## Original Research

# HEPATITIS B VACCINATION AND POST–VACCINATION TEST AMONG HEALTH CARE WORKERS IN A TERTIARY CARE TEACHING HOSPITAL IN SOUTH INDIA：A CROSS–SECTIONAL STUDY

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**ABSTRACT**

**Introduction:** Hepatitis B virus (HBV) is a life-threatening infection that is amenable to prevention by a safe and efficacious vaccine. Healthcare workers including medical students are among the high-risk group for HBV infection. This study is carried out to estimate HBV vaccination coverage and assess the knowledge, attitude, and practice (KAP) of HBV infection among healthcare workers in a tertiary care teaching hospital, in Tamil Nādu, India **Methods:** A cross-sectional study was conducted using a structured questionnaire to collect data on socio-demographic characteristics, vaccination status, a set of knowledge, attitude and practice questions on preventive measures for hepatitis B infection. **Results:** The prevalence of complete hepatitis B vaccination 195 (44.2.%) among Health Care Workers (HCWs) was very low. The remaining 256 (56.8%) of HCWs were either partially vaccinated 128 (28.4%) or non-vaccinated 128 (28.4%). Merely, 8.4% of vaccinated persons were aware of testing of antibody titer after hepatitis B vaccination. Only 97 (30%) knew the protective values of anti-hepatitis B antibodies. Study participants had adequate knowledge attitude and practice (KAP) on preventive measures for Hepatitis B infection (overall KAP score of 100.8 out of 125). Vaccination status was found to be an independent predictor of the KAP score in the final model predicted using multiple linear regression. **Conclusion:** The government and institutions should take proactive measures to vaccinate the unvaccinated HCWs including the medical students against vaccine-preventable diseases. Also, it is prudent to perform HBV testing among those already vaccinated or partially vaccinated to determine their level of protective antibodies.

**Keywords:** Hepatitis B virus, vaccination, health personnel, vaccine-preventable diseases

**Introduction:**

Hepatitis B virus infection, a vaccine-preventable disease is still a serious problem all over the world. An estimated 296 million people were living with chronic hepatitis B infection with 1.5 million new infections and 8.2 lakh deaths every year. Healthcare workers including medical students are at high risk of contracting this infection owing to their close handling of patients and working in hazardous hospital environments. (*Hepatitis B*, n.d.) Hepatitis B virus (HBV) infection is highly contagious and is spread through contact with infected blood, semen, or other body fluids through percutaneous or mucosal contact or mother-to-child transmission. If left untreated, it can complicate chronic viral hepatitis which puts people at a high risk of death due to liver cirrhosis and liver cancer.(Alshammari et al., 2019; Tenner et al., 2012)

Hepatitis B infection can be prevented with a safe and efficient vaccine that offers protection of 98 percent to 100 percent. Preventing hepatitis B infection averts the development of complications including chronic disease and liver cancer. (World Health Organization, 2016) Antiviral prophylaxis is recommended in addition to newborn vaccination by WHO to prevent hepatitis B transmission from mother to child. Blood safety initiatives and safer sex habits, such as reducing the number of partners and employing barrier protective measures (condoms), can also help to prevent transmission. (Chang & Chen, 2015)

Even though Hepatitis B vaccination has been available in most developing countries since 1981, huge numbers of healthcare workers are still unvaccinated or unaware of their vaccination status. In India, roughly 1-10% of healthcare professionals are HBsAg positive; nevertheless, there is still a lack of awareness about Hepatitis B vaccination among healthcare workers, and there is insufficient data on the vaccination status of HCWs.(Chanda et al., 2020) In high-risk populations such as medical students and healthcare workers, the World Health Organization (WHO) recommended (zero dosage, one month, and six months) the Government of India under the National Viral Hepatitis Control Programme launched in 2018. (Pathak et al., 2013; World Health Organization, 2016)

There is a limited number of studies estimating the hepatitis B vaccination coverage among healthcare workers in India, particularly in South India. Therefore, this study was conducted to estimate HBV vaccination coverage among HCWs and also assess the factors concerning knowledge, attitude, and practice toward the preventive measures of hepatitis B infection among healthcare workers in South India.

Objectives of study

1. To estimate the prevalence of Hepatitis B Vaccination among healthcare workers in Dhanalakshmi Srinivasan medical college and Hospital.
2. To assess the knowledge, attitude, and practice towards the Preventive Measures of Hepatitis B infection among healthcare workers in Dhanalakshmi Srinivasan medical college and Hospital.

**Methods**

This cross-sectional study took place in Dhanalakshmi Srinivasan Medical College and Hospital, Perambalur located center of Tamil Nādu, which is approximately 260 kilometres from Chennai city, India between November 2021 to February 2022. The tutors from our department were trained for the collection of data for four hours. They collected the data from healthcare workers (HCWs) through the interview method. Subjects were all official HCWs of the selected medical college and had direct contact with patients. They were medical students, interns, postgraduates, and allied medical professionals (nurses, and blood bank/lab technicians). Ethics committee approval (IECHS/IRCHS no:137 October 26, 2021, Dhanalakshmi Srinivasan Medical College Hospital) and informed consent was taken before the start of the study.

A study done by Qianli Yuan shows that the prevalence of completed 3 doses of the hepatitis B vaccination in China was found to be 60%. (Liu et al., 2018) The sample size was estimated with a 95% confidence interval and 5% allowable error by using the formula $n= Z\alpha^2PQ/d^2$ [$Z\alpha=1.96$, P=60, Q=40(100-60), d=5]. The sample size was estimated to be 369. With a 10% non-response rate, the final estimated sample size was 406. The study collected data from 451 subjects. The samples were selected by a simple random sampling method. The participants who gave consent to participate were included in the study.

A structured questionnaire was used and consisted of three parts. Part one was about the respondent's personal information including age, sex, occupation, Hepatitis B vaccination status, and reason for non-vaccination. Part two includes 15 questions on the knowledge about Hepatitis B infection. Part 3 includes 10 questions on attitudes and practices related to Hepatitis B infection. The subjects were required to choose from five descriptions (Strongly Agree, Agree, Neutral, Disagree, Strongly disagree). Scoring was given based on a 5-point Likert scale (Strongly agree=5 to strongly disagree=1) for the positive questions and the score was reversely coded for negative questions. The possible scores for knowledge questions were 15-75 and attitude & practice questions were 10-50. The total possible KAP scores were 25-125.

The data collected was entered in Microsoft Excel and analyzed using SPSS version 26 software. The descriptive analysis was analyzed using frequencies, mean, standard deviation, and proportions. Tests of association were performed using appropriate tests like independent t-test, and One-way ANOVA test for the bivariate analysis. The Pearson correlation coefficient was used between two continuous variables. Multivariate linear regression was used to test if independent variables can significantly predict the dependent variable.

**Results**

Among 451 healthcare workers, the majority were 288 (63.9%) females and those belonging to the age group of 21-40 years 251(55.7%). The mean (SD) age of the study participants was 22.12 (5.26). Most of them 326(72.3%) were MBBS students and the remaining 125(27.7%) were doctors, nurses, lab technicians, and housekeeping staff. Merely, 8.4 percent of vaccinated persons were aware of testing

of antibody titer after hepatitis B vaccination. Only 97 (30%) knew the protective values of anti-hepatitis B antibodies. Only 37.5 percent had a hepatitis B vaccination card (Table 1)

**Table 1: Bivariate analysis showing the association of KAP score towards the preventive measures of hepatitis B infection with socio-demographic factors and vaccination details among study participants**

| **Characteristics** | | **n (%)** | **KAP score Mean (SD)** | **p-value** |
|---|---|---|---|---|
| Age | mean (SD) | 22.12 (5.26) | 0.134[r] | **0.007**[***] |
| Age (in years), n=451 | ≤ 20 | 189 (41.9) | 97.78 (11.37) | **<0.001*** |
| | 21 - 40 | 251 (55.7) | 103.09 (11.38) | |
| | > 40 | 11 (2.4) | 96.25 (14.45) | |
| Gender, n=451 | Male | 163 (36.1) | 100.35 (12.34) | 0.567 |
| | Female | 288 (63.9) | 101.05 (11.31) | |
| Occupation, n=451 | MBBS student | 326 (72.3) | 99.92 (11.64) | **0.033*** |
| | Intern | 50 (11.1) | 103.34 (11.84) | |
| | Doctor | 12 (2.7) | 106 (11.62) | |
| | Nurse | 32 (7.1) | 104.92 (10.68) | |
| | Laboratory technician | 18 (4.0) | 101.18 (10.52) | |
| | Housekeeping staff | 13 (2.9) | 87.50 (91.92) | |
| Vaccination status against Hepatitis B, n=451 | Completely vaccinated | 195 (43.2) | 97.93 (10.92) | **<0.001*** |
| | Partially vaccinated | 128 (28.4) | 105.05 (10.69) | |
| | Not vaccinated | 128 (28.4) | 99.60 (12) | |
| Knowledge about testing of HBsAg antibody after vaccination, n=323 | Yes | 27 (8.4) | 94.36 (16.11) | **<0.001*** |
| | No | 263 (81.4) | 103.14 (11.03) | |
| | Don't know | 33 (10.2) | 95.45 (10.48) | |
| Awareness regarding the protective level of anti-HBs antibody, n=323 | Known (>10IU/ml) | 97 (30) | 99.64 (12.5) | **0.038**** |
| | Don't know | 226 (70) | 102.70 (11.35) | |
| Presence of Hepatitis B vaccination record, n=323 | Yes | 121 (37.5) | 101.76 (11.78) | **0.005*** |
| | No | 163 (50.5) | 98.77 (10.61) | |
| | Don't know | 39 (12) | 94 (11.81) | |

Among 451 HCWs, around 323 (71.6%) were vaccinated against hepatitis B vaccination out of which 195 (43.2) were completely vaccinated with three doses while 128 (28.4) were partially vaccinated. The reason for non-vaccination were: no vaccination program offered 61(47.7%), lack of knowledge

24(18.8%), not knowing vaccination status 33(25.8%), perceived low risk of Hepatitis B 4(3.1%), procrastination 6(4.7%).

Among 451, only 404 (89.6%) had heard about hepatitis B infection. So, the assessment of KAP on the preventive aspects of hepatitis B infection was evaluated from 404 HCWs. The knowledge score (mean± SD) for preventive measures on hepatitis B infection was 60.99 ± 7.63. The attitude and practice score (mean ± SD) for preventive measures for hepatitis B infection was 39.80 ± 5.29. The overall KAP score (mean ± SD) for preventive measures of Hepatitis B infection was 100.80 ± 11.68. Thus, health workers scored an average of 80 percent of the total KAP score of 125. Questions related to KAP on Hepatitis B infection were represented in Tables 2 & 3.

**Table 2: Knowledge questionnaire related to Hepatitis B infection**

| | **Strongly Agree** | **Agree** | **Neutral** | **Disagree** | **Strongly Disagree** |
|---|---|---|---|---|---|
| Hepatitis B is caused by a virus | 71.3 | 25.5 | 3.2 | 0 | 0 |
| Hepatitis B can be transmitted by an infected mother to a fetus | 55.7 | 32.4 | 10.4 | 1.5 | 0 |
| Hepatitis B can be transmitted by Contaminated blood & body fluids | 63.1 | 28 | 7.2 | 0.7 | 1 |
| Hepatitis B can be transmitted by Unprotected sex with infected ones | 52.7 | 29.5 | 1.4 | 3.7 | 2.5 |
| Hepatitis B can be transmitted by Casual contact (shaking hands) | 4.5 | 12.4 | 16.3 | 27.7 | 39.1 |
| Hepatitis B can be transmitted by Unsterilized syringes/needles | 56.2 | 32.9 | 9.2 | 0.5 | 1.2 |
| Hepatitis B can be transmitted by Coughing/sneezing | 8.2 | 14.1 | 23.8 | 21 | 32.9 |
| Hepatitis B can be transmitted by Contaminated food/water | 10.9 | 16.8 | 19.8 | 21.3 | 31.2 |
| Hepatitis B can cause liver cancer | 41.8 | 33.2 | 19.1 | 4.5 | 1.5 |
| Healthcare workers are at increased risk of getting Hepatitis B than the general population | 48.5 | 36.4 | 12.9 | 1.5 | 0.7 |
| Hepatitis B can be prevented by Vaccination | 53.5 | 36.4 | 9.4 | 0.7 | 0 |
| Hepatitis B can be prevented by Antivirals | 16.6 | 37.4 | 29.2 | 8.9 | 7.9 |
| Hepatitis B can be prevented by Avoiding sharp needle/syringe injury | 38.9 | 36.4 | 18.3 | 4.7 | 1.7 |
| Hepatitis B can be prevented by Avoiding contaminated water/food | 11.1 | 20.5 | 26.5 | 20 | 21.8 |
| Hepatitis B can be prevented by Using gloves when handling body fluid | 46.8 | 36.4 | 15.1 | 1 | 0.7 |

**Table 3: Attitude and Practice Questionnaire related to Hepatitis B Infection**

| | Strongly Agree | Agree | Neutral | Disagree | Strongly Disagree |
|---|---|---|---|---|---|
| I feel uncomfortable sitting with Hepatitis B infected person | 10.1 | 22.5 | 36.9 | 21.3 | 9.2 |
| I don't mind shaking hands/ hugging with Hepatitis B infected person | 16.3 | 25.2 | 37.9 | 16.1 | 4.5 |
| I believe the Hepatitis B vaccine is safe and effective | 45.3 | 40.3 | 12.6 | 1.5 | 0.2 |
| I believe healthcare workers should receive Hepatitis B vaccination | 59.9 | 28 | 10.4 | 1.2 | 0.5 |
| I don't need a Hepatitis B vaccination because I am not at risk | 5 | 7.9 | 16.6 | 32.9 | 37.6 |
| I ask/use a new blade for shaving/haircutting | 49.8 | 30.9 | 16.1 | 2.2 | 1 |
| I ask for a new syringe before the injection | 57.9 | 31.2 | 9.9 | 0.7 | 0.2 |
| I ask for sterilized equipment for ear/nose piercings | 55 | 30 | 13.6 | 1 | 0.5 |
| I always report for needle pricks / sharp injuries | 44.6 | 33.7 | 17 | 3.7 | 0.2 |
| I attend a hepatitis B-related awareness program | 25 | 27.2 | 33.2 | 9.4 | 5.2 |

The bivariate analysis found a statistically significant association of KAP score about preventive measures of hepatitis B infection with age, occupation, vaccination status against hepatitis B, knowledge about testing of HBsAg antibody after vaccination, knowledge of the protective level of anti-HBs antibody and presence of vaccination record of Hepatitis B. Age is positively correlated with KAP on Hepatitis B infection and statistically significant (r=0.134, p=0.007). (Table 1)

On multivariate analysis using multivariate linear regression, an overall regression model was found to be statistically significant [$R^2$=0.077, F=4.109, df =6, p=0.001]. The only independent variable which is statistically significant with the overall KAP score in the final model was vaccination status against hepatitis B [β=- 0.177, t= -2.99, p=0.003, 95% Confidence Interval (CI) = -7.049 to -1.447]. (Table 4)

**Table 4: Multivariate linear regression between basic characteristics and KAP about hepatitis B infection**

| Characteristics | | β (95%CI) | p-value |
|---|---|---|---|
| Age (in years), n=451 | ≤ 20 | 0.120 (-0.21 – 5.89) | 0.052 |
| | 21 - 40 | | |
| | > 40 | | |
| Occupation, n=451 | MBBS student | 0.027 (-1.03 – 1.63) | 0.654 |
| | Intern | | |
| | Doctor | | |
| | Nurse | | |
| | Laboratory technician | | |
| | Housekeeping staff | | |
| Vaccination status against Hepatitis B, n=451 | Completely vaccinated | -0.177 (-7.05 – -1.45) | **0.003*** |
| | Partially vaccinated | | |
| | Not vaccinated | | |
| Knowledge about testing of HBsAg antibody after vaccination, n=323 | Yes | 0.017 (-2.88 – 3.83) | 0.780 |
| | No | | |
| | Don't know | | |
| Awareness regarding the protective level of anti-HBs antibody, n=323 | Known (>10IU/ml) | 0.091 (-0.52 – 5.17) | 0.109 |
| | Don't know | | |
| Presence of Hepatitis B vaccination record, n=323 | Yes | -0.043 (-2.86 – 1.33) | 0.473 |
| | No | | |
| | Don't know | | |

**Discussion**

Even though the Government of India has mandated that the Hepatitis B vaccination should be done for all medical students and HCWs, the prevalence of complete hepatitis B vaccination coverage among HCWs in the present study was found to be very low 195 (43.2%). A similar study was done among 181 medical students in Nepal (2020) by Dhan Bahadur Shrestha et al showed the prevalence of vaccination against Hepatitis B infection was 110 (60.8%) and non-vaccinated were 71 (39.2%). (Shrestha et al., 2020) Another study done by Thamir M Alshammari et al in Saudi Arabia showed the prevalence of non-vaccination at 16.5% which is lower when compared to our study.(Alshammari et al., 2019) Such variation in the prevalence of vaccination among HCWs may be due to regional variations of program implementation and knowledge about hepatitis B vaccination.

In our study, among 128 who were not vaccinated against hepatitis B, around 48 percent of the participants reported the reason for non-vaccination as no vaccination program was offered by the institute followed by lack of knowledge, not knowing vaccination status, perceived low-risk of Hepatitis B and procrastination. A similar study in India by Rambha Pathak et al showed that the reason for non-vaccination was negligence (41.6%) and lack of knowledge (45%). (Pathak et al., 2013)

Among 451 healthcare workers, only 404 (89,.6%) heard of Hepatitis B infection. Out of 404 healthcare workers surveyed, 96.8% were aware that Hepatitis B is caused by a virus, regarding the mode of transmission of disease from infected mother to fetus (88.1%), unprotected sex (82.2%), transmission through contaminated blood and body fluids (91.1%) and unsterilized syringes and needles (81.1%). The findings are similar to the findings of the study done by Abdela et al among medical students from Northeast Ethiopia.(Abdela et al., 2016)

The present study found KAP scores were statistically significant with age, doses received, knowledge about testing of HBsAg antibody after vaccination ($p < 0.001$), occupation(p-0.033), vaccination status against hepatitis B (p-0.005), awareness of the protective level of anti-HBs antibody and presence of Hepatitis B vaccination record (p-0.038). In our current study, the participants who belonged to the age group 21-40 had good knowledge 103.09(11.38) about the preventive measures for Hepatitis B infection when compared to other age groups individuals. Likewise, the study done among Malaysian individuals found good knowledge in the 35–44-year age group.(Rajamoorthy et al., 2019) Regarding the occupation, scores for doctors (106 ± 11.62) and nurses (104.92 ± 10.68) were comparatively good for hepatitis B infection when compared to other paramedical staff. A similar study done among HCWs in South India by Venkataramana Kandi et al showed a similar finding to our study.(Kandi et al., 2020) another study done in Khartoum, Sudan showed average knowledge among nurses and midwives when compared to other HCWs.(Mursy & Mohamed, 2019). Such differences show there are good KAP measures among Indian Nurses when compared to other countries.

In the present study, the variables which are statistically significant in bivariate analysis were considered for multivariate linear regression. Which, is the definite predictor variable as doses of vaccination received (p-0.003) which is statistically significant with KAP scores. A similar study done among HCWs in Kabul, Afghanistan found that 56.37% had received the HBV vaccine ($p < 0.0001$), which is statistically significant on KAP scores(Roien et al., 2021).

This is one of the few studies done in south India which has estimated the vaccination coverage among healthcare workers and determined the level & correlates of KAP regarding hepatitis B among them. However, as it is a single institute-based study results should be carefully generalised. However, they will surely provide a reference for further research in this field. We could not highlight the Needle Stick Injury/blood splash.

## Conclusion

Complete Hepatitis B vaccination coverage 195 (43.2%) was very low among HCWS. This is despite adequate knowledge attitude and practice (KAP) on preventive measures of Hepatitis B infection as evidenced by an overall KAP score of 100.8 out of 125. Vaccination status was found to be an independent predictor of KAP score in the present study. Thus, it is essential to take proactive measures to vaccinate the unvaccinated HCWs. Also, it is prudent to perform HBV testing among those already vaccinated or partially vaccinated to determine their level of protective antibodies. So, the administration of the respective hospitals, universities, the state government, and the central governments should ensure complete vaccination of the health care providers including the medical students against vaccine-preventable diseases.

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## Conflicts of Interest

The author declares no conflicts of interest.

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