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# Determinants and Barriers to Hepatitis B Vaccination Uptake Among Undergraduate Students at Al Hikmah University Ilorin Nigeria

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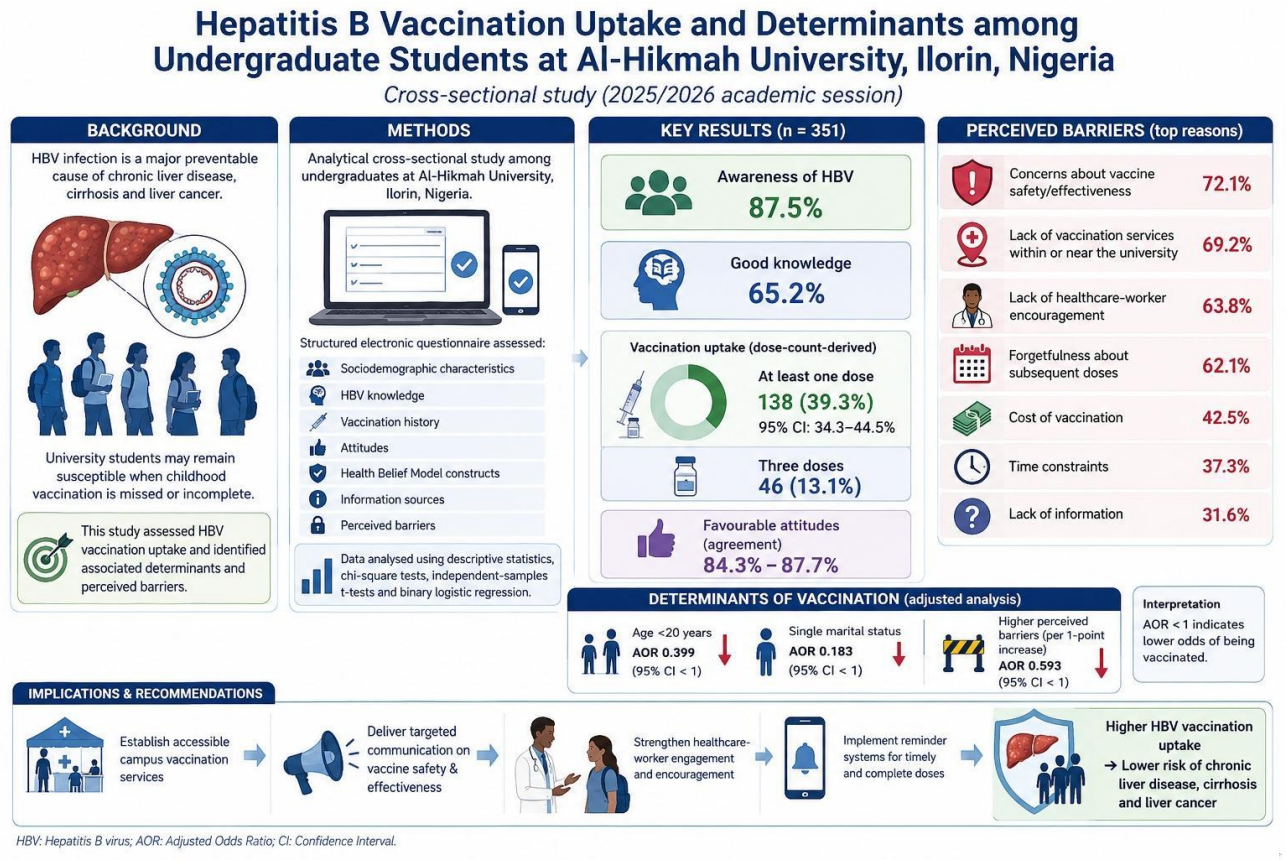
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**Abstract**

Hepatitis B virus (HBV) infection remains an important preventable cause of chronic liver disease, cirrhosis and liver cancer. University students may remain susceptible when childhood vaccination was missed or incomplete, yet institution-specific evidence on vaccination behavior is limited. This study assessed hepatitis B vaccination uptake and identified associated determinants and perceived barriers among undergraduate students at Al-Hikmah University, Ilorin, Nigeria. An analytical cross-sectional study was conducted among consenting undergraduates during the 2025/2026 academic session. A structured electronic questionnaire assessed sociodemographic characteristics, HBV knowledge, vaccination history, attitudes, Health Belief Model constructs, information sources and barriers. Data were analyzed using descriptive statistics, chi-square tests, independent-samples t-tests and binary logistic regression. Of 361 students who accessed the questionnaire, 351 consented and were analyzed. Awareness of HBV was 87.5%, and 65.2% had good knowledge. Using the dose-count-derived analytic variable, 138 (39.3%) had received at least one vaccine dose (95% CI: 34.3–44.5%), while 46 (13.1%) reported three doses. Attitudes were favorable (84.3–87.7% agreement), but barriers were prominent, especially concerns about vaccine safety/effectiveness (72.1%), lack of vaccination services within or near the university (69.2%), lack of healthcare-worker encouragement (63.8%) and forgetfulness about subsequent doses (62.1%). In adjusted analysis, age <20 years (AOR 0.399), single marital status (AOR 0.183) and higher perceived barriers (AOR 0.593 per one-point increase) were associated with lower odds of vaccination. Improving uptake will require accessible campus vaccination, targeted safety communication, healthcare-worker engagement and reminder systems.

**Keywords:** Hepatitis B Virus; Vaccination Uptake; Undergraduate Students; Health Belief Model; Vaccination Barriers.

## Graphical Abstract




**Note:** The graphical abstract was created with ChatGPT

## 1.0 Introduction

Hepatitis B virus (HBV) infection remains a major global public health problem affecting the liver. The infection may occur as an acute illness, which is often short-term and may resolve spontaneously, or as a chronic infection that can persist for years and progress to severe complications such as liver cirrhosis, liver failure and hepatocellular carcinoma (World Health Organization, 2024). Transmission occurs through contact with infected blood or body fluids, including through sexual contact, contaminated medical instruments, and mother-to-child transmission during childbirth (WHO, 2024; Centers for Disease Control and Prevention, 2025). HBV can remain infectious on environmental surfaces for at least seven days, and transmission may occur when contaminated blood or body fluids come into contact with mucous membranes or broken skin, including through contaminated instruments and personal items such as razors and toothbrushes (CDC, 2025).

Hepatitis B affects people of all age groups; however, university students and other young adults may experience exposure through sexual activity and other risk behaviors, while students involved in clinical training may additionally experience occupational exposure to blood and body fluids (Ashaka *et al*., 2024; Makan *et al*., 2023). Most immunocompetent adults who become infected with HBV clear the infection spontaneously, whereas the likelihood of developing chronic infection is strongly influenced by the age at which infection occurs (CDC, 2025). Chronic HBV infection develops in approximately 90% of infections acquired perinatally, 20-30% of infections acquired during childhood, and less than 5% of infections acquired during adulthood. Chronic infection is associated with an increased risk of cirrhosis and hepatocellular carcinoma, with approximately 15%-25% of people with chronic HBV infection at risk of premature death from these complications (Croagh & Lubel, 2014; Fattovich *et al*., 2008).

Hepatitis B virus (HBV) can be transmitted through exposure to infected blood and certain body fluids, particularly semen and vaginal secretions, with sexual and blood-borne exposure constituting important routes of transmission (WHO, 2026; CDC, 2025; Adekanle *et al*., 2010). HBV is highly infectious and is estimated to be approximately 50–100 times more infectious than human immunodeficiency virus (HIV) (Mohammed *et al*., 2019).

Globally, an estimated 240 million people are living with chronic HBV infection, and approximately 1.1 million deaths attributed to the disease were recorded in 2024, largely due to complications such as liver cirrhosis and hepatocellular carcinoma (WHO, 2026).

Despite the existence of a safe, effective, and relatively affordable vaccine since the 1980s, vaccination uptake remains suboptimal in many low and middle-income countries (LMICs), including Nigeria (Olakunde, 2025). The African region bears a disproportionate share of the global hepatitis B burden. According to the WHO Global Hepatitis Report, the African region accounted for 68% of new HBV infections globally in 2024. Yet, despite this substantial burden only 17% of newborns across the continent received the hepatitis B birth-dose vaccine (WHO, 2026). Ten countries including Nigeria are collectively responsible for two-thirds of the global hepatitis B and C burden, highlighting the urgency of targeted intervention in high-burden settings (WHO, 2024; Cui *et al*., 2026).

Nigeria remains one of the countries with substantial burden of HBV infection. Earlier national survey data reported prevalence ranging between 8% and 12% in the total population. The high prevalence has been attributed to poor vaccination coverage, low awareness, inadequate screening services, unsafe traditional practices, poverty, and weak healthcare infrastructure (Olayinka *et al*., 2016). A 2025 narrative review estimated the current prevalence of HBV in Nigeria at approximately 5.4% in 2022, equivalent to roughly 14.4 million people living with hepatitis B virus (Olakunde *et al*., 2025). An earlier systematic review and meta-analysis covering studies published between 2010 and 2019 reported a pooled prevalence of 9.5% (Ajuwon *et al*., 2021). Available data also reveal socio-demographic disparities in disease burden, with higher rates observed among men, rural dwellers and adults above 18 years. Furthermore, special populations such as healthcare workers, blood donors, prison inmates, and female sex workers carry significantly elevated HBV prevalence rates (Olakunde *et al*., 2025).

University students occupy a unique epidemiological position. Although many are young adults in ostensibly good health, some engage in risky behaviors and lifestyles including unprotected sexual intercourse, sharing of sharp objects, and in the case of health sciences students, occupational exposure to blood and body fluids which heightens their vulnerability to HBV transmission (Ashaka *et* al., 2024; Makan *et al*., 2023). Despite this elevated risk, studies from across sub-Saharan Africa consistently document low HBV vaccination rates among university students, despite vaccination being the most effective preventive strategy against the infection (CDC, 2025; Makan *et al*., Hassan *et al*., 2023). The World Health Organization (WHO) aims to eliminate viral hepatitis as a major public health threat by 2030, with targets of a 90% reduction in new infections and a 65% reduction in hepatitis-related mortality compared with the 2015 baseline (WHO, 2026). For hepatitis B specifically, WHO aims for a 95% reduction in new chronic HBV infections. Achieving these targets requires the expansion of

essential prevention, testing and treatment services, including hepatitis B vaccination, blood and injection safety, harm-reduction interventions, and access to testing and treatment (WHO, 2016, 2026).

A cross-sectional study at Garden City University College, Ghana, found that many students lacked accurate knowledge of HBV transmission and vaccination (Abban *et al*., 2024). A South African study among health sciences students similarly documented incomplete vaccination uptake, even among students aware of institutional vaccination policies (Makan *et al*., 2023). Among Somali health sciences students, only 33.4% had received a required doses of the HBV vaccine (Hassan *et al.*, 2023).

The determinants of hepatitis B vaccination uptake are multifactorial. They include individual-level factors such as knowledge about the disease and vaccine, perceived susceptibility, perceived severity, perceived benefits, and perceived barriers, which are constructs well captured by the Health Belief Model (Rosenstock, 1966; Janz & Becker, 1984). Evidence from Nigeria also indicates that structural factors such as vaccine availability, access to vaccination service, provider recommendation and knowledge can influence hepatitis B birth-dose vaccination (Freeland *et al*., 2023).

This multidisciplinary student population includes individuals with varying levels of exposure to health-related education and occupational health information. Recent studies at Al-Hikmah University have provided important evidence on HBV knowledge, vaccination perception, misconceptions and preventive practices among undergraduate students. Abdulazeez (2026) reported low vaccination uptake despite relatively good knowledge of HBV, while Issa *et al.* (2026) documented substantial gaps in full vaccination and identified misconceptions and preventive-practice issues among students. However, these studies did not specifically focus on the range of individual, socio-demographic, behavioral and institutional determinants and barriers associated with HBV vaccination uptake examined in the present study. This creates a need for a study specifically focused on identifying the factors associated with vaccination uptake and the barriers to receiving and completing vaccination among undergraduate students at Al-Hikmah University.

Recent evidence from Al-Hikmah University demonstrates the magnitude of the vaccination problem among undergraduate students. Abdulazeez (2026), in a study of 202 undergraduate students, reported that although 65.2% demonstrated good knowledge of HBV infection, only 10.4% had received at least one dose of the vaccine and only 7.4% had completed the recommended vaccination schedule. The study further found no statistically significant association between knowledge of HBV infection and students' perception towards vaccination ($r = -0.15$, $p = 0.068$). Similarly, Issa *et al*. (2026), in a study involving 409 undergraduate students of Al-Hikmah University, reported that only 17.8% of

participants were fully vaccinated, while 38.9% had never received the vaccine. These findings indicate that awareness and knowledge of HBV may not necessarily translate into complete vaccination and suggest the possible influence of other individual, socioeconomic and institutional factors.

Evidence from Nigeria also indicates that barriers to hepatitis B vaccination can include limited knowledge, inadequate access to vaccines and health-system constraints, demonstrating that vaccination uptake may be influenced by factors beyond individual awareness (Freeland *et al*., 2023).

The findings of this study were relevant to several stakeholders. First, the study provide institution-specific evidence on hepatitis B vaccination uptake among undergraduate students of Al-Hikmah University and identify the factors influencing their vaccination behavior. Although recent studies at the university have examined HBV knowledge, vaccination perception, misconceptions and preventive practices, there remains a need for evidence specifically addressing the determinants and barriers associated with vaccination uptake (Abdulazeez, 2026; Issa et al., 2026).

Second, identifying specific barriers to vaccination, including knowledge-related, economic, accessibility and institutional factors, provided useful evidence for the university health services and relevant public health authorities to develop targeted and context-appropriate interventions. Such interventions include improved health education, vaccination promotion, enhanced access to vaccination services and strategies for encouraging completion of the recommended vaccination schedule.

Third, the study contributed to the broader public health goal of reducing HBV transmission and advancing viral hepatitis elimination efforts. The World Health Organization's global hepatitis strategy established the goal of eliminating viral hepatitis as a major public health threat by 2030, with a 90% reduction in new chronic infections and a 65% reduction in mortality compared with the 2015 baseline; for HBV specifically, the incidence reduction target is 95% (WHO, 2016).

Fourth, the study applied the Health Belief Model to examine relevant individual perceptions and behavioral factors associated with HBV vaccination uptake. The findings may therefore provide a basis for developing behavior-change communication and health-promotion strategies that address specific perceived barriers and benefits to vaccination.

Finally, the study contributed to the growing body of literature on HBV vaccination among university students in Nigeria and provide a useful reference for future researchers, particularly those interested in vaccination behavior, health promotion and hepatitis B prevention among young adults.

The aim of this study was to determine the factors influencing hepatitis B vaccination uptake and identify the barriers to vaccination among undergraduate students at Al-Hikmah University, Ilorin, Nigeria.

## 2.0 Materials and Methods

### 2.1 Study Area

The study was conducted at Al-Hikmah University, Ilorin, Kwara State, North-Central Nigeria. Al-Hikmah University is a private university established in 2005 by the Abdur-Raheem Oladimeji Islamic Foundation and licensed by the Federal Government of Nigeria. The university is located in Adewole Estate, Adeta Road, Ilorin, Kwara State. The university provides undergraduate and postgraduate education across multiple academic disciplines and faculties.

The university has a health centre that provides healthcare services to students and members of the university community. The study setting provides an appropriate environment for assessing hepatitis B vaccination uptake, knowledge, attitudes, determinants, and barriers among undergraduate students.

### 2.2 Study Design

The study employed a descriptive and analytical cross-sectional design. The design is appropriate because data on hepatitis B vaccination uptake, knowledge, attitudes, determinants, and barriers were collected from undergraduate students at a single point in time. The design allowed the researcher to determine the prevalence of hepatitis B vaccination uptake and examine associations between vaccination uptake and selected socio-demographic, knowledge-related, attitudinal, individual, behavioral, accessibility, and institutional factors among the study participants.

### 2.3 Study Population

The study population comprised all undergraduate students enrolled at Al-Hikmah University, Ilorin, during the 2025/2026 academic session. The accessible population consisted of eligible undergraduate students across the various faculties, departments and levels who can be reached through the approved electronic channels used for questionnaire distribution.

The current undergraduate enrolment for the 2025/2026 academic session was obtained from the appropriate university records and used to define the sampling frame for the study.

### 2.4 Eligibility Criteria

#### 2.4.1 Inclusion Criteria

Participants eligible for inclusion in the study;

1. Were undergraduate students currently registered in a Bachelor's degree programme at Al-

Hikmah University, Ilorin, during the 2025/2026 academic session.

2. Are aged 18 years or older.

3. Provided informed consent to participate in the study.

4. Were able to understand and complete the questionnaire.

### 2.4.2 Exclusion Criteria

Participants excluded from the study were:

1. Postgraduate students of Al-Hikmah University.

2. Academic or non-academic staff of the university.

3. Those who declined to provide informed consent.

4. Submit incomplete responses that do not contain sufficient information for analysis.

## 2.5 Sample Size Determination

The minimum sample size was calculated using the Leslie Kish formula for single population proportion in descriptive cross-section studies.

$$n_0 = \frac{Z^2 PQ}{d^2}$$

Where: $n_0$ = minimum estimated sample size;

Z = statistic corresponding to the 95% confidence level (1.96);

P = estimated proportion of hepatitis B vaccination uptake among university students (taken as 26.9%, based on Elegbede *et al*., 2022, A study conducted among undergraduate students in a private university in Ekiti state.)

$$Q = 1 - P = 0.731$$

d = acceptable margin of error (0.05).

$$n_0 = \frac{(1.96)^2 \times 0.269 \times 0.731}{(0.05)^2} = 302.16 \approx 303$$

To compensate for possible non-response and incomplete questionnaires, a 10% non-response rate was added (John W. Creswell & J. David Creswell, 2018).

The adjusted sample size was calculated as:

$$\mathrm{nf} = \frac{n}{1 - \mathrm{r}}$$

$n_f$ = Final sample size

n = Minimum sample size (303)

r = Non-response rate (10% = 0.10)

$$\mathrm{nf} = \frac{303}{1 - 0.10} = 336.67$$

The value was approximated to 337 respondents, which constituted the final sample size for the study.

**2.6 Sampling Technique**

A convenience sampling technique was employed for this study. The Google form questionnaire link were distributed electronically to undergraduate students of Al-Hikmah University through students' WhatsApp groups, class platforms, and other approved communication channels. Only undergraduate students who met the inclusion criteria and voluntarily provided electronic informed consent were eligible to participate in the study. Data collection continued until at least the calculated minimum sample size of 337 eligible respondents was obtained. A total of 351 consenting and sufficiently complete responses were ultimately included in the analysis.

**2.7 Data Collection Instrument**

The instrument used for data collection was a structured, self-administered questionnaire administered electronically through Google Forms. The questionnaire was designed to obtain information relevant to the study objectives and was completed voluntarily by eligible undergraduate students.

The questionnaire was developed based on the objectives of the study and informed by relevant literature on hepatitis B infection and vaccination among university students, including Naqid *et al*. (2023) and Abban *et al*. (2024). Relevant items were adapted and modified where appropriate to suit the study population, research objectives, and context of Al-Hikmah University. The questionnaire was also structured to incorporate selected constructs of the Health Belief Model (HBM).

The questionnaire consisted of five sections:

**Section A:** Socio-demographic Characteristics

This section obtained information on the socio-demographic characteristics of the respondents including age, sex, marital status, faculty, and level of study.

**Section B:** Knowledge of Hepatitis B Infection and Vaccination

This section assessed respondents' knowledge of hepatitis B infection and vaccination, including its causative agent, modes of transmission, prevention through vaccination, vaccine safety and effectiveness, complications of infection, vaccination schedule, and the possibility of asymptomatic infection. Responses were obtained using True, False, and Don't Know options.

**Section C:** Hepatitis B Vaccination Uptake and History

This section assessed respondents' history of hepatitis B vaccination, including whether they have ever received the vaccine, number of doses received, completion of the recommended three-dose schedule, place of vaccination, timing of the most recent dose, and reasons for non-completion where applicable.

**Section D:** Attitudes, Perceptions and Determinants of Hepatitis B Vaccination

This section assessed respondents' attitudes towards hepatitis B vaccination and selected determinants of vaccination uptake. The items covered perceived susceptibility/risk, perceived severity, perceived benefits, healthcare-worker influence, social and peer influence, accessibility and institutional influence, and self-efficacy. Sources of information about hepatitis B and its vaccination were also assessed. Responses to the attitudinal and determinant items were measured using a four-point Likert scale ranging from Strongly Agree to Strongly Disagree. The items in this section are informed by the Health Belief Model (HBM).

**Section E:** Barriers to Hepatitis B Vaccination Uptake

This section assessed perceived barriers to hepatitis B vaccination uptake, including cost, fear of side effects, fear of injections, lack of time, accessibility, inadequate information, perceived risk, concerns about vaccine safety or effectiveness, religious or cultural considerations, difficulty completing subsequent doses, healthcare-worker recommendation, availability of vaccination services, academic workload, and competing priorities. Responses were also measured using a four-point Likert scale ranging from Strongly Agree to Strongly Disagree.

### 2.8 Validity and Reliability of Instrument

The questionnaire was subjected to face and content validity by experts in Public Health, Epidemiology, and Research Methodology. Their suggestions regarding the clarity, relevance, comprehensiveness, and appropriateness of the questionnaire items were incorporated before the final administration of the instrument.

A pilot study was conducted among 34 undergraduate students, representing approximately 10% of the calculated sample size, at the University of Ilorin, a comparable institution not included in the main study. The pilot study was used to assess the clarity, appropriateness, and reliability of the questionnaire. Internal consistency of the relevant multi-item Likert-scale sections was assessed using Cronbach's alpha coefficient, with a coefficient of $\geq 0.70$ considered acceptable. Data obtained from the pilot study were not included in the main study analysis.

### 2.9 Data Collection Procedure

Following ethical approval and permission from the relevant university authorities, the Google Forms questionnaire link was distributed electronically to eligible undergraduate students through approved student communication channels. The introductory section of the form provided information about the purpose of the study, the voluntary nature of participation, confidentiality of information provided, and the informed consent process.

Only respondents who provide informed consent electronically were allowed to proceed to the questionnaire. Periodic reminders were sent through the approved communication channels to encourage participation and minimize non-response. Data collection continued until the required sample size of 337 eligible and sufficiently complete responses is attained.

### 2.10 Data Management and Analysis

Data collected through Google Forms were downloaded into Microsoft Excel and subsequently entered into IBM SPSS Statistics version 26.0 (IBM Corp., Armonk, NY, USA) for analysis. Descriptive statistics, including frequencies, percentages, means, and standard deviations, were computed for relevant variables. The prevalence of hepatitis B vaccination uptake was expressed as a proportion with its 95% confidence interval.

Bivariate analysis was performed using the chi-square test for categorical variables and the independent t-test for continuous variables, as appropriate, to assess associations between hepatitis B

vaccination uptake and relevant socio-demographic, knowledge-related, attitudinal, individual, behavioral, accessibility, and institutional factors.

Variables with statistical significance at $p < 0.20$ at the bivariate level, together with variables considered theoretically important or potential confounders, were considered for inclusion in a binary logistic regression model to identify independent determinants of hepatitis B vaccination uptake. Results were presented as adjusted odds ratios (AOR) with 95% confidence intervals (CI). Statistical significance set at $p < 0.05$.

Statistical significance set at $p < 0.05$.

### 3.11 Ethical Consideration

The study protocol was reviewed and approved by the Department of Health Research Ethics Committee of Al-Hikmah University, Ilorin, Kwara State, Nigeria, in accordance with the department's guidelines for research involving human participants. However, no protocol number was assigned for this study. The research was carried out following the ethical principles outlined in the Declaration of Helsinki. Formal institutional research ethics committee approval was obtained prior to data collection. All procedures performed in this study involving human participants were in accordance with the ethical standards of the institutional research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

## 3.0 Results

This chapter presents the results of the study on determinants and barriers to Hepatitis B vaccination uptake among undergraduate students of Al-Hikmah University, Ilorin, Kwara State, Nigeria. A total of 361 students accessed the questionnaire, of whom 351 provided informed consent and were included in the analysis; the remaining 10 did not consent and were excluded. Data were analyzed using descriptive statistics (frequencies, percentages, means, and standard deviations), with the prevalence of vaccination uptake expressed as a proportion with its 95% confidence interval. Bivariate associations between vaccination uptake and relevant factors were assessed using the chi-square test and independent t-test, and variables significant at $p < 0.20$ were entered into a binary logistic regression model to identify independent determinants, with results presented as adjusted odds ratios (AOR) and 95% confidence intervals. The study hypotheses were tested at the $p < 0.05$ significance level. Results are presented under the following sub-headings: socio-demographic characteristics of respondents; knowledge of Hepatitis B infection and vaccination; Hepatitis B vaccination uptake and history; attitudes towards Hepatitis B vaccination; perceived susceptibility and severity; perceived benefits; healthcare-worker and social/peer influence; accessibility and institutional influence; self-efficacy; sources of information; barriers to Hepatitis B vaccination uptake; bivariate analysis of factors associated with uptake; multivariate logistic regression analysis; and test of hypotheses. Each table is accompanied by a brief interpretation of the findings.

Of the 361 respondents, 351 (97.2%) indicated that they had read and understood the study information and voluntarily agreed to participate in the study, while 10 (2.8%) did not give consent. All 351 returned questionnaires completed were retained for the analysis presented below.

### 3.1 Socio-demographic Characteristics of Respondents

**Table 3.1** shows that the majority of the respondents, 134 (38.2%), were aged 20–24 years, followed by those aged 25–29 years (106, 30.2%), while those aged 30 years and above and those less than 20 years accounted for 16.0% and 15.7% respectively. By faculty, respondents from the Faculty of Health Sciences formed the largest proportion (173, 49.3%), followed by the Faculty of Natural and Applied Sciences (20.8%), Faculty of Arts, Social and Management Sciences (15.7%), and Faculty of Education (11.1%), while the Faculty of Law recorded the least representation (11, 3.1%). With respect to level of study, 400 Level students formed the largest group (102, 29.1%), while 100 Level students were the least represented (22, 6.3%). More female respondents (205, 58.4%) participated in

the study than males (146, 41.6%). Regarding marital status, most respondents were single (249, 70.9%), while married, divorced, and widowed respondents accounted for 21.1%, 6.6%, and 1.4% respectively.

**Table 3.1: Socio-demographic Characteristics of Respondents (N = 351)**

| Variable | Category | Frequency | Percentage (%) |
|---|---|---|---|
| **Age (years)** | Less than 20 years | 55 | 15.7 |
| | 20-24 years | 134 | 38.2 |
| | 25-29 years | 106 | 30.2 |
| | 30 years and above | 56 | 16.0 |
| **Faculty** | Faculty of Arts, Social and Management Sciences | 55 | 15.7 |
| | Faculty of Natural and Applied Sciences | 73 | 20.8 |
| | Faculty of Health Sciences | 173 | 49.3 |
| | Faculty of Education | 39 | 11.1 |
| | Faculty of Law | 11 | 3.1 |
| **Level of Study** | 100 Level | 22 | 6.3 |
| | 200 Level | 86 | 24.5 |
| | 300 Level | 86 | 24.5 |
| | 400 Level | 102 | 29.1 |
| | 500 Level | 55 | 15.7 |
| **Sex** | Female | 205 | 58.4 |
| | Male | 146 | 41.6 |
| **Marital Status** | Single | 249 | 70.9 |
| | Married | 74 | 21.1 |
| | Divorced | 23 | 6.6 |
| | Widowed | 5 | 1.4 |

### 3.2 Knowledge of Hepatitis B Infection and Vaccination

**Table 3.2** shows that 307 (87.5%) of the respondents had heard of Hepatitis B prior to the study, while only 44 (12.5%) had not, indicating a generally high level of awareness of the disease among the undergraduate students surveyed.

**Table 3.2: Awareness of Hepatitis B**

| Response Category | Frequency | Percentage (%) |
|---|---|---|
| **Yes** | 307 | 87.5 |
| **No** | 44 | 12.5 |
| **Total** | 351 | 100.0 |

**Table 3.3** reveals varying levels of knowledge across the specific items assessed. Correct knowledge (True) was highest for the statement that the hepatitis B vaccine is safe and effective in preventing hepatitis B infection, with 280 (79.8%) respondents answering correctly, followed by the statement that hepatitis B can be prevented through vaccination, with 276 (78.6%). A relatively high proportion of respondents also correctly identified that a person who looks healthy can still be infected with hepatitis B (275, 78.3%), that hepatitis B can be transmitted from an infected mother to her baby during childbirth (254, 72.4%), through unprotected sexual intercourse (255, 72.6%), and through sharing contaminated sharp objects (250, 71.2%). Knowledge was comparatively lower regarding the potential for hepatitis B infection to lead to liver cirrhosis or liver cancer (235, 67.0%) and the recommended three-dose vaccination schedule (224, 63.8%). Notably, 81 (23.1%) respondents selected "Don't know" regarding the three-dose vaccination schedule, representing the highest proportion of "Don't know" responses among the items assessed.

**Table 3.3: Knowledge of Hepatitis B Transmission, Prevention, and Health Effects (Correct response = True)**

| Statement | True n (%) | False n (%) | Don't Know n (%) |
|---|---|---|---|
| **Hepatitis B is caused by a virus.** | 250 (71.2%) | 54 (15.4%) | 47 (13.4%) |
| **Hepatitis B can be transmitted through unprotected sexual intercourse.** | 255 (72.6%) | 59 (16.8%) | 37 (10.5%) |
| **Hepatitis B can be transmitted through sharing contaminated sharp objects such as razors and needles.** | 250 (71.2%) | 59 (16.8%) | 42 (12.0%) |
| **Hepatitis B can be transmitted from an infected mother to her baby during childbirth.** | 254 (72.4%) | 59 (16.8%) | 38 (10.8%) |
| **Hepatitis B can be prevented through vaccination.** | 276 (78.6%) | 51 (14.5%) | 24 (6.8%) |
| **The hepatitis B vaccine is safe and effective in preventing Hepatitis B infection.** | 280 (79.8%) | 43 (12.3%) | 28 (8.0%) |
| **Hepatitis B infection can lead to liver cirrhosis or liver cancer.** | 235 (67.0%) | 52 (14.8%) | 64 (18.2%) |
| **The recommended hepatitis B vaccination schedule consists of three doses.** | 224 (63.8%) | 46 (13.1%) | 81 (23.1%) |
| **A person who looks healthy can still be infected with hepatitis B.** | 275 (78.3%) | 49 (14.0%) | 27 (7.7%) |

**Table 3.4** shows that 229 (65.2%) of respondents demonstrated good knowledge of Hepatitis B infection and vaccination (i.e., correctly answered at least 70% of the nine items), while 122 (34.8%) demonstrated poor knowledge. Although the majority demonstrated good overall knowledge, specific gaps were evident, particularly regarding the recommended three-dose vaccination schedule.

**Table 3.4: Overall Level of Knowledge of Hepatitis B (based on 9 knowledge items)**

| Response Category | Frequency | Percentage (%) |
|---|---|---|
| **Good Knowledge (≥70% correct)** | 229 | 65.2 |
| **Poor Knowledge (<70% correct)** | 122 | 34.8 |
| **Total** | 351 | 100.0 |

### 3.3 Hepatitis B Vaccination Uptake and History

**Table 3.5** reveals that 186 (53%) of respondents had never received the Hepatitis B vaccine, while 140 (39.9%) had received at least one dose and 25 (7.1%) did not know their vaccination status. Among all respondents, only 46 (13.1%) reported having received the full three doses, while 56 (16%) and 36 (10.3%) had received one and two doses respectively. Consistent with this, 202 (57.5%) of respondents indicated that they had not completed the recommended three-dose schedule, compared with 101 (28.8%) who had completed it and 48 (13.7%) who were not sure. Among those who had received at least one dose, vaccination was most commonly obtained at government hospitals (53, 15.1%), followed by private hospitals (12.5%), school clinics (10.3%), and primary healthcare centres (8.5%); most recent doses were received within the last 12 months for 67 (19.1%) of vaccinated respondents. Among respondents who did not complete the three-dose schedule, the most frequently cited reason was forgetting to return for a subsequent dose (47, 13.4%), followed by lack of time (6.6%), cost (6%), and vaccine unavailability (5.7%). Overall, these findings point to low completion of the full Hepatitis B vaccination schedule among the undergraduate students surveyed.

**Table 3.5: Hepatitis B Vaccination Uptake and History**

| Variable | Category | Frequency | Percentage (%) |
|---|---|---|---|
| **Ever received Hepatitis B vaccine** | Yes | 140 | 39.9 |
| | No | 186 | 53.0 |
| | I don't know | 25 | 7.1 |
| **Number of doses received** | Zero dose | 83 | 23.6 |
| | One dose | 56 | 16.0 |
| | Two doses | 36 | 10.3 |
| | Three doses | 46 | 13.1 |
| | Not applicable | 130 | 37.0 |
| **Completed 3-dose schedule** | Yes | 101 | 28.8 |
| | No | 202 | 57.5 |
| | Not sure | 48 | 13.7 |
| **Place of vaccination** | Government hospital | 53 | 15.1 |
| | Private hospital | 44 | 12.5 |
| | School clinic | 36 | 10.3 |
| | Primary Healthcare Center | 30 | 8.5 |
| | Not applicable | 188 | 53.6 |
| **Timing of most recent dose** | Within 12 months | 67 | 19.1 |
| | 1-3 years ago | 51 | 14.5 |
| | More than 3 years ago | 37 | 10.5 |
| | I do not remember | 22 | 6.3 |
| | Not applicable | 174 | 49.6 |
| **Main reason for non-completion** | Cost | 21 | 6.0 |
| | Forgot to return for subsequent dose | 47 | 13.4 |

| | | | |
|---|---|---|---|
| | Lack of time | 23 | 6.6 |
| | Vaccine was unavailable | 20 | 5.7 |
| | Fear of side effects | 11 | 3.1 |
| | Fear of injections | 10 | 2.8 |
| | Did not think further doses were necessary | 5 | 1.4 |
| | I completed all three doses | 27 | 7.7 |
| | Not applicable | 187 | 53.3 |

### 3.3.1 Note on Data Cleaning: Vaccination Status Variable

During data cleaning, the questionnaire item asking whether respondents had "ever received" the hepatitis B vaccine (Yes/No/I don't know) was found to be inconsistent with the item asking how many doses respondents had received, for a meaningful proportion of respondents (60 of 351 respondents, 17.1%). Similarly, of the 101 respondents who reported "Yes" to having completed the three-dose schedule, only 43 (42.6%) also reported having received three doses, whereas of the 46 respondents who reported having received three doses, 43 (93.5%) confirmed completion indicating that the direct dose-count item was substantially more internally consistent than the self-reported completion item. Accordingly, vaccination status used in the bivariate analysis (Section 3.12) and multivariate logistic regression (Section 4.13) was derived from the reported number of doses received (yielding 138 respondents, 39.3%, classified as ever vaccinated), rather than from the direct yes/no item reported in Table 3.5 (140 respondents, 39.9%). The two figures are close but not identical because 33 respondents who answered "Yes" on the direct item reported zero doses received, while 31 respondents who answered "No" or "I don't know" reported having received at least one dose.

### 3.4 Attitudes, Perception and Determinants of Hepatitis B Vaccination

As shown in **Table 3.6**, respondents generally held favorable attitudes towards Hepatitis B vaccination. A combined 305 (86.9%) either agreed or strongly agreed that Hepatitis B vaccination is important for university students, while 296 (84.3%) expressed willingness to be vaccinated if not previously vaccinated. Similarly, 306 (87.2%) trusted the safety of the vaccine, and 308 (87.7%) agreed that completing the recommended vaccination schedule is important. These results indicate that positive attitudes towards Hepatitis B vaccination were widespread among the respondents, even though, as shown earlier in Table 4.5, actual vaccination uptake and schedule completion remained comparatively low suggesting a gap between favorable attitudes and actual vaccination behavior.

**Table 3.6: Attitudes Towards Hepatitis B Vaccination**

| Statement | Strongly Agree n (%) | Agree n (%) | Disagree n (%) | Strongly Disagree n (%) |
|---|---|---|---|---|
| **Hepatitis B vaccination is important for university students.** | 167 (47.6%) | 138 (39.3%) | 31 (8.8%) | 15 (4.3%) |
| **I would be willing to receive the Hepatitis B vaccine if I have not been vaccinated.** | 153 (43.6%) | 143 (40.7%) | 33 (9.4%) | 22 (6.3%) |
| **I trust the safety of the hepatitis B vaccine.** | 145 (41.3%) | 161 (45.9%) | 28 (8.0%) | 17 (4.8%) |
| **Completing the recommended Hepatitis B vaccination schedule is important.** | 167 (47.6%) | 141 (40.2%) | 26 (7.4%) | 17 (4.8%) |

### 3.5 Perceived Susceptibility, Risk and Severity

**Table 3.7** shows that 302 (86%) of respondents agreed that the benefits of Hepatitis B vaccination outweigh its possible risks, and 293 (83.5%) agreed that university students can be exposed to Hepatitis B infection. However, only 209 (59.5%) perceived themselves to be personally at risk of contracting the infection, indicating a lower level of perceived personal susceptibility relative to perceived susceptibility of university students as a group. With regard to perceived severity, the majority of respondents agreed that a person can be infected with Hepatitis B without showing symptoms (293, 83.5%), that Hepatitis B infection can cause serious health problems (314, 89.5%), and that untreated chronic infection can lead to liver cirrhosis or liver cancer (303, 86.3%). These findings suggest that while respondents generally perceived Hepatitis B as a severe condition, perceived personal susceptibility to infection was comparatively lower.

**Table 3.7: Perceived Susceptibility/Risk and Perceived Severity of Hepatitis B Infection**

| Statement | Strongly Agree n (%) | Agree n (%) | Disagree n (%) | Strongly Disagree n (%) |
|---|---|---|---|---|
| **I believe that the benefits of Hepatitis B vaccination outweigh its possible risks.** | 153 (43.6%) | 149 (42.5%) | 33 (9.4%) | 16 (4.6%) |
| **I believe that I am at risk of contracting Hepatitis B infection.** | 83 (23.6%) | 126 (35.9%) | 89 (25.4%) | 53 (15.1%) |
| **I believe that university students can be exposed to Hepatitis B infection.** | 134 (38.2%) | 159 (45.3%) | 41 (11.7%) | 17 (4.8%) |
| **I believe that a person can have Hepatitis B infection without showing symptoms.** | 123 (35.0%) | 170 (48.4%) | 37 (10.5%) | 21 (6.0%) |
| **I believe that Hepatitis B infection can cause serious health problems.** | 163 (46.4%) | 151 (43.0%) | 20 (5.7%) | 17 (4.8%) |
| **I believe that untreated chronic Hepatitis B infection can lead to liver cirrhosis or liver cancer.** | 158 (45.0%) | 145 (41.3%) | 31 (8.8%) | 17 (4.8%) |

### 3.6 Perceived Benefits of Hepatitis B Vaccination

**Table 3.8** revealed, 310 (88.3%) of respondents agreed that receiving the Hepatitis B vaccine would reduce their risk of contracting the infection, and an even higher proportion, 319 (90.9%), agreed that completing the recommended three-dose schedule provides better protection than partial vaccination. These results indicate a strong perception of the benefits of both vaccination and schedule completion among the respondents.

**Table 3.8: Perceived Benefits of Hepatitis B Vaccination**

| Statement | Strongly Agree n (%) | Agree n (%) | Disagree n (%) | Strongly Disagree n (%) |
|---|---|---|---|---|
| **I believe that receiving the Hepatitis B vaccine will reduce my risk of contracting Hepatitis B infection.** | 172 (49.0%) | 138 (39.3%) | 25 (7.1%) | 16 (4.6%) |
| **I believe that completing the recommended Hepatitis B vaccination schedule provides better protection against Hepatitis B infection.** | 177 (50.4%) | 142 (40.5%) | 18 (5.1%) | 14 (4.0%) |

### 3.7 Healthcare-Worker Influence and Social/Peer Influence

**Table 3.9** shows that 299 (85.2%) of respondents agreed that a recommendation from a healthcare worker would influence their decision to receive the Hepatitis B vaccine, although a comparatively lower proportion, 265 (75.5%), reported having actually received information about Hepatitis B vaccination from a healthcare worker. This suggests an existing gap between the potential influence of healthcare workers and the extent of healthcare-worker-led sensitization reaching students. In terms of social and peer influence, 278 (79.2%) of respondents agreed that information from family members or friends influences their vaccination decisions, and 280 (79.8%) agreed that seeing other students get vaccinated would encourage them to do the same, indicating a meaningful role for peer example and social networks in vaccination decision-making.

**Table 3.9: Healthcare-Worker Influence and Social/Peer Influence on Hepatitis B Vaccination**

| Statement | Strongly Agree n (%) | Agree n (%) | Disagree n (%) | Strongly Disagree n (%) |
|---|---|---|---|---|
| **Recommendation from a healthcare worker would influence my decision to receive the Hepatitis B vaccine.** | **140 (39.9%)** | **159 (45.3%)** | **38 (10.8%)** | **14 (4.0%)** |
| **I have received information about Hepatitis B vaccination from a healthcare worker.** | **107 (30.5%)** | **158 (45.0%)** | **68 (19.4%)** | **18 (5.1%)** |
| **Information from family members or friends influences my decision about Hepatitis B vaccination.** | **111 (31.6%)** | **167 (47.6%)** | **54 (15.4%)** | **19 (5.4%)** |
| **Seeing other students receive the Hepatitis B vaccine would encourage me to get vaccinated.** | **118 (33.6%)** | **162 (46.2%)** | **53 (15.1%)** | **18 (5.1%)** |

### 3.8 Accessibility and Institutional Influence

**Table 4.10** shows 309 (88%) of respondents agreed that easy access to vaccination services encourages uptake, and 303 (86.3%) agreed that the availability of Hepatitis B vaccination services within or near the university would encourage them to get vaccinated. In addition, 297 (84.6%) of respondents indicated that they would be more likely to receive the vaccine if recommended by the university, and 295 (84%) agreed that a university-led vaccination campaign would encourage them to get vaccinated. These findings highlight accessibility and institutional support as important facilitators that could improve vaccination uptake among undergraduate students.

**Table 3.10: Accessibility and Institutional Influence on Hepatitis B Vaccination**

| Statement | Strongly Agree n (%) | Agree n (%) | Disagree n (%) | Strongly Disagree n (%) |
|---|---|---|---|---|
| **Easy access to Hepatitis B vaccination services encourages vaccination uptake.** | 160 (45.6%) | 149 (42.5%) | 27 (7.7%) | 15 (4.3%) |
| **The availability of Hepatitis B vaccination services within or near the university would encourage me to get vaccinated.** | 148 (42.2%) | 155 (44.2%) | 32 (9.1%) | 16 (4.6%) |
| **I am more likely to receive the Hepatitis B vaccine if it is recommended by the university.** | 144 (41.0%) | 153 (43.6%) | 40 (11.4%) | 14 (4.0%) |
| **A university vaccination campaign would encourage me to receive the Hepatitis B vaccine.** | 145 (41.3%) | 150 (42.7%) | 43 (12.3%) | 13 (3.7%) |

### 3.9 Self-Efficacy Towards Hepatitis B Vaccination

**Table 4.11** shows that a majority of respondents expressed confidence in their ability to complete Hepatitis B vaccination. Specifically, 306 (87.2%) were confident they could receive all recommended doses, 300 (85.5%) felt they could make arrangements to be vaccinated despite academic workload, and 294 (83.8%) were confident they could complete the schedule once they received the first dose. Despite this relatively high self-efficacy, the low schedule-completion rate reported in Table 3.5 suggests that perceived self-efficacy alone has not translated into actual completion of the vaccination schedule, pointing to the influence of other structural or situational barriers.

**Table 3.11: Self-Efficacy Towards Hepatitis B Vaccination**

| Statement | Strongly Agree n (%) | Agree n (%) | Disagree n (%) | Strongly Disagree n (%) |
|---|---|---|---|---|
| **I am confident that I can receive all the recommended doses of the Hepatitis B vaccine.** | 142 (40.5%) | 164 (46.7%) | 29 (8.3%) | 16 (4.6%) |
| **I can make arrangements to receive the Hepatitis B vaccine even when I am busy with academic activities.** | 131 (37.3%) | 169 (48.1%) | 37 (10.5%) | 14 (4.0%) |
| **I am confident that I can complete the Hepatitis B vaccination schedule once I receive the first dose.** | 128 (36.5%) | 166 (47.3%) | 40 (11.4%) | 17 (4.8%) |

### 3.9.1 Summary of Health Belief Model Construct Scores

**Table 4.12** presents mean scores for the Health Belief Model constructs assessed, measured on a four-point Likert scale (1 = Strongly Disagree to 4 = Strongly Agree). Respondents showed generally positive attitudes and perceptions across all constructs assessed, with the highest mean score recorded for perceived benefits of vaccination (mean = r) and the lowest for perceived susceptibility/risk (mean = 2.99), suggesting that although students generally believe the vaccine is beneficial, they are comparatively less convinced of their personal risk of infection.

**Table 3.12: Summary of Attitudes, Perceptions and Determinants of Hepatitis B Vaccination (N = 351)**

| Construct | Mean | SD |
|---|---|---|
| **Attitudes towards vaccination** | 3.26 | 0.70 |
| **Perceived susceptibility/risk** | 2.99 | 0.67 |
| **Perceived severity** | 3.29 | 0.73 |
| **Perceived benefits** | 3.35 | 0.72 |
| **Healthcare-worker influence** | 3.11 | 0.72 |
| **Social and peer influence** | 3.07 | 0.73 |
| **Accessibility and institutional influence** | 3.24 | 0.68 |

### 3.10 Sources of Information on Hepatitis B

**Table 3.13** shows that healthcare workers (166, 47.3%) and social media (165, 47%) were the two most commonly cited sources of information on Hepatitis B and its vaccination, followed by the university/school (35.6%) and the internet/websites (26.5%). Family members and friends/peers were each cited by 17.7% of respondents, while television/radio (13.7%) and religious/community sources (6.8%) were the least commonly cited channels. Notably, 42 (12%) of respondents reported that they had not received any information about Hepatitis B, underscoring a residual information gap that health education interventions could target.

**Table 3.13: Sources of Information on Hepatitis B and Hepatitis B Vaccination (N = 351; multiple responses permitted)**

| Source | Frequency | Percentage (%) |
|---|---|---|
| **Healthcare workers** | 166 | 47.3 |
| **University/school** | 125 | 35.6 |
| **Social media** | 165 | 47.0 |
| **Television/radio** | 48 | 13.7 |
| **Internet/websites** | 93 | 26.5 |
| **Family members** | 62 | 17.7 |
| **Friends/peers** | 62 | 17.7 |
| **Religious/community sources** | 24 | 6.8 |
| **I have not received information about Hepatitis B** | 42 | 12.0 |

**Note:** Percentages are based on the total number of respondents (N = 351) and do not sum to 100%, as respondents could select more than one source.

### 3.11 Barriers to Hepatitis B Vaccination Uptake

**Table 3.14** presents the barriers to hepatitis B vaccination uptake, showing the percentage of respondents who agreed, strongly agreed, disagreed, or strongly disagreed that each factor was a barrier. Survey shows that concern about the safety or effectiveness of the Hepatitis B vaccine was the most frequently endorsed barrier, agreed to by 253 (72.1%) of respondents, followed by the lack of vaccination services within or near the university (243, 69.2%), lack of encouragement or recommendation from healthcare workers (224, 63.8%), and fear of possible side effects (224, 63.8%). Forgetfulness or difficulty returning for subsequent doses was also identified as a notable barrier (218, 62.1%), consistent with the finding in Table 3.5 that this was the leading reason given for non-completion of the three-dose schedule. Structural barriers such as cost, lack of time, poor accessibility of vaccination centres, and inadequate information were each endorsed by roughly half or more of the respondents, while religious or cultural beliefs were the least frequently endorsed barrier (154, 43.9%). About half of the respondents (176, 50.1%) did not consider Hepatitis B vaccination a priority compared with other personal or academic needs. Taken together, these results suggest that vaccine safety concerns, limited access to services on or near campus, and insufficient

healthcare-worker engagement are the most prominent barriers to Hepatitis B vaccination uptake and schedule completion among the undergraduate students surveyed.

| Statement | Strongly Agree n (%) | Agree n (%) | Disagree n (%) | Strongly Disagree n (%) |
|---|---|---|---|---|
| **The cost of the Hepatitis B vaccine prevents or discourages me from getting vaccinated.** | 85 (24.2%) | 120 (34.2%) | 113 (32.2%) | 33 (9.4%) |
| **Fear of possible side effects discourages me from receiving the Hepatitis B vaccine.** | 81 (23.1%) | 143 (40.7%) | 94 (26.8%) | 33 (9.4%) |
| **I do not have enough time to visit a vaccination centre.** | 69 (19.7%) | 132 (37.6%) | 119 (33.9%) | 31 (8.8%) |
| **Vaccination centres are not easily accessible to me.** | 71 (20.2%) | 138 (39.3%) | 105 (29.9%) | 37 (10.5%) |
| **I do not know where to obtain the Hepatitis B vaccine.** | 73 (20.8%) | 127 (36.2%) | 112 (31.9%) | 39 (11.1%) |
| **I have not received enough information about Hepatitis B vaccination.** | 81 (23.1%) | 128 (36.5%) | 99 (28.2%) | 43 (12.3%) |
| **I do not think I am at sufficient risk of Hepatitis B infection to need vaccination.** | 74 (21.1%) | 120 (34.2%) | 112 (31.9%) | 45 (12.8%) |
| **I am concerned about the safety or effectiveness of the Hepatitis B vaccine.** | 86 (24.5%) | 167 (47.6%) | 74 (21.1%) | 24 (6.8%) |
| **Religious or cultural beliefs may discourage me from receiving Hepatitis B vaccination.** | 61 (17.4%) | 93 (26.5%) | 125 (35.6%) | 72 (20.5%) |

| | | | | |
|---|---|---|---|---|
| **Forgetfulness or difficulty returning for subsequent doses may prevent me from completing the vaccination schedule.** | 80 (22.8%) | 138 (39.3%) | 96 (27.4%) | 37 (10.5%) |
| **Lack of encouragement or recommendation from healthcare workers may discourage me from getting vaccinated.** | 93 (26.5%) | 131 (37.3%) | 91 (25.9%) | 36 (10.3%) |
| **Lack of vaccination services within or near the university discourages me from getting vaccinated.** | 86 (24.5%) | 157 (44.7%) | 81 (23.1%) | 27 (7.7%) |
| **My academic workload makes it difficult for me to receive or complete the Hepatitis B vaccination schedule.** | 76 (21.7%) | 133 (37.9%) | 110 (31.3%) | 32 (9.1%) |
| **I do not consider Hepatitis B vaccination a priority compared with other personal or academic needs.** | 64 (18.2%) | 112 (31.9%) | 124 (35.3%) | 51 (14.5%) |

**Table 3.14: Barriers to Hepatitis B Vaccination Uptake**

### 3.12 Bivariate Analysis of Factors Associated with Hepatitis B Vaccination Uptake

Chi-square tests were used to assess associations between categorical variables and vaccination uptake, and independent-samples t-tests were used for continuous score variables. Vaccination status for this analysis was defined using the dose-count-derived variable described in Section 3.3.1.

**Table 3.15** presents the results. Variables significant at $p < 0.20$ were retained for entry into the multivariate logistic regression model (Section 3.13), consistent with the analysis plan described in Section 3.10.

**Table 4.15: Bivariate Analysis of Factors Associated with Hepatitis B Vaccination Uptake**

| Variable | Test | Statistic | p-value | Retained (p<0.20) |
|---|---|---|---|---|
| **Age** | $\chi^2$ | 12.794 | 0.005* | Yes |
| **Faculty** | $\chi^2$ | 8.880 | 0.064 | Yes |
| **Level of study** | $\chi^2$ | 6.788 | 0.148 | Yes |
| **Sex** | $\chi^2$ | 0.216 | 0.642 | No |
| **Marital status** | $\chi^2$ | 17.728 | 0.001* | Yes |
| **Heard of hepatitis B** | $\chi^2$ | 0.004 | 0.947 | No |
| **Knowledge (% score)** | t-test | -1.459 | 0.146 | Yes |
| **Knowledge level (Good/Poor)** | $\chi^2$ | 0.124 | 0.725 | No |
| **Attitude score** | t-test | 1.069 | 0.286 | No |
| **Perceived susceptibility/risk** | t-test | 2.113 | 0.035* | Yes |
| **Perceived severity** | t-test | 0.120 | 0.904 | No |
| **Perceived benefits** | t-test | 1.116 | 0.265 | No |
| **Healthcare-worker influence** | t-test | 1.816 | 0.070 | Yes |
| **Social and peer influence** | t-test | 1.328 | 0.185 | Yes |
| **Accessibility/institutional influence** | t-test | 1.622 | 0.106 | Yes |
| **Self-efficacy** | t-test | 1.765 | 0.078 | Yes |
| **Barriers (overall score)** | t-test | -1.835 | 0.068 | Yes |

*Statistically significant at $p < 0.05$. Age, faculty, marital status, and perceived susceptibility/risk were significantly associated with vaccination uptake at the bivariate level ($p < 0.05$). Level of study, knowledge (% score), healthcare-worker influence, peer influence, accessibility, self-efficacy, and barriers did not reach significance at $p < 0.05$ but were retained for multivariate analysis under the $p < 0.20$ threshold.

### 3.13 Multivariate Logistic Regression Analysis of Determinants of Hepatitis B Vaccination Uptake

Variables significant at $p < 0.20$ in the bivariate analysis (Table 3.15) were entered into a binary logistic regression model, with hepatitis B vaccination uptake (ever received at least one dose) as the outcome. Table 3.16 presents the adjusted odds ratios (AOR), 95% confidence intervals (CI), and p-values.

**Table 3.16: Binary Logistic Regression Analysis of Determinants of Hepatitis B Vaccination Uptake**

| Variable | AOR | 95% CI | p-value |
|---|---|---|---|
| Age: Less than 20 years (ref: 20–24 years) | 0.399 | 0.171–0.933 | 0.034* |
| Age: 25–29 years | 1.679 | 0.898–3.141 | 0.105 |
| Age: 30 years and above | 1.716 | 0.782–3.766 | 0.178 |
| Faculty: Education (ref: Arts/Social/Mgt Sci.) | 0.653 | 0.227–1.883 | 0.430 |
| Faculty: Health Sciences | 2.136 | 0.986–4.628 | 0.054 |
| Faculty: Law | 1.066 | 0.238–4.787 | 0.933 |
| Faculty: Natural and Applied Sciences | 1.423 | 0.589–3.437 | 0.432 |
| Level: 200 Level (ref: 100 Level) | 1.292 | 0.355–4.701 | 0.697 |
| Level: 300 Level | 1.171 | 0.323–4.252 | 0.810 |
| Level: 400 Level | 0.941 | 0.253–3.506 | 0.928 |
| Level: 500 Level | 0.439 | 0.107–1.798 | 0.253 |
| Marital status: Married (ref: Divorced) | 0.584 | 0.183–1.866 | 0.364 |
| Marital status: Single | 0.183 | 0.054–0.614 | 0.006* |
| Marital status: Widowed | 0.541 | 0.066–4.426 | 0.567 |
| Knowledge (% score) | 0.995 | 0.986–1.004 | 0.274 |
| Perceived susceptibility/risk | 1.454 | 0.879–2.406 | 0.145 |
| Healthcare-worker influence | 1.016 | 0.606–1.703 | 0.953 |
| Social and peer influence | 1.011 | 0.590–1.733 | 0.969 |
| Accessibility/institutional influence | 1.319 | 0.678–2.566 | 0.415 |
| Self-efficacy | 1.621 | 0.866–3.032 | 0.131 |
| Barriers (overall score) | 0.593 | 0.410–0.859 | 0.006* |

*Statistically significant at $p < 0.05$. After adjustment for all other variables in the model, three factors remained significantly associated with hepatitis B vaccination uptake: being younger than 20 years of age was associated with significantly lower odds of vaccination (AOR = 0.399, 95% CI: 0.171–0.933, p = 0.034) relative to the 20–24 year reference group; being single was associated with significantly lower odds of vaccination (AOR = 0.183, 95% CI: 0.054–0.614, p = 0.006) relative to divorced respondents; and higher perceived barriers were significantly associated with lower odds of vaccination (AOR = 0.593, 95% CI: 0.410–0.859, p = 0.006) each one-point increase in the mean barriers score was associated with approximately 41% lower odds of having been vaccinated.

Notably, perceived barriers did not reach statistical significance at the bivariate level (p = 0.068, Table 3.15) but became significant after adjustment for socio-demographic and other confounding variables (p = 0.007), suggesting that its association with vaccination uptake was masked by confounding at the bivariate level. Knowledge, attitudes, healthcare-worker influence, and peer influence were not independently associated with vaccination uptake once other variables were controlled for.

A methodological caveat should be noted: with 138 vaccinated respondents (positive outcome cases) and 20 estimated parameters in the final model, the events-per-variable ratio (approximately 6.9) falls below the conventional threshold of 10 recommended for stable logistic regression estimates. This is most evident in the wide confidence interval for the Faculty of Law category (n = 11), and results involving small subgroup categories should be interpreted with caution.

### 4.14 Test of Hypotheses

This section presents the formal test of each null hypothesis stated in Section 1.6, based on the bivariate analysis presented in Table 3.15.

**Table 3.17: Summary of Hypothesis Testing**

| Hypothesis | Test Statistic | p-value | Decision |
|---|---|---|---|
| **H01: No significant association between knowledge of HBV infection and vaccination uptake** | t = -1.459 | 0.146 | Fail to reject H01 |
| **H02: No significant association between perceived risk and vaccination uptake** | t = 2.113 | 0.035 | Reject H02 |
| **H03: No significant association between accessibility of vaccination services and vaccination uptake** | t = 1.622 | 0.106 | Fail to reject H03 |
| **H04: No significant association between attitudes and vaccination uptake** | t = 1.069 | 0.286 | Fail to reject H04 |
| **H05: No significant association between perceived barriers and vaccination uptake** | t = -1.835 | 0.068 | Fail to reject H05 (bivariate); significant after adjustment (p = 0.007) |

At the bivariate level, only H02 (perceived risk/susceptibility) was rejected, indicating a statistically significant association between perceived susceptibility to hepatitis B infection and vaccination uptake. H01, H03, and H04 were not rejected at the bivariate level, indicating no statistically significant bivariate association between knowledge, accessibility, or attitudes and vaccination uptake, respectively. H05 was not rejected at the bivariate level; however, as reported in Section 3.13, perceived barriers emerged as a statistically significant independent predictor of vaccination uptake once other variables were controlled for in the multivariate model, indicating that its relationship with uptake is more accurately characterized as significant after adjustment for confounding factors.

### 3.15 Summary of Key Findings

Overall, the results show that undergraduate students of Al-Hikmah University had a generally good level of awareness and knowledge of Hepatitis B (65.2% with good knowledge) and largely favorable attitudes towards vaccination (86.9%–87.7% agreement across attitude items), alongside relatively high perceived severity of the disease and self-efficacy to complete vaccination. However, actual vaccination uptake was comparatively low, with only 39.3% of respondents having ever received the vaccine and just 13.1% having completed the full three-dose schedule. This gap between favorable knowledge/attitudes and actual uptake appears to be explained largely by the barriers identified in Table 3.14 particularly concerns about vaccine safety, limited access to vaccination services on or near the university campus, insufficient healthcare-worker engagement, and forgetfulness in returning for subsequent doses alongside social/peer and institutional factors that were identified as potential facilitators of improved uptake.

## 4.0 Discussion

This study demonstrates a substantial gap between hepatitis B vaccination readiness and actual uptake among undergraduates at Al-Hikmah University. Awareness of HBV was high and two-thirds of respondents had good overall knowledge, while attitudes, perceived benefits and self-efficacy were also favorable. Nevertheless, only 39.3% were classified as having received at least one dose using the dose-count-derived analytic variable, and 13.1% reported three doses. The adjusted analysis further indicates that younger age, single marital status and higher perceived barriers were associated with lower odds of vaccination. Together, the findings suggest that information and motivation are present for many students, but they do not fully overcome practical and perceptual obstacles.

### 4.1 Knowledge and the knowledge–behavior gap

The 87.5% awareness level and 65.2% good-knowledge level indicate that students in this setting are not generally starting from a position of complete informational deprivation. These levels are higher than the broader awareness and knowledge reported among young adults in Ekiti State and compare favorably with some earlier Nigerian university studies (Agbesanwa *et al.,* 2023; Okeke *et al.,* 2008). The relatively high knowledge level may partly reflect the substantial representation of Health Sciences students (49.3%) and the university context. However, knowledge was uneven: only 63.8% correctly identified the three-dose schedule, and 23.1% were uncertain about it. This is important because vaccination requires specific operational knowledge, where to obtain the vaccine, how many doses are required and when to return, not merely recognition that HBV is preventable.

The lack of an independent association between the continuous knowledge score and vaccination uptake after adjustment is consistent with the study's wider pattern. Knowledge can facilitate readiness, but vaccination also depends on service availability, convenience, cost, provider engagement and perceived need. Similar tensions between knowledge and vaccination completion have been documented among university students in Africa (Haile *et al.,* 2021; Makan *et al.,* 2023; Wibabara *et al.,* 2019).

### 4.2 Low uptake and incomplete vaccination

The principal public-health finding is the low level of uptake. Only 39.3% of respondents were classified as vaccinated, and only 13.1% reported three doses. This is markedly below the coverage reported among clinical medical and dental students at a Nigerian university, where 83.2% had received at least one dose and 79.65% had completed all three doses (Adenlewo *et al.,* 2017). The contrast may reflect differences in clinical exposure, perceived occupational risk, organized

vaccination opportunities and institutional requirements. In another Nigerian study among non-medical undergraduates at a private university in Ekiti State, uptake was also an important concern, supporting the need to examine vaccination access and program design in broader university populations (Elegbede *et al.,* 2022).

The leading specific reason for non-completion was forgetting to return for subsequent doses, followed by lack of time, cost and vaccine unavailability. This pattern is consistent with evidence that logistical and scheduling barriers can interrupt vaccination even when willingness is high. The finding has direct program implications: a student who intends to vaccinate may still fail to complete the series unless the health system reduces the effort required to attend multiple appointments.

### 4.3 Health Belief Model interpretation

The HBM findings help explain why the study observed favorable perceptions alongside low uptake. Perceived benefits were the highest-scoring construct (mean 3.35/4), while perceived severity was also high (mean 3.29/4). In contrast, perceived susceptibility/risk had the lowest mean score (2.99/4), and only 59.5% felt personally at risk even though 83.5% believed that university students could be exposed. The difference between group-level and personal risk perception is consistent with the HBM logic that individuals may recognize a health threat without applying the perceived threat to themselves. This construct is therefore relevant to vaccination promotion, but it should not be interpreted as an independent causal pathway because the study is cross-sectional.

Self-efficacy was similarly high, with 83.8%–87.2% agreeing that they could obtain and complete vaccination. Yet perceived barriers were prominent and, unlike several psychosocial constructs, were independently associated with uptake in the adjusted model. This combination suggests that confidence alone may not be sufficient when external constraints remain. The finding complements evidence from Tanzania that HBM-related perceived benefits and self-efficacy can matter for HBV vaccination, while also showing that the local service environment may be more decisive for students who are already willing to vaccinate (Munuo & Masika, 2024).

### 4.4 Healthcare-worker, peer and institutional influence

Healthcare-worker recommendation was endorsed as influential by 85.2%, whereas 75.5% reported receiving vaccination information from healthcare workers. Similarly, about four-fifths agreed that family/friends or seeing other students get vaccinated could influence their behavior. Accessibility and institutional items were also strongly endorsed, with 86.3% supporting nearby vaccination services and 84.0% supporting a university campaign. These findings point to an implementation

opportunity: the university already has a health centre and a student communication environment, while the students themselves report that provider recommendation and institutional facilitation could matter. Organized vaccination program has been associated with higher coverage in student populations elsewhere (Adenlewo *et al.,* 2017; Makan *et al.,* 2023).

### 4.5 Barriers and vaccine confidence

The leading barrier was concern about vaccine safety or effectiveness (72.1%), followed by lack of nearby vaccination services (69.2%), lack of healthcare-worker encouragement (63.8%), fear of side effects (63.8%) and forgetfulness (62.1%). This combination is important because it includes both confidence-related and service-delivery barriers. The finding is broadly compatible with systematic evidence from developing countries identifying cost, access, concerns and information deficits as common reasons for avoiding hepatitis B vaccination (Machmud *et al.,* 2021). Recent Nigerian evidence among healthcare workers likewise highlights psychosocial and digital factors in vaccination behavior (Aremu *et al.,* 2025). Although the present study did not test misinformation directly, the prominence of social media as an information source (47.0%) suggests that digital communication should be considered when addressing safety concerns and vaccine confidence.

### 4.6 Adjusted determinants and cautious interpretation

Age below 20 years was associated with lower adjusted odds of vaccination relative to the 20–24-year group. This may reflect differences in exposure to university health information or opportunity to encounter vaccination services, but the cross-sectional data cannot establish why the age difference exists. Single marital status was also associated with lower odds relative to divorced respondents. Because the divorced category contained only 23 respondents, this estimate should not be interpreted as a general causal or behavioral effect of marital status; the result may be sensitive to sparse data and the selected reference category. The strongest program-relevant adjusted finding was the inverse association between perceived barriers and vaccination uptake: each one-point increase in the barriers score was associated with approximately 41% lower adjusted odds of vaccination. This supports the interpretation that barriers are not merely descriptive concerns; they may be linked to whether students actually initiate vaccination.

### 4.7 Strengths and limitations

The study's strengths include inclusion of students across multiple faculties, explicit measurement of multiple HBM constructs and perceived barriers, and use of multivariable regression to examine independent associations. The transparent data-cleaning step is also important because it identifies internal inconsistency in the vaccination-history responses rather than masking it. However, several limitations affect interpretation. The cross-sectional design precludes temporal or causal inference. Vaccination status, knowledge and perceptions were self-reported and were not verified using vaccination cards or medical records, creating potential recall and social-desirability bias. Convenience sampling and the large proportion of Health Sciences students limit representativeness and generalizability. The logistic model may also be over-parameterized for 138 outcome events, and some categories were small. Finally, the dissertation does not report the observed pilot Cronbach's alpha coefficient, and a p-value discrepancy exists between the narrative (0.007) and table (0.006) for the barriers are coefficient; both issues should be resolved against the original analysis files before journal submission.

## 5.0 Conclusion

Among undergraduate students at Al-Hikmah University, hepatitis B awareness and general knowledge were relatively high, attitudes toward vaccination were favorable, and perceived benefits, severity and self-efficacy were strong. Nevertheless, vaccination uptake remained low: 39.3% were classified as having received at least one dose using the dose-count-derived analytic variable, and 13.1% reported three doses. The principal barriers were concerns about vaccine safety/effectiveness, limited access to vaccination services near the university, insufficient healthcare-worker encouragement, fear of side effects and difficulty returning for subsequent doses. In adjusted analysis, younger age, single marital status and higher perceived barriers were associated with lower odds of vaccination. The findings indicate that improving uptake will require a combination of communication, service-access and follow-up strategies rather than information alone.

## 6.0 Recommendations

1. Implement regular, accessible and preferably subsidized or free hepatitis B vaccination sessions on campus or immediately adjacent to the university, using the university health service as an access point.

2. Use targeted, evidence-based communication to address vaccine safety, effectiveness and side-effect concerns, with consistent messages delivered by healthcare workers and through student-facing digital channels.

3. Strengthen healthcare-worker recommendation and brief vaccination counselling during routine student health contacts, with particular attention to newly enrolled and younger students.

4. Introduce reminder and recall mechanisms through SMS, email, WhatsApp or a student health portal so that students who initiate vaccination are prompted before subsequent doses.

5. Provide simple, visible information on where vaccination is available, the required number of doses and the timing of subsequent doses; align clinic hours with academic schedules.

6. Consider an institution-supported vaccination policy or documented vaccination offer for students, while ensuring that implementation is consistent with applicable Nigerian immunization guidance, informed consent and institutional ethics requirements.

7. Future research should verify vaccination histories against records where feasible and evaluate campus-based vaccination and reminder interventions using longitudinal or quasi-experimental designs.

## 7.0 Declarations

### 7.1 Ethics approval:

The study protocol was reviewed and approved by the Department of Health Research Ethics Committee of Al-Hikmah University, Ilorin, Kwara State, Nigeria, in accordance with the department's guidelines for research involving human participants. However, no protocol number was assigned for this study. The research was carried out following the ethical principles outlined in the Declaration of Helsinki. Formal institutional research ethics committee approval was obtained prior to data collection. All procedures performed in this study involving human participants were in accordance with the ethical standards of the institutional research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

**7.2 Consent to participate:** Informed consent was obtained from all individual participants included in the study. For participants under 18 years of age, informed consent was obtained from their parents or legal guardians prior to their participation, and assent was also obtained from the minor participants themselves. The study purpose, procedures, risks, and benefits were fully explained to both parents/guardians and participants before obtaining consent. School authorities provided administrative permission for data collection.

### 7.3 Funding

No funding was received for this research.

### 7.4 Data availability

All available Data are included in the Manuscript.

### 7.5 Competing interests

The authors declare that there were no competing interests.

### 7.6 Author contributions

**Study concept and design:** Usman Ndabata Abdullahi, Jeremiah Achimugu, and Chizaram Onyeaghala

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**Drafting and revision of paper:** Usman Ndabata Abdullahi, Sidiq Abdulrofiee Oladimeji, Jeremiah Achimugu, and Chizaram Onyeaghala.

All authors have read, edited, and contributed to the content of this manuscript. This work has not been previously published and has not been considered for publication elsewhere.

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## Supplementary Materials

### Supplementary Table S1. Questionnaire domains and item content

The full questionnaire in the source dissertation contained five sections. The following item inventory is reproduced in condensed form to document the measurement framework; response options were as stated below.

| Section | Domain | Items / content |
|---|---|---|
| A | Sociodemographic | Age; sex; marital status; level of study; faculty. |
| B | Knowledge | Nine True/False/Don't Know items covering cause, sexual transmission, contaminated sharps, mother-to-child transmission, vaccine prevention, vaccine safety/effectiveness, complications, three-dose schedule, and asymptomatic infection; plus prior awareness. |
| C | Vaccination history | Ever received vaccine; number of doses; three-dose completion; vaccination location; timing of most recent dose; main reason for non-completion. |
| D | Attitudes | Importance of vaccination; willingness; trust in safety; importance of completion; perceived benefit-risk balance. |
| D | Perceived susceptibility/risk | Personal risk; student exposure; asymptomatic infection. |
| D | Perceived severity | Serious health problems; cirrhosis/liver cancer risk. |
| D | Perceived benefits | Risk reduction and added protection from completing the series. |
| D | Healthcare-worker and social influence | HCW recommendation; HCW information; family/friend influence; observing vaccinated peers. |
| D | Accessibility/institutional influence | Easy access; services within/near university; university recommendation; university vaccination campaign. |
| D | Self-efficacy | Confidence obtaining all doses; arranging vaccination despite academic activities; confidence completing the schedule. |
| D | Information sources | Healthcare workers; university/school; social media; TV/radio; internet/websites; family; friends/peers; religious/community sources; no information. |
| E | Barriers | Cost; side effects; injections; time; accessibility; knowing where to vaccinate; information; perceived risk; safety/effectiveness; |

| Section | Domain | Items / content |
|---|---|---|
| | | religious/cultural beliefs; forgetfulness; HCW recommendation; campus service availability; academic workload; competing priorities. |

**Supplementary Table S2. Source-data consistency checks**

| Check | Source finding | Manuscript handling |
|---|---|---|
| Ever vaccinated vs dose count | 60/351 (17.1%) inconsistent | Use dose-count-derived uptake for inferential analyses. |
| Direct completion vs 3-dose count | 101 reported completed; 43 of these also reported 3 doses; 46 reported 3 doses overall | Use 46/351 (13.1%) as three-dose completion indicator. |
| Barriers: fear of injections | Questionnaire item present; aggregate result not reported | Do not impute a percentage. |
| Logistic regression p-value | Table reports 0.006 for barriers; one narrative sentence reports 0.007 | Use table value 0.006 and verify against original SPSS output. |
| Pilot reliability | Cronbach's alpha threshold ≥0.70 stated; observed coefficient not reported | Insert the observed alpha from pilot analysis before submission. |
| Ethics identifier | Ethics approval stated; committee/reference number not reported | Insert verified committee name and approval/reference number before submission. |

**Supplementary material note:** The source dissertation also included informed consent and the full questionnaire. The present supplementary section preserves the measurement domains and the key source-data consistency information while keeping the journal manuscript compact.