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ASSESSMENT OF HEPATITIS B VACCINATION COVERAGE AND ASSOCIATED FACTORS AMONG UNDERGRADUATE NURSING STUDENTS IN KARACHI, PAKISTAN: A DESCRIPTIVE CROSS-SECTIONAL STUDY

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Abstract

Background: *Hepatitis B virus (HBV) infection remains a major global public health concern and a significant occupational hazard for healthcare personnel, particularly nursing students undergoing clinical training. Vaccination provides reliable protection, yet coverage among nursing trainees in low- and middle-income countries remains suboptimal.*

Objective: *To assess hepatitis B vaccination coverage, level of complete dosing, and identified barriers among undergraduate nursing students in Karachi, Pakistan.*

Methods: *A descriptive cross-sectional study was conducted across public and private nursing institutes in Karachi, Pakistan, from June to December 2024. A sample of 362 undergraduate nursing students was recruited using clustered sampling. Data were collected via a structured, pre-tested, self-administered questionnaire evaluating demographics, HBV vaccination history, dosage completion, timing of immunization, and barriers to vaccination. Data were analyzed using IBM SPSS Statistics Version 20.0.*

Results: *Out of 362 respondents (51% male, 49% female), overall HBV vaccination coverage (at least one dose) was 35% (n=127), whereas 65% (n=235) had never received any HBV vaccine. Only 12% (n=43) of all participants completed the recommended three-dose schedule, 14% (n=51) received two doses, and 9% (n=33) received a single dose. Among vaccinated individuals, only 30% (n=108/362 total cohort basis) received vaccination prior to clinical exposure, while 70% was exposed before immunization. Primary reported barriers to non-vaccination included lack of awareness/knowledge (63.6%), non-availability of free institutional vaccines (44%), and time constraints (24%). Knowledge regarding HBV transmission via blood/body fluids (90%) and needle-stick injuries (90.5%) was generally high.*

Conclusion: *HBV vaccination coverage among undergraduate nursing students in Karachi is critically inadequate, leaving the majority vulnerable to occupational HBV infection. Educational campaigns alone are insufficient; mandatory pre-clinical immunization policies and institutional provision of free vaccines are urgently required.*

1. INTRODUCTION & BACKGROUND

Hepatitis B virus (HBV) infection represents a major global public health challenge, causing acute and chronic liver pathology, cirrhosis, and hepatocellular carcinoma. According to World Health Organization (WHO) estimates, approximately 254 million people worldwide live with chronic hepatitis B infection, with highest burdens reported in the African and Western Pacific regions. HBV is the most infectious blood-borne pathogen, estimated to be 50 to 100 times more infectious than Human Immunodeficiency Virus (HIV).

Healthcare workers (HCWs) and health professional students—particularly nursing students—are at exceptionally high risk of occupational HBV exposure due to frequent contact with patient blood, bodily fluids, contaminated equipment, and accidental needle-stick injuries (NSIs) during clinical rotations. Despite WHO recommendations advocating routine screening and complete 3-dose vaccination for all healthcare personnel and trainees prior to patient contact, compliance in developing nations remains low.

Pakistan is classified as a region with intermediate-to-high HBV endemicity. Nursing students in Pakistan face heightened risk during clinical placements due to overcrowding in tertiary hospitals, lack of structured post-exposure prophylaxis protocols, and variable enforcement of infection control measures. While the HBV vaccine is safe and provides 90–100% protection upon completion of the 3-dose regimen, many nursing students remain partially vaccinated or completely unvaccinated.

1.1 Aim & Objectives of the Study

The primary aim of this study is to evaluate hepatitis B vaccination coverage and identify associated barriers among undergraduate nursing students in Karachi, Pakistan. Specific objectives include:

- To determine the proportion of nursing students who have received HBV vaccination (single, partial, and complete 3-dose regimens).
- To assess the timing of vaccination relative to initial clinical exposure.
- To identify major socio-demographic and institutional factors, knowledge gaps, and physical barriers associated with vaccine non-compliance.

1.2 Rationale & Significance

Nursing students represent the frontline of clinical bedside care during their academic training. Unvaccinated nursing trainees who sustain needle-stick injuries risk contracting HBV, subsequently transmitting it to patients or family members. Identifying key systemic and individual barriers to vaccination in Karachi will provide empirical evidence for policy makers, nursing councils, and academic administrators to enforce institutional immunization mandates.

2. RESEARCH METHODOLOGY

2.1 Study Design & Duration

A descriptive cross-sectional study design was conducted over a seven-month period from June 2024 to December 2024.

2.2 Study Setting & Target Population

The study was carried out across multiple public and private undergraduate nursing colleges affiliated with nursing bodies in Karachi, Pakistan. The target population comprised male and female undergraduate nursing students enrolled in 4-year BSN programs.

2.3 Sample Size & Sampling Technique

The sample size was calculated using RaoSoft online sample size calculator based on a total target population of approximately 6,000 nursing students in the region, an expected vaccination prevalence of 50%, a margin of error of 5%, and a 95% confidence interval. The minimum required sample size was 362. A clustered sampling technique was utilized to select representative clusters of nursing colleges across Karachi.

2.4 Eligibility Criteria

- **Inclusion Criteria:** Enrolled undergraduate nursing students actively attending clinical rotations.
- **Exclusion Criteria:** Students unwilling to provide informed consent, those absent during

data collection visits, or individuals with missing baseline demographic records.

2.5 Data Collection Tool, Pilot Testing & Reliability

Data were gathered using a pre-tested, self-administered structured questionnaire comprising three main sections: (1) Sociodemographic characteristics; (2) HBV vaccination status, dosage history, and timing; and (3) Knowledge of HBV transmission and reported barriers to vaccination. A pilot study was conducted on 10% of the sample (n=25) to evaluate tool clarity, objectivity, and feasibility. Tool validity and reliability were formally reviewed and approved by the Institutional Review Board (IRB) of Allied Institute of Nursing and Health Sciences.

2.6 Data Analysis Procedure

Data were coded, entered, and analyzed using IBM SPSS Statistics Version 20.0. Descriptive statistics, including frequencies, percentages, means, and standard deviations, were calculated. Categorical variables were summarized using tables, bar charts, and pie charts.

2.7 Ethical Considerations

Ethical approval was obtained from the Research Ethics Committee / IRB of Allied Institute of Nursing & Health Sciences, Karachi. Participation was entirely voluntary, and written informed consent was secured from all participants. Confidentiality, anonymity, and data protection were strictly maintained.

2.8 Data Analysis

Data were entered and analyzed using **IBM SPSS Statistics Version 20.0**. Descriptive statistics were employed to summarize the data. Frequencies and percentages were calculated for categorical variables, while means and standard deviations were used for continuous variables. Results were presented in tables, charts, and graphs. No inferential statistical tests were performed. Statistical findings were interpreted using descriptive measures only.

3. RESULTS

Table 01. Demographic Characteristics of Participants

Demographic Characteristics (N=529)	Frequency	Percentage
Gender		
Male	185	51%
Female	177	49%
Marital status		
Married	22	6%
Unmarried	340	94%
Academic Level		
First Year	**148**	**41% =**
Second Year	**11**	**3% =**
Third Year	**109**	**30% =**
Fourth Year	**83**	**23% =**

Table 02. Hepatitis B Vaccination Status (n=362)

Demographic Characteristics (N=529)	Frequency	Percentage
Yes	43	12%
No	235	65%
Vaccination status (n=270)		
Completely vaccinated	43	12%
Not vaccinated	235	65%
Two doses	51	14%
One Dose	33	9%
When you received Hepatitis B vaccine		

Before clinical exposure	108	30%
After clinical exposure	254	70%

Figure: 1 Reasons for HBV Testing

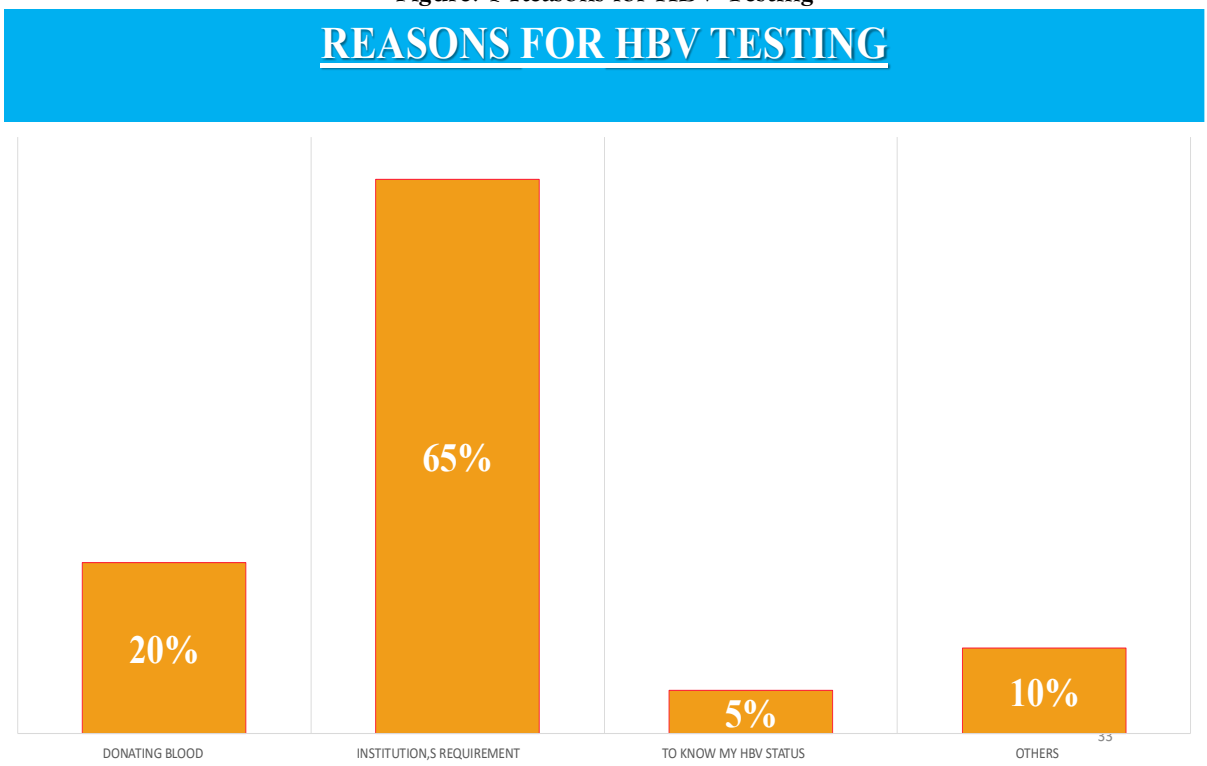


Figure: 2 Number of doses participants received

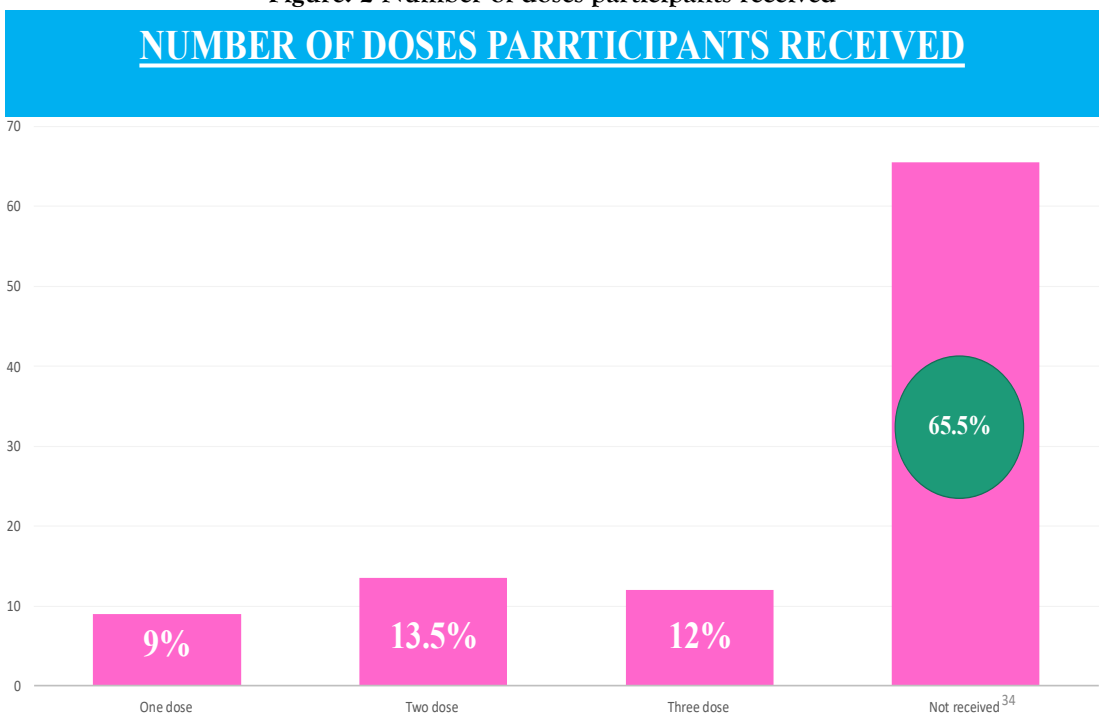


Figure: 3 Reasons for not Vaccination

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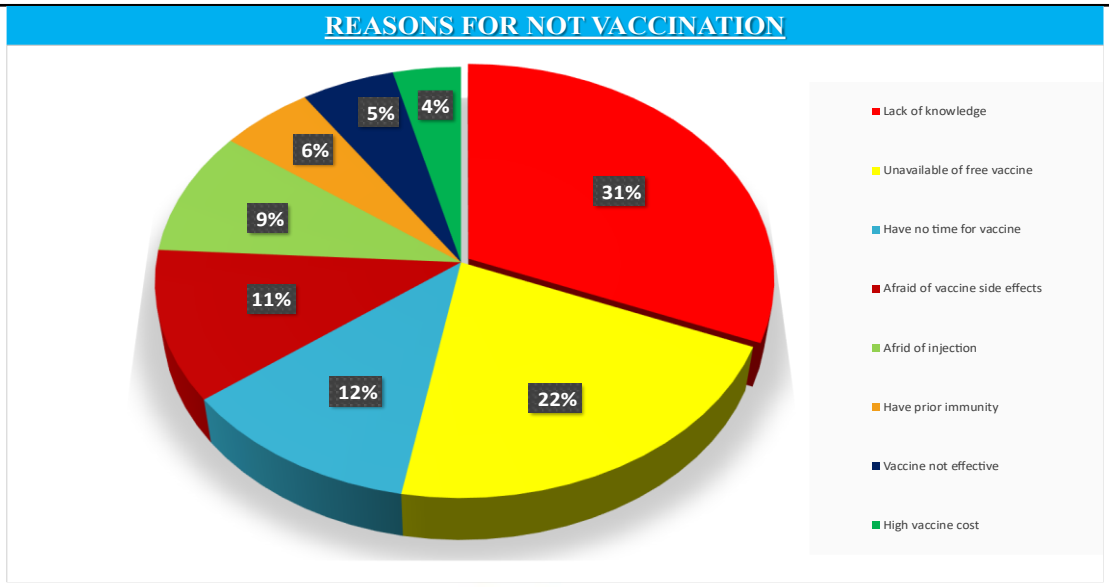


Table 03. Knowledge of participants regarding Hepatitis B vaccination coverage

Knowledge of participants regarding Hepatitis B vaccination coverage		FREQUENCY		PERCENTAGE %	
QUESTIONS		YES	NO	YES	NO
Q1	HBV can be transmitted through contact with the blood and body fluids of an infected person?	180	20	90.0	10.0
Q2	HBV can be transmitted from mother to baby during delivery?	155	44	77.5	22.0
Q3	HBV can be transmitted through needle stick injury	181	19	90.5	9.5
Q4	HBV can cause liver cirrhosis?	164	36	82.0	18.0
Q5	HBV can cause hepatic failure?	170	30	85.0	15.0
Q6	Have you Received HBV vaccination?	75	124	37.5	62.0
Q7	HBV can be prevented through immunization?	177	23	88.5	11.5
Q8	HBV can be prevented by avoiding unsafe sex?	148	52	74.0	26.0
Q9	Have you often exposed to Accidental needle injury in clinical?	89	111	44.5	55.5
Q10	Have you tested yourself for HBV?	67	132	33.5	66.0
Q11	Do you have any record of your hepatitis B vaccination?	47	153	23.5	76..5
Q12	Are you aware of protocols to be followed after a needle stick injury?	116	84	58.0	42.0
Q13	Have you or has anyone you know experienced a needle stick injury?	85	115	42.2	57.5
Q14	Are you aware of the hepatitis B vaccination schedule?	87	112	43.5	56.0
Q15	Have you received a booster dose of the hepatitis B vaccine?	44	155	22.0	77.5
	Mean	119	81	60.00%	40.00%

4. DISCUSSION

The findings of this study reveal an alarmingly low rate of HBV vaccination among undergraduate nursing students in Karachi, Pakistan. Overall, only 35% of students had received at least one dose of the HBV vaccine, and an even smaller minority (12%) had completed the mandatory three-dose schedule. These figures underscore significant vulnerability to occupational exposure among future nursing professionals.

Our findings align closely with regional studies conducted across South Asia and developing regions. For example, Thapa et al. (2020) reported that only 37% of preclinical students in Nepal were fully vaccinated against HBV, attributing non-vaccination primarily to a lack of institutional vaccination programs. Similarly, studies in African nations, such as Ghana and Somalia, have documented suboptimal vaccination coverage among allied health students due to systemic access barriers.

In contrast, studies in developed nations or higher-resource healthcare settings demonstrate near-universal coverage (>85-95%) among health science students. This vast disparity highlights

the pivotal role of policy enforcement. In developed health systems, proof of HBV immunity or completion of the standard 3-dose series is a strict prerequisite prior to clinical placement.

An interesting paradox observed in this study is that while over 90% of students demonstrated high knowledge regarding HBV transmission routes (blood/body fluids and needle-stick injuries), vaccine compliance remained exceptionally low (35%). This confirms that theoretical awareness does not automatically translate into health-seeking behavior or vaccine compliance. Institutional barriers, specifically vaccine cost, unavailability within college clinics, and demanding academic schedules, severely impede student action.

5. CONCLUSION

HBV vaccination coverage among undergraduate nursing students in Karachi is dangerously inadequate. Financial constraints, lack of institutional supply, and operational bottlenecks prevent nursing trainees from achieving full immunization. To bridge this gap, the following targeted recommendations are proposed:

6. RECOMMENDATIONS

- **Mandatory Pre-Clinical Policy:** The Pakistan Nursing Council (PNC) and institutional boards must establish mandatory HBV immunization policies, requiring verified 3-dose vaccination certificates before clinical site access.
- **Institutional Provision:** Nursing colleges and teaching hospitals should offer free or heavily subsidized HBV vaccines and screening during new student orientation.
- **Accessible Clinical Services:** Establish dedicated, on-campus health clinics to administer vaccines without conflicting with academic or clinical schedules.
- **Curricular Enhancement:** Incorporate practical infection control, needle-stick safety, and post-exposure prophylaxis (PEP) protocols into early nursing curricula.

7. STRENGTHS AND LIMITATIONS

Strengths: Multi-center representation across public and private nursing institutes in Karachi, standardized methodology, and robust sample size (N=362).

Limitations: Cross-sectional design limits causal inferences; self-reported vaccination status may introduce recall bias; convenient/clustered sampling may affect generalizability across rural health facilities.

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