١.٠٥	٧.٣٢±١.٧٥	١٧.٩٢±٣.١٤	١٠.٦٨±١.٩٨	1.86±0.34
Bachelor	٤٠٤(٦١.٠)	٦.١٠±١.٠٤	٨.٠٩±١.٥٥	١٨.٢٢±٢.٧٠	١٠.٧٧±٢.٢٢	1.95±٠.21
Master	٩٠(١٣.6)	٦.١٠±٠.٨٦	٨.١٨±١.٥١	١٨.٣١±٢.٧٩	١١.١٩±١.٨١	1.92±٠.26
PhD	٥٢(٧.٩)	٦.٤٨±٠.٥٧	٧.٩٢±١.٩١	١٨.٣١±٢.٤٩	١٠.٢٩±٢.٣٣	1.94±٠.23
P-value		.000*	0.001*	.٤٧٦	0.001*	.149
Age (years)						
19-29	٢٥٥(٣٨.٥)	٦.٠٨±١.٠٤	٨.١٥±١.٦٢	١٨.١٨±٢.٦٣	١٠.٨٢±٢.٢٠	1.94±٠.23
30-39	٣١٤(٤٧.٤)	٥.٩٤±١.٢٢	٧.٨٨±١.٦٧	١٨.٢٦±٢.٨٧	١٠.٦٠±٢.26	1.94±٠.23
40-49	٨٠(١٢.١)	٥.٨٦±١.٠١	٧.٧١±١.٥١	١٨.١١±٢.٨٩	١٠.٥٤±٢.٠٨	1.92±٠.26
50≤	١٣(٢.٠)	٥.٦٩±٢.٠٥	٧.٦٩±١.٣١	١٧.٦٢±٢.١٨	١٠.٤٦±٢.٤٣	1.76±٠.43
P-value		.269	.090	.843	.587	.088
Work experience (years)						
1-10	٤٨٠(٧٢.٥)	٥.٩٧±١.١٥	٨.٠٠±١.٦٦	١٨.١٧±٢.٧٧	١٠.٧١±٢.٢٣	1.94±٠.23
11-20	١٥٨(٢٣.٩)	٥.٩٩±١.١٩	٧.٩٥±١.٥٦	١٨.٣٠±٢.٧٥	١٠.٧٢±٢.١٠	1.93±٠.24
21-30	٢٤(٣.٦)	٦.٠٨±١.١٠	٧.٣٠±١.٣٢	١٨.١٧±٢.٩٧	٩.٧١±٢.٥٩	1.83±٠.38
P-value		.892	.138	.875	.094	.106
Job position						
Nurse	٤٢٣(٦٣.٩)	٦.٠٦±١.٠٩	٨.٠٥±١.٥٧	١٨.١٠±٢.٨٧	١٠.٨١±٢.٢١	1.94±٠.22

Services	١٣٥(٢٠.٤)	٥.٤٧±١.٤٣	٧.٧٩±١.٧٣	١٨.٢٦±٢.٨٥	١٠.٣٠±٢.٣٤	1.90±٠.29
Physician	١٧(٢.٦)	٦.٤١±٠.٦١	٨.٠٠±١.٣٢	١٩.٣٥±٢.١٤	١١.٠٠±٢.٠٦	1.94±٠.24
Laboratory technician	٥٢(٧.٩)	٦.٣٣±٠.٨٣	٧.٩٠±١.٨٨	١٨.٢٣±٢.١٩	١٠.٤٨±٢.٠٥	1.94±٠.23
Radiologist	٣٥(٥.٣)	٦.٢٩±٠.٧١	٧.٦٣±١.٦٢	١٨.٥٤±١.٩٦	١٠.٦٦±٢.٠١	1.91±٠.28
P-value		.000*	.380	.392	.184	007*
Gender						
Male	259(39.1)	5.90±1.23	7.90±1.67	18.22±2.75	10.85±2.13	1.90±0.29
Female	403(60.9)	6.03±1.10	8.00±1.60	18.19±2.78	10.56±2.27	1.95±0.20
P-value		.492	.292	.676	.164	.014*

Notes: * P-value = 0.05, knowledge (kn), General population risk perceptions (GPRP), Personal risk perceptions (PRP), Behavioral intentions (BI), Behavior (Be)

According to the Pearson correlation matrix (Table 2), statistically significant positive correlations were found between behavior and knowledge (r=.181, P<.01), PRP (r=.166, P<.01), GPRP (r=.199, P<.01), and behavioral intention (r =.177, P<.01).

Table 2. Pearson correlation matrix (r coefficient) of constructs' scores and behavior

Constructs	M±SD	kn	PRP	GPRP	BI	Be
Kn	5.98±١.16	1				
PRP	7.96±١.63	.161*	١			
GPRP	18.20±2.٧7	.126*	.309*	1		
BI	10.68±2.22	.135*	.193*	.246*	1	
Be	1.93±0.24	.181*	.166*	.199*	.177*	1

Notes: *P<0/01, knowledge (kn), General population risk perceptions (GPRP), Personal risk perceptions (PRP), Behavioral intentions (BI), Behavior (Be)

Multiple linear regression analysis (Table 3) was conducted to predict behavior. Among the variables entered into the model, knowledge, PRP, intention and GPRP collectively explained 11% of the variance in behavior. Specifically, for every one standard deviation increase in knowledge, PRP, intention and GPRP scores, behavior scores increased by 0.188, 0.134, 0.097 and 0.157, respectively.

Table 3. Regression findings for predicting hepatitis B preventive behaviors

Predictor Variables		B	Std. Error	Beta	t	P
Behavior	(Constant)	.438	.426	-	1.028	.304
	Knowledge	.040	.008	.188	4.991	.000
	Personal risk perceptions	.043	.013	.134	3.374	.001
	Intention	.011	.004	.097	2.506	.012
	General population risk perceptions	. 014	.003	.157	3.929	.000
ADJR^2=.108	R^2=.116	R=.341				

Discussion

This study aimed to investigate the associations among knowledge, perceived risk, and behavioral intention in explaining hepatitis B virus (HBV) preventive behaviors among HCWs in hospitals affiliated with Qazvin University of Medical Sciences.

Overall, respondents demonstrated a high level of HBV-related knowledge, with a mean score of 5.98 out of 7.00. This favorable outcome may be attributed to structured institutional training programs, including hospital-based workshops, as well as informal on-the-job orientation provided by shift supervisors and infection control personnel. These findings align with previous national studies. For instance, Tafti et al. reported that healthcare personnel attained 83.78% of the total obtainable knowledge score [24]. Similarly, Nasirzadeh et al. observed a mean awareness score of 5.56 out of 8.00 among students at Isfahan University of Medical Sciences; however, approximately 70% of those participants showed deficient knowledge regarding HBV transmission routes [21]. In another investigation, Razi et al. found that 80% of biological science students and 62% of non-biological science students answered awareness items correctly [26].

On the international level, findings have been more variable. Balegha et al. observed a moderate level of knowledge regarding hepatitis B prevention among their respondents [20]. Conversely, Hang Pham et al. identified poor knowledge among HCWs in China, attributing this deficiency primarily to inadequate occupational training on HBV prevention [23]. In a study by Alaridah et al. (8), 58.9% of healthcare students and 30.2% of healthcare personnel incorrectly believed that HBV could be transmitted through sharing utensils and food with an infected individual. Comprehensive knowledge regarding hepatitis B prevention encompasses an understanding of HBV etiology, modes of transmission, clinical manifestations, diagnostic modalities, therapeutic options, long-term complications, immunization schedules, and the availability of post-exposure prophylaxis (PEP) for individuals at occupational risk [20].

In the present study, only 6.3% of participants (42 of 661) had never received an HBV vaccine, indicating that the vast majority had received at least one dose. Furthermore, 83.1% of the personnel reported undergoing prior serological testing for HBV. This high level of compliance among hospital personnel in Qazvin may be explained by their elevated knowledge levels—which correlated significantly with practice as well as routine administrative supervision, clinical audits, and constructive feedback delivered by department supervisors. Similarly, Nguyen et al. reported that 84.2% of medical students had undergone HBV screening and 83.9% had received HBV vaccination, with an overall mean knowledge, attitude, and practice (KAP) score of 40.2 out of 54.0 (74.4%), reflecting a satisfactory level of understanding [6]. Standard preventive practices against HBV infection include routine screening, complete vaccination courses, post-vaccination serological testing for protective surface antibodies, single-use glove replacement per patient encounter, strict avoidance of needle recapping, prevention of needlestick injuries (NSIs), and adherence to barrier precautions to prevent blood and body fluid splashes [20].

The perceived risk of HBV infection among participants in this study was high, with a mean individual perceived risk score of 7.96 ± 1.63 out of 10.00. This reflects a strong personal valuation of health and a clear recognition of their occupational vulnerability within hospital environments. In contrast, Rahimi-Ghilchalan et al. found that despite high perceived susceptibility to HBV, high-risk workers possessed inadequate knowledge regarding preventive practices and universal precautions, and 66% had not received the HBV vaccine, highlighting an urgent need for systematic training and continuing education [27]. Therefore, a comprehensive assessment of KAP serves not only to identify gaps in understanding and attitudes, but also to inform the design and implementation of targeted preventive and clinical strategies.

Statistical analyses revealed that preventive behaviors were significantly associated with sex, educational attainment, and occupational category. Furthermore, educational level was significantly associated with knowledge, individual perceived risk, and behavioral intention. This association is theoretically consistent, as higher educational attainment is generally linked to greater health literacy, increased health consciousness, better comprehension of clinical complications, and a heightened perception of occupational exposure risks, thereby fostering stronger behavioral intentions. These findings concur with those of Chonka et al., who reported significant associations between hepatitis B and C preventive practices and sex, age, place of residence, marital status, education, and occupational status [28]. Conversely, Rahimi-Ghilchalan et al. found no statistically significant relationship between demographic variables and HBV preventive behaviors among high-risk workers [27]. These discrepancies indicate that the influence of sociodemographic determinants on preventive practices warrants further investigation across diverse clinical settings.

Finally, multivariable regression results demonstrated that each one-standard-deviation increase in knowledge, individual perceived risk, and behavioral intention was associated with an increase in preventive behavior scores of 0.097, 0.134, and 0.108, respectively.

Behavioral intention represents an individual's readiness and motivational resolve to execute a given action, serving as the most immediate and robust proximal predictor of actual behavior. In this context, Dwiartama et al. observed that behavioral intention is strongly governed by baseline knowledge and attitudes; higher HBV knowledge was associated with greater willingness to participate in diagnostic screening mediated by confidence in high-sensitivity diagnostic technology with every unit increase in knowledge yielding a 0.115-unit increase in screening intention [29]. Similarly, Zibrik et al. showed that improving public health literacy through community-based educational workshops significantly increased screening uptake among immigrant populations in Canada [30]. Taken together, these findings suggest that individuals with higher knowledge and elevated perceived risk engage more selectively and proactively in health-protective practices, demonstrating a greater propensity to translate behavioral intentions into sustained clinical compliance.

Conclusion

The findings indicate that HCWs demonstrated good knowledge about HBV and had a strong awareness of their occupational risk. A high proportion had received vaccination and undergone HBsAg testing. Regular training programs on HBV prevention, delivered through workshops and refresher courses, are crucial for the continuous empowerment of these high-risk occupational groups and can yield significant benefits in enhancing preventive practices.

Study Limitations: This study was conducted among HCWs from a single medical university in Iran, which may limit the generalizability of the findings to other healthcare workers or settings. Additionally, due to the cross-sectional nature of the research, causal relationships could not be established. Repetition of the study in more diverse populations and in multiple settings is recommended.