



Assessing the Gap: Knowledge, Attitudes, and Practices of Adult Vaccination Among Healthcare Professionals in West Uttar Pradesh

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Abstract

Background: Adult immunization remains underutilized despite its proven benefits. Healthcare professionals (HCPs) play a pivotal role in vaccination implementation, yet their knowledge levels may vary significantly.

Objective: To assess knowledge, attitudes, and practices (KAP) regarding adult vaccination schedules among HCPs in a tertiary care hospital of West Uttar Pradesh.

Material and Methods: A cross-sectional study was conducted among 217 HCPs (doctors, nurses, and pharmacists) using a structured questionnaire assessing demographics, knowledge, attitudes, and practices regarding adult vaccination.

Results: While 52.5% of participants demonstrated moderate knowledge, only 19.8% had good knowledge. Significant discrepancies existed between professional categories: doctors (mean score 65.2 ± 14.8), nurses (40.3 ± 13.7), and pharmacists (35.2 ± 12.5). Although 91.2% HCPs showed positive attitudes, only 53.1% doctors regularly recommended vaccines. Awareness was highest for COVID vaccine (99.1%) and traditional vaccines (Hepatitis B: 87.1%, Tetanus: 85.3%) but lowest for newer vaccines (Pneumococcal: 42.9%, Herpes Zoster: 22.1%). Primary barriers included lack of institutional protocols (73.7%), time constraints (66.4%), and perceived patient non-affordability (63.1%).

Conclusion: Despite positive attitudes, significant knowledge-practice gaps exist among HCPs. Targeted educational interventions and institutional protocols are needed to improve adult vaccination coverage.

Keywords: Adult Immunization; Healthcare Professionals; Knowledge; Attitude; Practices; Vaccination Schedule

Introduction

Vaccination is vital throughout life to prevent infectious diseases and related deaths, with over 25% of mortality attributed to infections [1]. Despite this importance, adult immunization in India remains severely neglected, while childhood vaccination receives priority from both the Indian government and WHO. This oversight leads to unnecessary healthcare costs from preventable diseases [1]. Vaccines are recommended for adults on the basis of age, prior vaccinations, health conditions, lifestyle, occupation, and travel [2]. The changing demographics and evolving disease patterns have highlighted the importance of adult immunization as a critical public health strategy.

Vaccine Preventable diseases (VPDs) impact numerous adults globally, causing significant illness, death, and financial strain [3]. Adults who haven't received vaccines can also transmit diseases such as pertussis to young infants who aren't yet immunized [4]. Consequently, enhancing vaccination rates among adults could benefit not only individuals but also their families and wider communities. Additionally, adult immunization programs might help lower healthcare expenses, which is especially critical for economically disadvantaged populations [3].

Healthcare professionals (HCPs) play a pivotal role in recommending and administering vaccines. Their knowledge, attitudes, and practices directly influence patient decisions regarding vaccination [5]. However, despite well-established benefits and comprehensive vaccination schedules

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for adults published by health authorities, bringing adult vaccination into routine practice remains a challenge in many healthcare settings, including India.

Current adult vaccination schedules recommend numerous vaccines for adults based on age, health conditions, and risk factors. These include COVID-19, Influenza, Tdap/Td, MMR, Chickenpox, Herpes Zoster, HPV, Pneumococcal, Hepatitis A, Hepatitis B, Meningococcal, and Hib vaccines [6, 7]. However, awareness and adherence to these guidelines vary significantly among healthcare professionals.

Previous studies have reported substantial gaps in KAP regarding adult immunization among HCPs [8-11]. The present study was designed to assess KAP regarding adult vaccination schedules among different categories of HCPs in a tertiary care hospital, with the aim of identifying gaps and informing targeted interventions.

Materials and Methods

Study Design and Setting

A cross-sectional descriptive study was conducted between January and February 2025 in a tertiary care hospital in West Uttar Pradesh.

Study Population

The study included healthcare professionals (doctors, nurses, and pharmacists) currently employed at the tertiary care hospital and willing to participate. Healthcare professionals on leave during the study period, interns, and students in training were excluded from the study.

Sample Size and Sampling

The study targeted healthcare professionals at the tertiary care hospital. Based on the hospital's human resource records, the total eligible population consisted of 520 healthcare professionals: 230 doctors (44.2%), 225 nurses (43.3%), and 65 pharmacists (12.5%).

Sample size was calculated using the formula $n = [Z^2 p(1-p)]/d^2$, where $Z = 1.96$ for 95% confidence level, $p = 0.5$ (assumed prevalence of good knowledge about adult vaccination), and $d = 0.05$ (margin of error). This yielded a minimum required sample size of 385. However, due to resource constraints and the total eligible population size of 520, the study targeted 250 healthcare professionals, which provided a margin of error of 5.9% at 95% confidence level.

Stratified random sampling was employed to ensure proportional representation of the three professional categories. The sample was stratified according to the actual proportion of each category in the hospital workforce: doctors: 44.2% (111 professionals), nurses: 43.3% (108 professionals) and pharmacists: 12.5% (31 professionals).

For each stratum, a sampling frame was created using employee ID numbers obtained from the hospital's human resource department. Random selection within each stratum was performed using computer-generated random numbers in Microsoft Excel (RAND function). Each randomly selected healthcare professional was approached for participation. If a selected individual declined participation or was unavailable, the next randomly selected individual from the same stratum was approached until the target sample size for that stratum was achieved.

Of the 250 healthcare professionals approached, 217 completed the questionnaire (response rate 86.8%): 96 doctors (44.2%), 94 nurses

(43.3%), and 27 pharmacists (12.5%), maintaining the proportional representation of the original hospital workforce.

Data Collection Tool

A structured questionnaire was developed based on existing literature and guidelines, including the Association of Physicians of India (API) and Centers for Disease Control and Prevention (CDC) recommendations [6, 7]. The questionnaire was divided into four sections:

1. Demographics: Age, gender, professional role, years of experience, and department.

2. Knowledge: 15 questions on types of vaccines, indications, contraindications, and adult vaccination schedules. Each correct answer was assigned 6.67 points, yielding a maximum possible score of 100 points and a minimum of 0 points. Within the knowledge assessment, we differentiated between "knowledge" and "awareness":

- **Knowledge** referred to comprehensive understanding of vaccination principles, schedules, contraindications, and efficacy, measured through questions requiring application of information (10 questions)

- **Awareness** referred to basic recognition or familiarity with specific vaccines, measured through simpler recognition-based questions ("Are you aware of the existence of the following vaccines for adults?") (5 questions)

1. Attitudes: 10 Likert scale questions on perceptions and beliefs about adult vaccination. Each item was scored on a 5-point scale (1=strongly disagree to 5=strongly agree), with total scores converted to percentages (0-100%).

2. Practices: 10 questions on frequency of recommending/administering vaccines, sources of information, and barriers faced. Each item was scored and converted to a percentage scale (0-100%).

The questionnaire was pre-tested on a small group of healthcare professionals (not part of the study) to ensure clarity and validity.

Data Collection Procedure

Ethical approval was obtained from the hospital's Institutional Ethics Committee (FHMC/IEC/R.Cell/2024/91). Written informed consent was obtained from all participants before administering the questionnaire. The questionnaires were distributed in paper format and collected back after completion.

Statistical Analysis

Data was analyzed using MS Excel and R software. Descriptive statistics were used to summarize demographic data and KAP responses. Chi-square tests and Multiple logistic regression analysis were employed to assess associations between demographic variables and KAP scores. Knowledge, attitude, and practice scores were categorized as poor ($\leq 50\%$), moderate (51-75%), and good ($> 75\%$). A p-value of < 0.05 was considered statistically significant [12, 13].

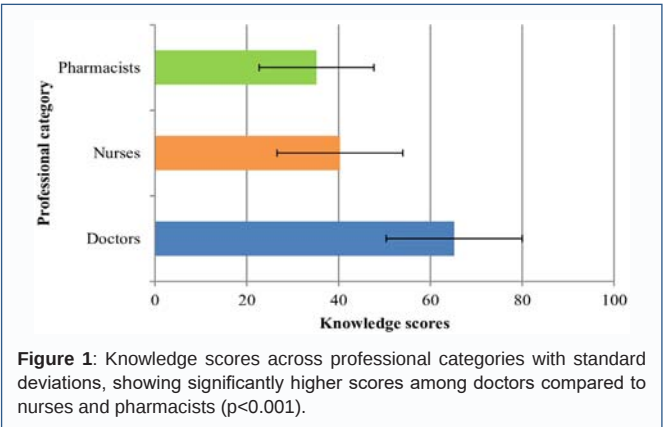
Results

Demographic Characteristics

Out of 250 healthcare professionals approached, 217 completed the questionnaire (response rate 86.8%). The demographic profile of the participants is presented in Table 1. The majority of participants were females (56.7%), with a mean age of 33.8 ± 8.4 years. Doctors constituted 44.2% of the sample, followed by nurses (43.3%) and

Table 1: Demographic characteristics of healthcare professionals (n=217).

Characteristic	n	%
Gender		
Female	123	56.7
Male	94	43.3
Age (years)		
20-30	78	35.9
31-40	83	38.3
41-50	39	18.0
>50	17	7.8
Mean age ± SD	33.8 ± 8.4	
Professional Category		
Doctors	96	44.2
Nurses	94	43.3
Pharmacists	27	12.5
Years of Experience		
<5	75	34.6
5-10	82	37.8
>10	60	27.6
Department		
Medicine & Allied	89	41.0
Surgery & Allied	63	29.0
Pediatrics	31	14.3
Others	34	15.7
Previous Training on Vaccination		
Yes	63	29.0
No	154	71.0



pharmacists (12.5%).

Knowledge Assessment

The overall knowledge score was 50.6±18.2 (out of 100), with significant differences across professional categories: doctors (65.2±14.8), nurses (40.3±13.7), and pharmacists (35.2±12.5) (p<0.001), as shown in Figure 1. Among participants, 27.6% had poor knowledge, 52.5% moderate knowledge, and 19.8% good knowledge.

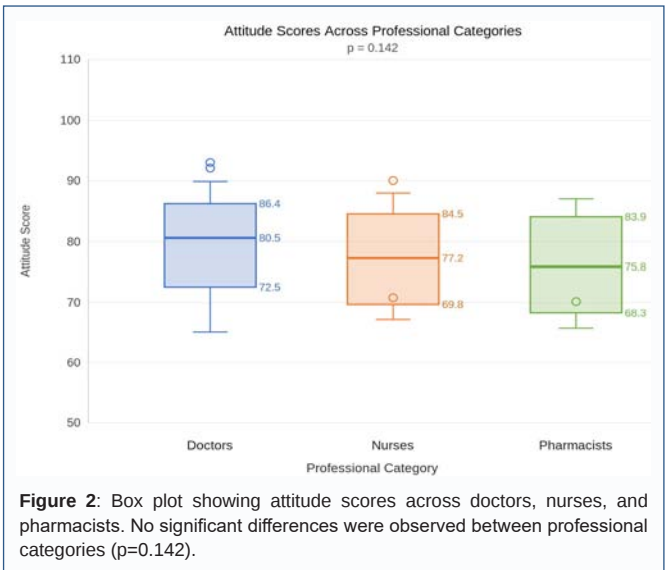
Awareness regarding specific vaccines (assessed through the awareness-focused questions within the knowledge section) varied

Table 2: Awareness of healthcare professionals regarding specific vaccines.

Vaccine	Overall (%)	Doctors (%)	Nurses (%)	Pharmacists (%)
COVID-19	99.1	100	99.1	98.2
Hepatitis B	87.1	94.8	82.4	75.0
Tetanus	85.3	92.7	80.6	72.2
Influenza	76.0	89.6	68.1	55.6
Pneumococcal	42.9	78.1	20.2	11.1
HPV	50.2	76.0	34.0	13.9
Herpes Zoster	22.1	40.6	10.6	2.8
Meningococcal	38.2	67.7	19.1	5.6
Hepatitis A	61.8	85.4	47.9	22.2
Rabies	68.7	88.5	58.5	33.3
Polio (IPV)	56.2	81.3	40.4	19.4
Cholera	35.0	59.4	19.1	8.3
Yellow Fever	44.7	72.9	25.5	13.9

Table 3: Knowledge of Healthcare Professionals regarding vaccination of special populations.

Population	Overall (%)	Doctors (%)	Nurses (%)	Pharmacists (%)
Healthcare workers	84.8	96.9	78.7	61.1
Pregnant women	70.5	87.5	61.7	41.7
Immunocompromised	58.1	88.5	38.3	19.4
Chronic diseases	43.8	77.1	22.3	5.6
Travelers	56.7	83.3	40.4	16.7



considerably as shown in Table 2. This assessment specifically measured participants' basic recognition of different adult vaccines rather than their in-depth knowledge of these vaccines.

Knowledge about special populations requiring vaccination was particularly low among nurses and pharmacists, with specific proportions shown in Table 3. For instance, regarding vaccination of patients with chronic diseases, only 22.3% of nurses and 5.6% of pharmacists demonstrated adequate knowledge compared to 77.1% of doctors.

Only 36.4% of participants were aware of the complete adult

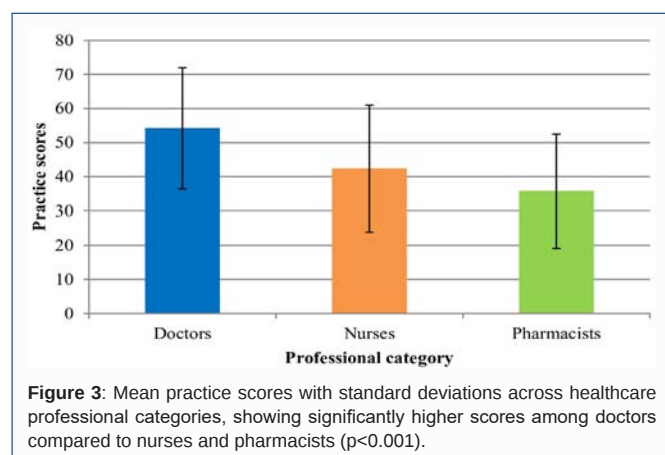


Figure 3: Mean practice scores with standard deviations across healthcare professional categories, showing significantly higher scores among doctors compared to nurses and pharmacists ($p < 0.001$).

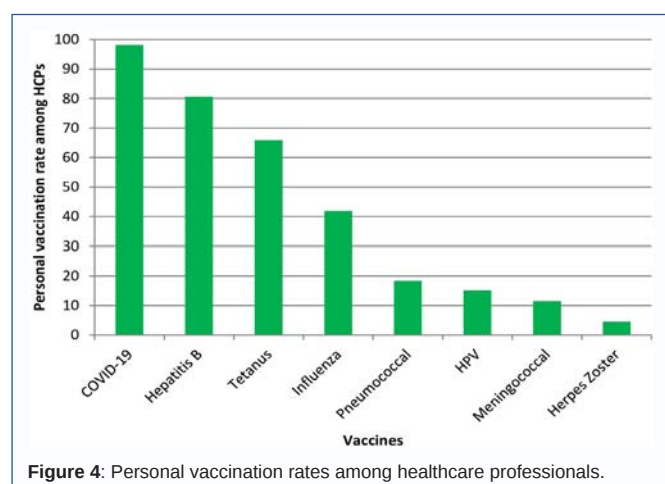


Figure 4: Personal vaccination rates among healthcare professionals.

immunization schedule as recommended by the Association of Physicians of India (API) guidelines [7].

Attitude Assessment

The overall attitude score had a median of 78.5 with an interquartile range (IQR) of 70.2-85.3 (out of 100), with 91.2% agreeing that adult vaccination is important for disease prevention and 87.6% agreed that healthcare professionals should recommend adult vaccines routinely. Attitude scores were relatively consistent across professional categories: doctors (median 80.5, IQR 72.5-86.4), nurses (median 77.2, IQR 69.8-84.5), and pharmacists (median 75.8, IQR 68.3-83.9) ($p = 0.142$), as shown in Figure 2. However, 58.1% believed adult vaccines are less important than childhood vaccines, and 44.7% expressed concerns about vaccine safety in adults.

Practice Assessment

The mean practice score was 46.9 ± 18.9 (out of 100), indicating suboptimal vaccination practices. When analyzing specifically among healthcare professionals who are authorized to recommend or prescribe vaccines (doctors), 53.1% reported routinely recommending vaccines to adult patients, while 35.4% did so occasionally, and 11.5% rarely or never recommended adult vaccines. Practice differences varied significantly across professional categories: doctors (54.2 ± 17.8), nurses (42.4 ± 18.6), and pharmacists (35.8 ± 16.7) ($p < 0.001$), as shown in Figure 3. Regarding personal vaccination status, 98.2% of participants reported receiving the COVID-19 vaccine, 80.6% Hepatitis B, 65.9% Tetanus, and 41.9% Influenza. Coverage for other vaccines was substantially lower: Pneumococcal

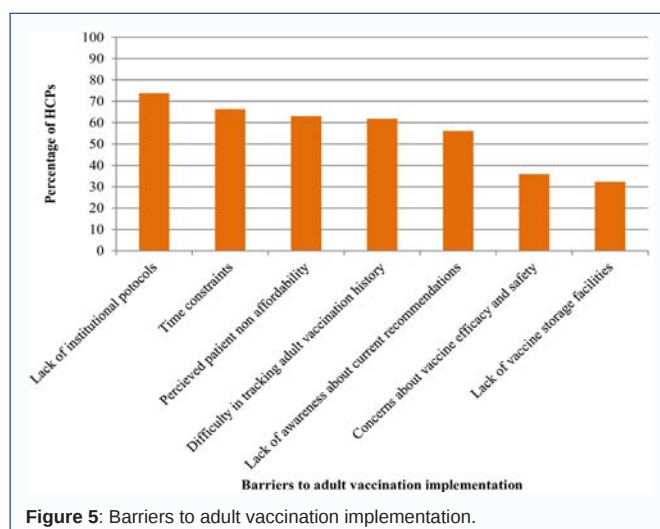


Figure 5: Barriers to adult vaccination implementation.

(18.4%), HPV (15.2%), Meningococcal (11.5%), and Herpes Zoster (4.6%), as shown in Figure 4.

Barriers to Adult Vaccination

The most commonly reported barriers to recommending adult vaccines were lack of institutional protocols (73.7%), time constraints (66.4%), perceived patient non-affordability (63.1%), difficulty in tracking adult vaccination history (61.8%), lack of awareness about current recommendations (56.2%), concerns about vaccine efficacy and safety (35.9%), and lack of vaccine storage facilities (32.3%), as shown in Figure 5.

Factors Associated with KAP Scores

Multiple logistic regression analysis revealed that higher knowledge scores were significantly associated with being a doctor (adjusted OR 3.48, 95% CI 2.13-5.67), having more than 10 years of experience (adjusted OR 1.76, 95% CI 1.18-2.62), and having received specific training on vaccination (adjusted OR 2.95, 95% CI 1.93-4.51). Higher practice scores were associated with good knowledge (adjusted OR 2.63, 95% CI 1.71-4.05), positive attitudes (adjusted OR 1.88, 95% CI 1.26-2.80), being a doctor (adjusted OR 2.34, 95% CI 1.47-3.71), and having received specific training on vaccination (adjusted OR 2.37, 95% CI 1.58-3.56), as shown in Table 4.

Discussion

This study revealed significant gaps in knowledge and practices regarding adult vaccination among HCPs, particularly among nurses and pharmacists. The substantial differences in knowledge scores between professional categories highlight the need for targeted educational interventions.

Knowledge Disparities

The considerable knowledge gap between doctors and other HCPs is concerning. While doctors demonstrated moderate knowledge (65.2 ± 14.8), nurses (40.3 ± 13.7) and pharmacists (35.2 ± 12.5) showed poor knowledge levels. This disparity might be attributed to differences in medical education curricula, continuing education opportunities, and exposure to vaccination guidelines.

The moderate level of knowledge (mean score 52.5%) observed in our study slightly differs in findings from other studies in India. Patel et al. (2021) reported substantial gaps in knowledge among physicians regarding adult immunization (only 35.8% doctors knew

Table 4: Factors Associated with Knowledge and Practice Scores (Multiple Logistic Regression Analysis).

Factor	Higher Knowledge Score		Higher Practice Score	
	Adjusted OR (95% CI)	p-value	Adjusted OR (95% CI)	p-value
Professional Category				
Doctor	3.48 (2.13-5.67)	<0.001	2.34 (1.47-3.71)	<0.001
Nurse	1.26 (0.72-2.19)	0.412	1.15 (0.68-1.97)	0.598
Pharmacist	Reference		Reference	
Years of Experience				
>10	1.76 (1.18-2.62)	0.006	1.42 (0.95-2.13)	0.089
5-10	1.32 (0.87-2.01)	0.193	1.19 (0.78-1.83)	0.421
<5	Reference		Reference	
Previous Training on Vaccination				
Yes	2.95 (1.93-4.51)	<0.001	2.37 (1.58-3.56)	<0.001
No	Reference		Reference	
Knowledge Score				
Good			2.63 (1.71-4.05)	<0.001
Moderate			1.49 (0.98-2.26)	0.062
Poor			Reference	
Attitude Score				
Positive			1.88 (1.26-2.80)	0.002
Negative			Reference	

about adult immunization), with particularly poor knowledge about booster immunizations for tetanus.^[5] Similarly, Jain et al. (2018) found that resident doctors had inadequate knowledge about various adult vaccines whereas Kashyap et al. (2024) reported that 72.4% residents were aware of adult immunization [8, 9].

Awareness was highest for COVID-19 vaccine, higher for traditional vaccines (Hepatitis B, Tetanus) but significantly lower for newer vaccines (Pneumococcal, HPV, Herpes Zoster). This pattern is consistent with findings from Jain et al. (2018) and Kashyap et al. (2024), who reported that knowledge about adult immunization among doctors regarding newer vaccines was significantly lower [8, 9], but differs regarding Tetanus vaccination as 92.7% doctors had knowledge of Tetanus immunization in our study, whereas Kumar et al. (2005) and Kashyap et al. (2024) reported significantly lower values of 35.8% and 24.1% respectively [9, 10].

The particularly low knowledge regarding special populations requiring vaccination among nurses and pharmacists is alarming. For instance, only 22.3% of nurses and 5.6% of pharmacists were aware of vaccination requirements for patients with chronic diseases. This gap could lead to missed opportunities for vaccination in high-risk populations.

Attitude-Practice Gap

Despite generally positive attitudes toward adult vaccination (77.3±12.8), the practice scores were considerably lower (46.9±18.9), indicating a significant knowledge-practice gap. This discrepancy was observed across all professional categories but was more pronounced among nurses and pharmacists.

Similar findings were reported by Kharoliwal and Mangal (2020), where medical students showed 100% positive attitudes toward adult immunization but had very poor knowledge and practice [11]. This

suggests that positive attitudes alone are insufficient for improving vaccination rates without adequate knowledge and institutional support. Hurley et al. (2016) reported that physicians' practices regarding adult vaccination recommendations varied widely and were often inconsistent with established guidelines [14].

Special Population Considerations

According to the API and CDC guidelines, special populations requiring focused vaccination efforts include immunocompromised individuals, adults with chronic medical conditions, pregnant women, healthcare workers, and travelers [6, 7]. Our study revealed particularly low awareness about vaccination requirements for these groups among nurses and pharmacists. For example, regarding vaccine recommendations for immunocompromised patients, only 38.3% of nurses and 19.4% of pharmacists were aware of the guidelines. Similarly, knowledge about vaccination for travelers was low among nurses (40.4%) and pharmacists (16.7%).

This lack of awareness could have serious implications for patient care, as these special populations are at increased risk for vaccine-preventable diseases and their complications. For instance, patients with chronic diseases like diabetes or respiratory conditions benefit significantly from vaccines such as influenza and pneumococcal, yet healthcare professionals' knowledge about these recommendations was limited.

Barriers to Implementation

The identified barriers to adult vaccination in our study align with findings from previous research. Bach et al. (2019) identified similar barriers and emphasized the need for multilevel interventions [15]. The lack of institutional protocols (73.7%) emerged as the most significant barrier, highlighting the need for system-level changes. Time constraints (66.4%) and perceived patient non-affordability (63.1%) were also major barriers. Patel et al. (2021) similarly reported

that 98% of physicians believed patients could not afford indicated vaccines [5]. This perception might prevent HCPs from even discussing vaccination options with patients. The difficulty in tracking adult vaccination history (61.8%) points to the need for better record-keeping systems. Unlike pediatric vaccinations, adult immunization lacks standardized tracking mechanisms, making it challenging for HCPs to determine which vaccines a patient might need.

This study provides comprehensive data on the knowledge, attitudes, and practices regarding adult vaccination across three different professional categories in a tertiary care setting in India. It quantifies the specific knowledge gaps related to newer vaccines and special populations requiring vaccination, highlighting the discrepancy between positive attitudes and suboptimal practices. Furthermore, it identifies specific barriers to implementation and factors associated with better knowledge and practices, providing actionable insights for targeted interventions.

Our findings suggest several key interventions to improve adult vaccination rates. Healthcare systems should implement targeted educational programs for nurses and pharmacists on vaccination guidelines, particularly for special populations, while establishing standardized institutional protocols with screening tools and decision support systems. Electronic health record systems with built-in vaccination reminders would enhance tracking capabilities. A multidisciplinary approach is essential, defining clear roles for all healthcare professionals and fostering collaborative practices. Financial barriers should be addressed through improved insurance coverage and subsidization options. Finally, incorporating adult vaccination topics into continuing education requirements would ensure all healthcare providers maintain current knowledge in this critical preventive health domain.

Limitations of the study

This study has several limitations. First, it was conducted in a single tertiary care hospital, limiting generalizability. Second, self-reported practices may be subject to social desirability bias. Third, the cross-sectional design prevents assessment of causality. Despite these limitations, our findings provide valuable insights into the current status of KAP regarding adult vaccination among HCPs.

Conclusion

Our study contributes novel findings on the specific disparities in knowledge and practices across different healthcare professional categories in an Indian tertiary care setting. We found that despite generally positive attitudes toward adult vaccination, significant knowledge gaps exist, particularly regarding newer vaccines and special populations. Our research uniquely identifies that the practice-knowledge gap is most pronounced among nurses and pharmacists, highlighting the need for targeted educational interventions for these groups. Additionally, we found that institutional factors such as lack of protocols and tracking systems are the predominant barriers to adult vaccination, rather than individual attitudes, suggesting that system-level changes may be more effective than individual

educational efforts alone. These findings provide a foundation for developing tailored, multidisciplinary approaches to improve adult vaccination coverage in Indian healthcare settings.

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