International Journal of Public Health Science (IJPHS)
Vol. 14, No. 3, September 2025, pp. 1294~1303
ISSN: 2252-8806, DOI: 10.11591/ijphs.v14i3.25824

Knowledge and practices of nurses regarding prevention of hepatitis B and C viral infection: findings from a single center cross-sectional study in Bangladesh

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Article Info

Article history:

Received Jul 27, 2024
Revised Jan 7, 2024
Accepted Mar 6, 2025

Keywords:

Hepatitis B
Hepatitis C
Nurses knowledge
Practices
Viral infection

ABSTRACT

The study aimed to evaluate the nurses' levels of knowledge and practices in preventing hepatitis B and C viral infections in tertiary level hospitals. A cross-sectional study was conducted among 119 nurses in tertiary level hospital by simple random sampling technique. Data were collected by face-to-face interview with semi-structured questionnaire and analysis involved the frequency distribution tables, bar diagrams, and proportion (z-tests). The analysis revealed that most of the nurses fell within the 25-34 age groups, and predominantly held a diploma in nursing. Analysis indicated that 95.79% demonstrated good knowledge, whereas 70.59% exposed good practices. Proportion tests revealed significant associations between demographic factors and knowledge/practice levels. Higher educated nurses (poor knowledge, good knowledge: 13.0%, 87.0%; p = 0.021) and those in older age groups (poor practice, good practice: 36.8%, 63.2%; p = 0.002) displayed significantly better knowledge and practices. This study highlights good knowledge among nurses concerning the prevention of hepatitis B and C infections; significant variation exists in the application of preventive practices. Training programs are recommended to bridge the gap between knowledge and practice.

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1. INTRODUCTION

Hepatitis B and C are the global public health concerns infecting millions of people globally, 78% of the world's hepatocellular carcinoma, and more than half of all fatal cirrhosis [1], [2]. The epidemic of viral hepatitis B and C affects 325 million people globally and is 10 times larger than the global HIV epidemic. Every day, more than 3,600 people die of viral hepatitis-related liver disease, liver failure, and liver cancer [3]. If left untreated, around 2-7% of chronic hepatitis B virus (HBV) cases and 86% of chronic hepatitis C virus (HCV) cases progress to liver cirrhosis and hepatocellular carcinoma [4], [5]. These conditions rank as the sixth most prevalent cancer and the third leading cause of cancer-related fatalities on a global scale [2], [6]. In 2019, an estimated 820,000 fatalities from HBV were caused by cirrhosis and

hepatocellular cancer. Additionally, there are around 1.5 million new cases of HCV reported each year, with an estimated 58 million people worldwide carrying the infection [7]. Cirrhosis and hepatocellular carcinoma were the leading causes of hepatitis C deaths in 2019, accounting for almost 290,000 deaths overall [8].

In Bangladesh, the prevalence of hepatitis B surface antigen ranges from 3-7% in the general population and 1.5-12% in children under the age of five, and the lifetime risk of contracting HBV ranges from 20 to 60% [9]–[12]. Although the country has suffered different burden in many times [13]–[18] the burden of hepatitis B and C viral infections is particularly high in healthcare settings [19], [20]. Nurses are directly involved in patient care and, therefore, have a crucial role in preventing the transmission of bloodborne viruses.

Currently, the prevention and cure measures are available for hepatitis B and C. A three-dose HBV vaccine provides over 95% immunity, while modern antiviral therapies can cure over 95% of chronic HCV cases [21]. These advancements have spurred global efforts against hepatitis B and C epidemics. The World Health Organization (WHO) has prioritized viral hepatitis, and combating it is acknowledged in the United Nations Sustainable Development Goals [22]. At the 2016 World Health Assembly, member states will consider a resolution to eliminate hepatitis B and C by 2030 [23]. Strategies to promote patient safety and prevent transmission of bloodborne viruses in healthcare settings include HBV vaccination of susceptible healthcare personnel and the use of primary prevention, such as preventing exposures and infection by strict adherence to the tenets of standard infection control precautions, the use of safer devices, and the implementation of work practice controls. For example, not recapping needles to prevent injuries that confer risks for HBV transmission to patients and their providers. Exposures that could put healthcare workers at risk of infection include percutaneous injury, such as needlestick injuries, and contact of mucous membranes or non-intact skin with blood, tissue, or other potentially infectious body fluids [24]. Strategies have been developed to avoid contact with such samples.

The knowledge and practices of nurses regarding the prevention of hepatitis B and C viral infections are of critical importance due to the direct impact these factors have on both healthcare workers' safety and patient outcomes. Nurses play a pivotal role in educating patients and the public about infection prevention [7]. They are often on the frontline of patient care, making them particularly vulnerable to exposure to bloodborne pathogens like hepatitis B and C [7]. Sometimes, they play a pivotal role in educating patients and the public about infection prevention. Their ability to effectively implement and advocate for proper infection control practices can significantly influence the overall success of public health efforts aimed at reducing the spread of these infections. In regions with limited resources, such as Bangladesh, where the prevalence of hepatitis B and C is high [20], ensuring that nurses are well-informed and practice rigorous infection control is essential for controlling the spread of these diseases within healthcare facilities and the broader community.

When it comes to hepatitis B and C viral infections, prevention cannot be achieved without knowledge and practice. Nurses should follow preventive practices and have good knowledge about transmission, high-risk groups, screening, and prevention of these viral infections. For instance, all nurses should receive hepatitis B vaccinations, refrain from sharing needles with others, utilize color-coded hospital waste bins, take extra care for positive cases, and use sterile equipment [25], [26]. However, there are very few studies among nurses on the topic in Bangladesh. Therefore, the aim of this study is to evaluate nurses' level of knowledge and practices regarding the prevention of hepatitis B and C viral infections.

2. METHOD

2.1. Ethical permission and consent for data collection

Prior to commencement of this study, the research protocol was approved by the Institutional Review Board (IRB) of National Institute of Preventive and Social Medicine (NIPSOM), Dhaka, Bangladesh with the Memo number NIPSOM/IRB/2021/18. The aims and objectives of the study along with its procedure, risk and benefits of this study was explained to the nurses in easily understandable local language, and then written informed consent had taken from each participant. It was assured that all information and records will be kept confidential and participants reserved the rights of withdrawal during any time of the study. Written permission was taken from hospital authority prior to data collection.

2.2. Study setting and participants

This study was conducted from January to December of 2021 at Dhaka Medical College and Hospital, Dhaka, Bangladesh. included both male and female nurses working in the inpatient and outpatient departments of the Surgery and Medicine units, as well as in the ICU, Dialysis Unit, and Emergency Department. This renowned hospital provides affordable health care to a huge number of patients through its indoor, outdoor and emergency facilities.

2.3. Participants' selection criteria

The inclusion criteria of the study were: i) both male and female nurses, ii) working for at least one year, iii) nurses who are available on duty, and iv) nurses who are willing to give consent and participate in the study. For achieving the research objectives, the study was carried out strictly following the research methodology. Participants fulfilling the selection criteria were enrolled in the study only.

2.4. Data collection instrument

A semi structured questionnaire was prepared in English then translated into Bengali. Completed questionnaires was prepared according to the objectives to get information regarding different variables. The questionnaire comprised of 34 questions of which eight were related to socio-demographic characteristics, 15 were regarding knowledge on prevention of hepatitis B and C, and ten questions with an observational checklist were related to preventive practices. In the knowledge questions, the correct answer was reported as "Yes = 1" where the incorrect answer was reported as "No = 0". On the other hand, eight out of ten practice questions were reported as "Yes = 1, and No = 0". The other two practice questions were observed through checklist. The coding was evident for all the questions included in the questionnaire.

2.5. Pretesting of the study

The questionnaire was finalized after some modification. The necessary changes in the questionnaire was done on the basis of pretest findings. The pretesting was done among 20 nurses in another tertiary level hospital (e.g., Shaheed Suhrawardy Medical College and Hospital) in Dhaka, Bangladesh. The questionnaire was designed so that it was easily understandable to the nurses as well as served best the purpose of collecting data to fulfill research objective.

2.6. Sampling technique and sample size

Simple random sampling technique was applied to obtain the required study participants. The sample size was calculated by using the (1).

$$n = \frac{z^2 pq}{d^2} \quad (1)$$

Here, n = required/desired sample size; z = the standard normal deviation; usually set at 1.96 at a 95% confidence level; p = proportion of nurses who had good knowledge on the prevention of hepatitis B and C which is 91.6% = 0.916, obtained by the literature search [27]; q = 1-p; and d=Margin of error (5%) = 0.05. Using (1), the sample size for the study when p = 0.916 is as (2).

$$n = \frac{1.96^2 \times 0.916 \times (1-0.916)}{0.05^2} = 118.23 \quad (2)$$

Therefore, the required sample size was approximately 119, covering both male and female nurses.

2.7. Data quality control, processing, and statistical analysis

After completing the necessary data cleaning, the 15 knowledge and 10 practice questions were computed to obtain two new knowledge and practice score variables. Afterward, both the score variables were categorized into "good" and "poor" levels based on 70% cut-off point. We used a number of techniques to ensure the reliability and validity of the study such as:

i) Conducted pre-testing before final data collection and validated the questionnaire,
ii) Collected the data by a trained field enumerator team (all are students of MPH),
iii) Checked the data and fixed errors by observing descriptive statistics,
iv) Employed Cronbach's alpha, the reliability coefficient for both knowledge and practice was 0.61 (inter-item correlation = 0.69) and 0.63 (inter-item correlation = 0.59),
v) Employed updated version of statistical software in data analysis, and
vi) Finally, we randomly re-observed the practice behaviors of nurses.

Both descriptive and inferential analysis were performed in the study. Respondents' socio-demographic characteristics, overall knowledge, and practice behaviors regarding the prevention of hepatitis B and C were reported in table, and graphs. In inferential analysis, the proportion test (z-test) was performed for testing the equality of two proportions (e.g., good versus poor) for different categorical variables. A P-value of 5% was considered significant at the 95% confidence interval (CI). All the analysis was performed in Microsoft Office 2019 and SPSS (Version-26) software.

3. RESULTS AND DISCUSSION

3.1. Results

3.1.1. Demographic and baseline characteristics of nurses

The study comprised 119 nurses where the majority (73.9%) of them were 25-34 years old following 10.1% and 16% were 35-44 and 45-54 years old as shown in Table 1. The majority were female (73.3%) and the rest of the nurses were male. Most of them were married (84%), Muslim (78.2%), and came from nuclear family (77.3%). Diploma in nursing was their main (61.3%) professional qualification of and the rest of the nurses were graduate and/or post-graduate (38.7%). More than 90% of the nurses' employee status was senior staff nurses working at least 1-15 years in Table 1.

Table 1. Demographic characteristics of nurses working at the tertiary level hospital

Characteristics		Frequency (n)	Percentage (%)
Age group	25-34	88	73.9%
	35-44	12	10.1%
	45-54	19	16%
Sex	Male	27	22.7%
	Female	92	77.3%
Religion	Islam	93	78.2%
	Non-Muslim	26	21.8%
Marital status	Married	100	84%
	Single	19	16%
Educational qualification	Diploma in nursing	73	61.3%
	Graduation/post-graduation	46	38.7%
Employee status	Senior staff nurse	110	92.4%
	Ward in-charge	5	4.2%
	Nursing supervisor	4	3.4%
Length of service	1 to 15 years	102	85.7%
	16 and above years	17	14.3%
Family type	Nuclear family	92	77.3%
	Joint family	27	22.7%

3.1.2. Nurses' knowledge and practices regarding prevention of hepatitis B and C infection

The analysis of knowledge and practice in nurses revealed that most (95.79%) of the nurses had good preventive knowledge regarding hepatitis B and C viral infection. But in terms of good practice the percentage was lower (70.59%) than that of knowledge. Figure 1 represents the nurses' nurses' knowledge and practices levels regarding prevention of hepatitis B and C viral infection. The majority 95.79% nurses had good knowledge as shown in Figure 1(a), while 70.59% had good practice Figure 1(b) behavior regarding prevention of hepatitis B and C viral infection.

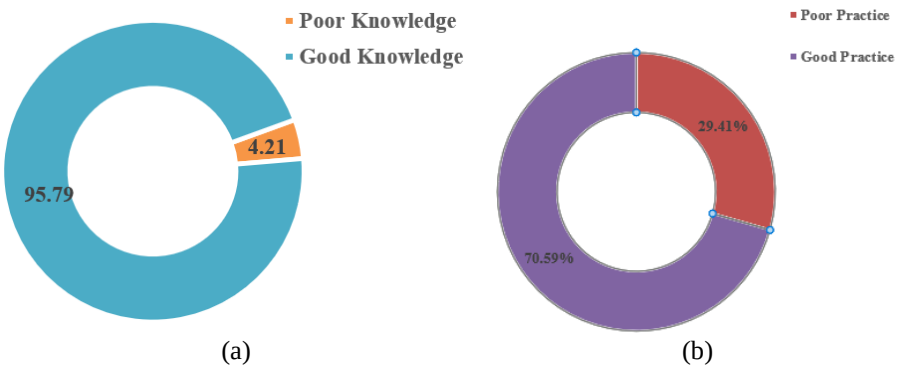

Figure 1. Nurses': (a) knowledge and (b) practice regarding prevention of hepatitis B and C viral infection

3.1.3. Significance of nurses' knowledge and practices among various socio-demographics

As part of inferential statistics, we performed proportion test (z-test) to show the significant differences of nurses' knowledge and practices with respect to various socio-demographic categories as shown in Table 2. It was observed that nurses' knowledge level regarding prevention of hepatitis B and C viral infection was significantly ($p<0.05$) higher with respect to age group, sex, educational qualification, employee status, and length of service. For instance, graduated and/or post-graduated nurses' knowledge

level regarding prevention of hepatitis B and C viral infection was significantly higher (poor knowledge, good knowledge: 13.0%, 87.0%; p = 0.021). Similarly, nurses' higher practice behavior concerning prevention of hepatitis B and C viral infection was found significantly ($p<0.05$) higher with respect to age, religion, marital status, educational qualification, and their employee status. For example, higher aged (45-54 years old) nurses' practice behavior regarding prevention of hepatitis B and C viral infection was found significantly higher (poor practice, good practice: 36.8%, 63.2%; p = 0.002).

Table 2. Proportion test to observe significancy in knowledge and practice variations among various socio-demographics

Characteristics		Knowledge			Practice		
		Poor	Good	p*-value	Poor	Good	p*-value
Age group	25-34	9 (10.2%)	79 (89.8%)	0.001	26 (29.5%)	62 (70.5%)	0.486
	35-44	2 (16.7%)	10 (83.3%)	0.451	2 (16.7%)	10 (83.3%)	0.034
	45-54	3 (15.8%)	16 (84.2%)	0.006	7 (36.8%)	12 (63.2%)	0.002
Sex	Male	5 (18.5%)	22 (81.5%)	0.216	5 (18.5%)	22 (81.5%)	0.158
	Female	9 (9.8%)	83 (90.2%)	0.001	30 (32.6%)	62 (67.4%)	0.56
Religion	Islam	9 (9.7%)	84 (90.3%)	0.919	31 (33.3%)	62 (67.7%)	0.76
	Non-Muslim	5 (19.2%)	21 (80.8%)	0.691	4 (15.4%)	22 (86.6%)	0.023
Marital status	Married	9 (9.0%)	91 (91.0%)	0.319	32 (32%)	68 (68%)	0.155
	Single	5 (26.3%)	14 (73.7%)	0.256	3 (15.8%)	16 (84.2%)	0.001
Educational qualification	Diploma in nursing	8 (11.0%)	65 (89.0%)	0.381	24 (32.9%)	49 (67.1%)	0.296
	Graduation/post-graduation	6 (13.0%)	40 (87.0%)	0.021	11 (23.9%)	35 (76.1%)	0.002
Employee status	Senior staff Nurse	10 (9.1%)	100 (90.9%)	0.037	33 (29.2%)	80 (70.8%)	0.27
	Ward in-charge	2 (40.0%)	5 (60.5%)	0.543	1 (20%)	4 (80%)	0.021
	Nursing supervisor	2 (50.0%)	2 (50.0%)	0.311	1(100%)	0 (0%)	0.781
Length of services	1 to 15 years	11 (10.8%)	91 (89.6%)	0.093	31 (30.4%)	71 (69.6%)	0.567
	16 and above years	3 (17.6%)	14 (82.4%)	0.012	4 (23.5%)	13 (76.5%)	0.562
Family type	Nuclear family	10 (10.9%)	82 (89.1%)	0.345	29 (31.5%)	63 (68.5%)	0.351
	Joint family	4 (14.8%)	23 (85.2%)	0.562	6 (22.2%)	21 (77.8%)	0.541

*p-values for testing the equality of two proportions (z-test) in different categorical variables

3.2. Discussion

The present study provides summary estimates for the nurses' knowledge and practices towards prevention of hepatitis B and C viral infection through a single center cross-sectional study. The findings of the study suggests that most nurses had good knowledge (95.79%) regarding hepatitis B and C prevention, while 70.59% exhibited good practices. These results demonstrate a substantial level of awareness among the surveyed nurses, indicating that they are well-informed about the prevention of hepatitis B and C infections. The high level of knowledge among nurses in this study is encouraging and might be attributed to their nursing education and training programs [28]. However, the fact that there is still room for improvement in practice behaviors is notable. The gap between knowledge and practice is a common concern in healthcare settings, as highlighted by previous research [29]–[31]. It may be influenced by factors such as workload, organizational policies, or lack of resources, which can hinder the translation of knowledge into practice [29], [32]–[34].

The proportion test of the study revealed significant associations between knowledge and practices and factors such as age, educational qualification, and employee status. The observed variations in knowledge and practices based on socio-demographics are consistent with the findings from other studies [7], [35]–[37]. For example, study in a similar setting found that nurses with higher education levels tend to exhibit better knowledge levels [31], [33]. Moreover, the influence of age on practice behavior is also documented in the literature, as older nurses may be more cautious and experienced in infection control [38], [39].

The current study is a single-center cross-sectional study conducted among the nurses of only one tertiary level hospital in Dhaka, Bangladesh. Therefore, there is a lack of generalizability, stemming from the exclusive focus on a single hospital and a relatively small sample size of 119 nurses. This limits the applicability of the findings to a broader population of nurses in Bangladesh. Additionally, the cross-sectional design, potential self-reporting biases, absence of a comparative group, and the study's inability to capture changes over time impede a comprehensive understanding of the dynamic nature of nurses' knowledge and practices regarding hepatitis B and C prevention.

This study lays the foundation for future research to develop and implement interventions to enhance nurses' knowledge and practice behaviors, ultimately contributing to the prevention and control of hepatitis B and C infections in healthcare settings. Based on the study findings, the following policy recommendations could be considered to improve their knowledge and practices:

i) Continuous education and training programs- implementing mandatory and regular training programs focused on hepatitis B and C prevention for nurses of all age groups, educational qualifications, and employment statuses could improve their knowledge and practice level [31], [40]–[42]. These programs should cover updated information, best practices, and emerging trends in infection control.
ii) Personalized training activities-developing tailored educational materials and workshops that cater to different educational backgrounds and experience levels among nurses [43], [44]. Adapting the content based on educational qualification could enhance the effectiveness of the training.
iii) Integration of hepatitis prevention in nursing curriculum-collaborating with nursing educational institutions to include comprehensive modules on hepatitis B and C prevention in their curriculum [45]–[48]. This integration would ensure that future nurses receive proper training right from their academic years.
iv) Accessible resources and guidelines-providing easily accessible resources and guidelines on hepatitis B and C prevention [44]. This could include online portals, manuals, and posters within healthcare facilities, ensuring that nurses have quick access to essential information and protocols.
v) Mentorship programs-establishing mentorship programs where experienced nurses can guide and support their colleagues, particularly focusing on practical implementation of knowledge in day-to-day practices within the healthcare setting [49]–[51].
vi) Regular assessments and feedback-conducting regular assessments to evaluate the knowledge and practices of nurses regarding hepatitis prevention [45], [51]. Feedback from these assessments should be used to tailor educational programs and identify areas that require additional focus.
vii) Incentivize continuous learning-creating incentives or rewards for nurses who actively participate in educational programs or demonstrate excellence in implementing best practices for hepatitis prevention [49], [50]. This could include recognition, career advancement opportunities, or other non-monetary rewards.
viii) Policy implementation and monitoring-formulating clear policies and protocols at the national or organizational level regarding hepatitis B and C prevention [51], [52]. Ensure effective monitoring and enforcement of these policies within healthcare facilities to maintain a high standard of infection control practices.
ix) Research and collaboration- encouraging and funding further research on the efficacy of various educational interventions and their impact on the improvement of knowledge and practices [53]. Fostering collaborations between healthcare institutions and research organizations could drive innovation and knowledge dissemination of nurses regarding prevention of hepatitis B and C infection.
x) Cultural sensitivity and community engagement-tailoring educational materials to the cultural context of Bangladesh and involve communities in awareness campaigns, promoting a deeper understanding of the importance of hepatitis prevention among nurses and the general public [50], [51], [53].

4. CONCLUSION

The findings of this study provide valuable insights to improve knowledge and practices of nurses regarding the prevention of hepatitis B and C viral infections. The results indicate that while nurses possess a strong knowledge base, there is room for improvement in translating this knowledge into practice. These findings are in line with existing literature, emphasizing the importance of targeted interventions and continuous education to bridge the gap between knowledge and practice, especially among nurses with varying socio-demographic characteristics. Implementation of our suggested policy recommendations should contribute significantly to enhancing the knowledge and practices of nurses in preventing hepatitis B and C viral infections in Bangladesh.

ACKNOWLEDGMENTS

We are in depth to indebted to the hospital authority for their co-operation and support. The authors would also like to mention the participants for their tremendous support during the study

FUNDING INFORMATION

This study received no specific funds from any agencies or organizations.

AUTHOR CONTRIBUTIONS STATEMENT

This journal uses the Contributor Roles Taxonomy (CRediT) to recognize individual author contributions, reduce authorship disputes, and facilitate collaboration.

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C : **C**onceptualization
M : **M**ethodology
So : **So**ftware
Va : **Va**lidation
Fo : **Fo**rmal analysis
I : **I**nvestigation
R : **R**esources
D : **D**ata Curation
O : Writing - **O**riginal Draft
E : Writing - Review & **E**diting
Vi : **Vi**sualization
Su : **Su**pervision
P : **P**roject administration
Fu : **Fu**nding acquisition

CONFLICT OF INTEREST STATEMENT

The authors state no conflict of interest.

INFORMED CONSENT

We have obtained informed consent from all individuals included in this study.

ETHICAL APPROVAL

This study was approved by the institutional review board of the National Institute of Preventive and Social Medicine (NIPSOM), Bangladesh (Memo number: NIPSOM/IRB/2021/18). Both written and verbal consent were taken before initiating the interview. A brief on the aims and objectives was given to the participants. Participants who agreed to give consent were finally included in the study.

DATA AVAILABILITY

The data that support the findings of this study are available from the corresponding author, [RP], upon reasonable request.

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