Epidemiology and Health System Journal
doi:10.34172/ehsj.26569 2025 Autumn;12(4):191-200 http://ehsj.skums.ac.ir

Original Article

Knowledge, Attitude, and Practice Regarding Human Papillomavirus Infection Among Medical College Students in Khulna, Bangladesh

Farhana Tasnim Promi[1], Shich-Al-Abrar[1], Narayon Chandro Sarker Nirob[1], Shatapdi Mallick[2], Kazi Mohammed Didarul Islam[1], Anti Islam[3*], Fouzia Akhter[4]

[1]Biotechnology and Genetic Engineering Discipline, Life Science School, Khulna University, Khulna-9208, Bangladesh
[2]Department of Microbiology, Khulna Medical College, Khulna-9000, Bangladesh
[3]Institute for Integrated Studies on the Sundarbans and Coastal Ecosystems, Khulna University, Khulna, Bangladesh
[4]Department of Physiology, Khulna Medical College, Khulna, Bangladesh

*Corresponding Author:
Anti Islam,
Emails: anti@iissce.ku.ac.bd, antiislam03@gmail.com

Received: August 13, 2025
Revised: November 17, 2025
Accepted: November 18, 2025
ePublished: December 30, 2025

Abstract

Background and aims: Cervical cancer (CC) is the fourth most common cancer among women worldwide, with persistent human papillomavirus (HPV) infection as the primary cause. This study assessed knowledge, attitudes, and practices regarding HPV, CC, and HPV vaccination among female medical students at public and private medical colleges in Khulna, Bangladesh, with a particular focus on their knowledge and attitudes.

Methods: This comparative cross-sectional survey was conducted using cluster-stratified random sampling among 180 female students from January to April 2024. Data were collected using a structured, self-administered questionnaire adapted from validated tools. Spearman's rho and Kendall's tau-b tests assessed relationships among KAP variables, while chi-square tests and multivariate logistic regression estimated associations and odds ratios.

Results: Most participants were 20–22 years old (57.8%) and unmarried (86.1%), with a high proportion reporting well-educated parents. In addition, 97.2% of students demonstrated adequate knowledge about HPV and CC, and 99.5% held positive attitudes. However, preventive practices were comparatively lower (89.5%), and only 16.1% had received the HPV vaccine. Moreover, knowledge was positively correlated with attitude and practice, and attitude was also strongly correlated with practice. Based on multivariate analysis, higher knowledge levels were associated with participants' education (OR = 0.813) and mothers' education (OR = 1.730), while better preventive practices were related to mothers' education (OR = 2.123).

Conclusion: Despite high knowledge and positive attitudes, HPV vaccination uptake remains low. Stronger vaccination campaigns, targeted awareness programs, and closer parental involvement, particularly from mothers, are needed to improve preventive behaviors while reducing CC risk in Bangladesh.

Keywords: Human papillomavirus, Cervical neoplasms, Health knowledge, Attitudes, Vaccination, Students, Medical

Introduction

The human papillomavirus (HPV) is a widespread sexually transmitted virus that infects multiple anatomical sites, including the cervix, vagina, vulva, penis, and anus. More than 40 HPV types primarily affect the anogenital region, and approximately 99.7% of cervical squamous cell carcinoma cases are linked to oncogenic HPV strains. Among the ~200 identified HPV types, at least 15 are classified as high-risk (oncogenic), while the remaining ones are low-risk (non-oncogenic).[1,2]

Globally, HPV is responsible for about 70% of cervical malignancies and precursor lesions, with HPV-16 and HPV-18 alone accounting for nearly 70% of cervical cancer (CC) cases.[3] The worldwide prevalence of HPV infection among women with normal cytology is estimated at 11–12%.[4] CC ranks as the fourth most common cancer among women, with 660,000 new cases and 350,000 deaths in 2020, the majority occurring in low-income and middle-income countries (LMICs).[5,6]

In Bangladesh, although CC is not the second most common disease, it is the second most prevalent cancer among women aged 15–44 years.[7] The age-standardized incidence and mortality rates are 10.6 and 6.7 per 100,000 women, respectively.[8] Each year, more than 8,000 women are newly diagnosed, and nearly 5,000 die of the disease, accounting for about 12% of all female cancers in the country. Without effective intervention, projections suggest that more than 500,000 and over one million

Bangladeshi women may die of CC by 2070 and 2120, respectively.[9]

Some studies performed in Bangladesh show HPV infection rates of 7.7% among women with normal cytology in Dhaka, 2.5–3.0% for high-risk HPV types in coastal districts, and 5.0% among rural women aged 45–64 years.[10,11] A recent systematic review reported pooled HPV vaccine uptake in South Asia at only 8%, while pooled knowledge and favorable attitudes toward vaccination remain limited (41% and 56%, respectively).[12] These findings highlight the continuing vulnerability of Bangladeshi women to HPV and CC.

HPV vaccination is the most effective preventive intervention, which is capable of preventing over 90% of HPV-related malignancies when administered before sexual intercourse.[13] Bangladesh launched its first HPV demonstration vaccination project in 2016, targeting schoolgirls in Gazipur.[14] More recently, national campaigns have reached more than 5.6 million girls with approximately 93% coverage of the eligible population, and HPV vaccination has now been incorporated into the national immunization program.[15] Despite these successes, challenges of equitable access, affordability, and stigma remain.

In Khulna, a significant city in southwestern Bangladesh, CC is also a rising health concern. A community-based survey indicated that awareness of CC screening and HPV prevention was lower among women in Khulna compared to the national average.[16] Another study conducted in southern coastal districts, including areas adjacent to Khulna, reported high-risk HPV prevalence of 2.5–3.0% among women with normal cytology.[10] Cultural barriers, such as reluctance to openly discuss reproductive health and stigma around sexually transmitted infections (STIs), further limit preventive behaviors in Khulna.[17] Considering that the city hosts multiple medical colleges, evaluating medical students' knowledge and attitudes provides valuable insight into regional awareness gaps and opportunities for targeted interventions.

While a few earlier studies in Bangladesh have assessed HPV awareness, most were conducted in Dhaka or other urban centers and targeted general women or high socioeconomic groups.[16-18] It should be noted that these studies provided critical baseline information but did not address regional disparities or focus specifically on medical students. Our study, therefore, contributes to new knowledge by examining female medical students in Khulna, a region with distinct cultural and healthcare challenges.

Medical students are future healthcare providers whose knowledge and attitudes directly influence their patients and communities. Female medical students were chosen for this investigation explicitly because CC directly affects women. As future physicians, they are expected to play a central role in educating communities, counseling patients, and promoting vaccination. By focusing on this underexplored group and evaluating their knowledge and attitudes, our study will fill a gap in the literature and provide region-specific evidence to guide CC prevention strategies in Bangladesh.

Materials and Methods

Study Design and Period

A cross-sectional comparative study was performed on medical college students in Khulna District, Bangladesh, from January to April 2024. The required data were collected using a structured, self-administered questionnaire adapted from previously validated tools.[8,19-21]

Study Population, Inclusion, and Exclusion Criteria

The study population consisted of female MBBS (Bachelor of Medicine and Bachelor of Surgery) students enrolled in the 1st–5th year at four medical colleges in Khulna District: Khulna Medical College, Gazi Medical College, Ad-din Akij Medical College, and Khulna City Medical College.

Inclusion Criteria

All female MBBS students enrolled in these institutions who were present during the data collection period and provided informed consent.

Exclusion Criteria

Students who declined participation, were absent on the survey day, or submitted incomplete questionnaires.

Sample Size Determination

The minimum required sample size was calculated using the standard formula[22]:

$$n = Z^2 P (1 - P)/d^2,$$

where Z (for 5% type I error), P (prevalence from earlier studies in Bangladesh and South Asia),[9,16,17] and d (precision) equal 1.96, 0.12, and 0.05, respectively. The calculated minimum sample size was 163. To strengthen representativeness, 180 students were finally enrolled, comprising 180 female MBBS students from Khulna Medical College (n = 72, 40%), Gazi Medical College (n = 36, 20%), Ad-din Akij Medical College (n = 36, 20%), and Khulna City Medical College (n = 36, 20%).

Sampling Technique

A cluster-stratified random sampling technique was employed to select participants. The study was conducted in four medical colleges, including Khulna Medical College, Gazi Medical College, Ad-din Akij Medical College, and Khulna City Medical College, located in the Khulna District of Bangladesh.

Each medical college was considered a separate cluster, and students were stratified by academic year within each cluster (1st–5th year). From each stratum, the students were selected by simple random sampling to ensure proportional representation across all study levels. The year-wise distribution of participants was as follows:

1st year – 11 students (6.1%), 2nd year – 42 students (23.3%), 3rd year – 32 students (17.8%), 4th year – 52 students (28.9%), and 5th year – 43 students (23.9%)

Research Instrument: Development, Validity, and Reliability

The 49-item questionnaire was developed in 2023 based on survey tools from the World Health Organization, the Centers for Disease Control and Prevention (2023), and the International HPV Information Centre (ICO/IARC, 2020). It was adapted to the Bangladeshi context through expert input from two public health specialists and one gynecologist.[6,8,13]

Content Validity

It was established through expert panel review.

Pilot Testing

It was conducted on 20 students outside the study sites; ambiguous items were modified.

Reliability

Cronbach's alpha coefficient was 0.814, indicating strong internal consistency.[23]

Scoring System

Knowledge: 14 items, scored 0 (incorrect/"don't know") or 1 (correct), ranging from 0 to 14. A score greater than 34 was considered adequate knowledge, while a score less than or equal to 34 was regarded as poor knowledge.[24]

Attitude: 14 items, 5-point Likert-type scale (1–5), were in the range of 14–70. Scores ≥ mean indicated a positive attitude. A score greater than 34 was considered a positive attitude.

Practice: 14 items, including vaccination status (verified by documentation) and attendance at HPV-related training. They were scored on a 5-point Likert-type scale (1–5), ranging from 14 to 70. Higher scores reflected better practice. A score greater than 34 was considered good practical behavior, while a score of 34 or lower was considered poor practical behavior regarding HPV infection, CC, and HPV vaccination.

Cut-off Points: The cut-off scores (< 60%) for knowledge, attitudes, and practices were adopted and modified from several similar medical and public health-related studies.[25-30]

Data Collection Procedure

Printed questionnaires were distributed during lecture hours after obtaining informed consent. Then, participants completed the survey independently under the supervision of trained research assistants, without the interviewer's influence.

Data Analysis

The obtained data were entered and analyzed using SPSS (version 29) and Microsoft Excel (2010). Descriptive statistics (frequencies, percentages, means ± standard deviations) were obtained. Inferential statistics included chi-square tests, Kendall's tau-b, Spearman's rho, and multivariate regression. Correlation strength was interpreted as weak (0–0.3), moderate (0.3–0.7), and strong (0.7–1).[25] Moreover, exact *P*-values were reported for non-significant findings, and a *P* value < 0.05 was considered statistically significant.

Ethical Considerations

Ethical clearance was obtained from the Khulna University Ethics Review Committee (approval No. KUERC/2023/12). The participating medical colleges granted administrative permission. Written informed consent was obtained from all participants, and they were assured of data confidentiality.

Results

Sociodemographic Characteristics of Participants

A total of 180 female medical students participated in this study. Nearly 40% of the students were from Khulna Medical College, while the others were evenly distributed across three private colleges (20% each). Most participants were aged 20–22 years (57.8%), unmarried (86.1%), and Muslim (78.3%). Fathers were more highly educated (85.6%) compared to mothers (64.4%). Moreover, fourth-year and fifth-year students comprised the largest groups (28.9% and 23.9%, respectively). Detailed sociodemographic characteristics are shown in Figure 1.

Knowledge of Human Papillomavirus, Cervical Cancer, and Vaccination

The mean knowledge score was 2.90 ± 0.022 out of 4, with 97.2% scoring above the cut-off point. Awareness was generally high. Most participants identified HPV as a cause of CC (96.1%), recognized women as predominantly affected (92.3%), and acknowledged sexual transmission (88.9%). However, misconceptions remained, with 40% believing that men are not at risk and 31% considering vaccination necessary only after age 30. Only 31.7% reported good knowledge of the HPV vaccine (Figure 2).

Attitudes Toward Human Papillomavirus, Cervical Cancer, and Vaccination

Nearly all participants (99.4%) demonstrated positive attitudes, with a mean score of 3.18 ± 0.021. Additionally, most perceived HPV as dangerous, acknowledged susceptibility, and emphasized preventive hygiene. In addition, vaccination was widely supported. Overall, 95.6% intended to be vaccinated, and 97.2% endorsed it for adults, though 78.3% expressed concern about potential side effects (Figure 3).

Practices Related to Human Papillomavirus and Cervical Cancer Prevention

Practices lagged despite strong knowledge and attitudes (mean ± SD = 2.89 ± 0.025). Only 16.1% had received the HPV vaccine, though most intended to inform others

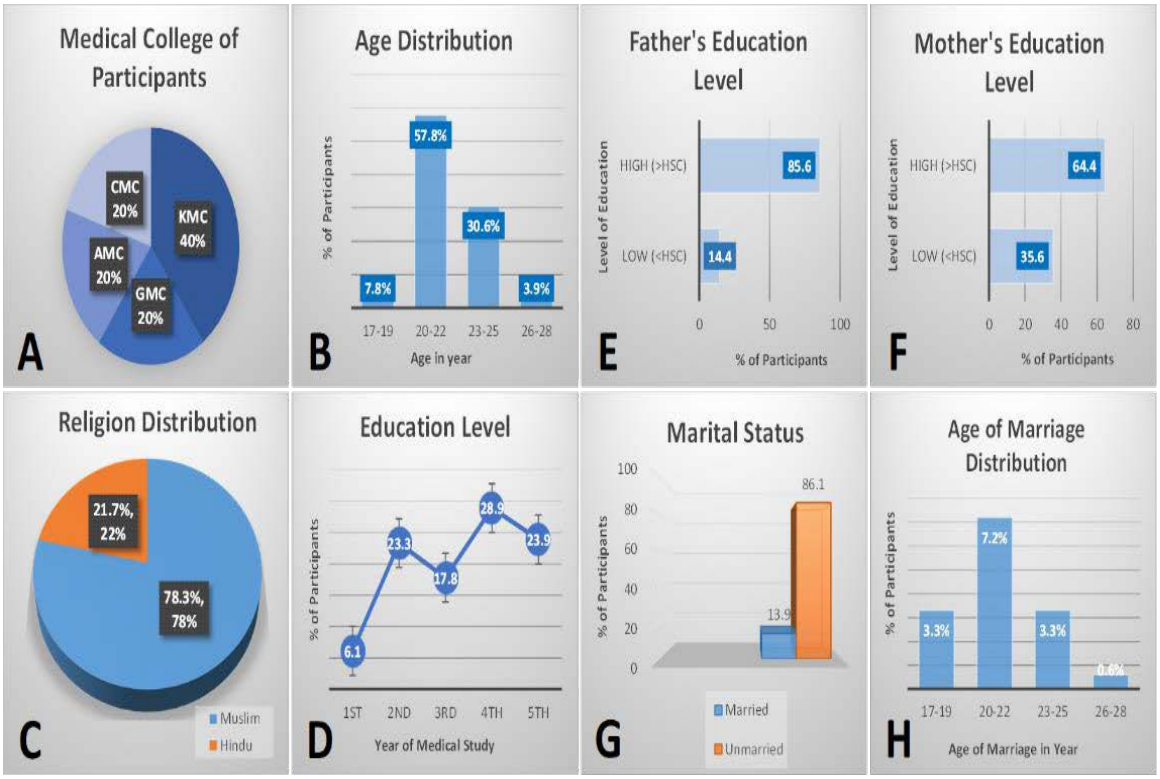

Figure 1. Sociodemographic Attributes of Participants

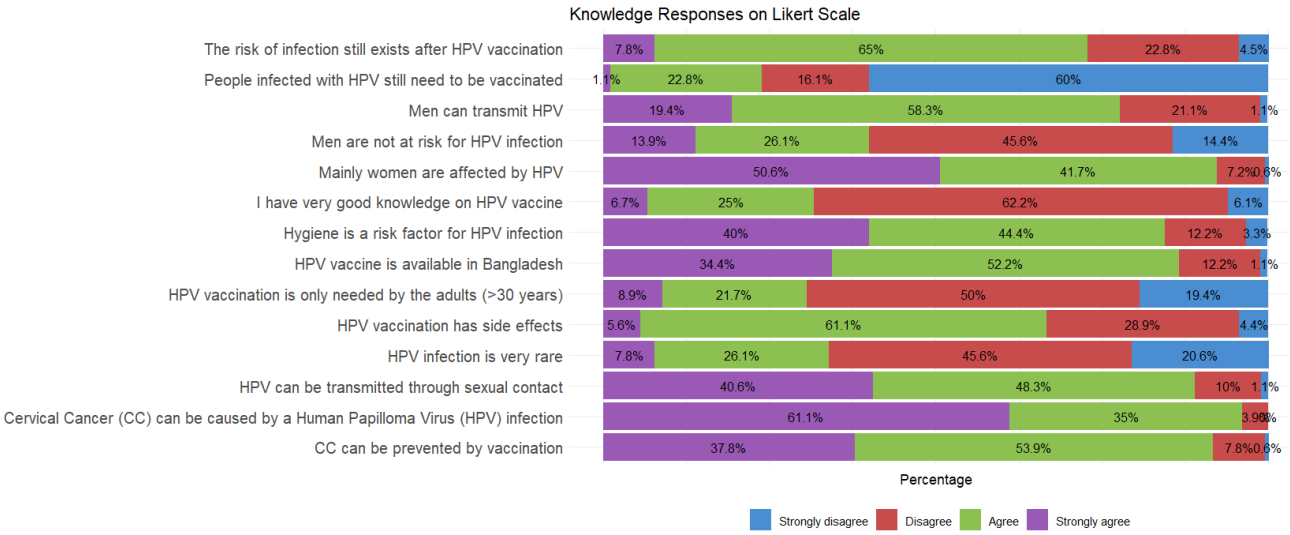

Figure 2. Responses of Participants on Knowledge-Based Questions

(97.8%) and encourage vaccination (89.4%). Preventive practices included seeking medical advice (77.7%), attending lectures (53.8%), and maintaining hygiene (86.6%), the details of which are displayed in Figure 4.

Correlations Among Knowledge, Attitude, and Practice

Significant positive correlations were observed among knowledge–attitude (rs = 0.459, $P < 0.01$), knowledge–practice (rs = 0.284, $P < 0.01$), and attitude–practice (rs = 0.466, $P < 0.01$).

Association of Knowledge, Attitudes, and Practices With Sociodemographic Factors

Correlation analysis demonstrated no significant associations between knowledge or attitude scores and sociodemographics (all $P > 0.05$; exact values in Tables 1 and 2). For example, age ($P = 0.313$), marital status ($P = 0.223$), and religion ($P = 0.151$) were not significant predictors. Practice scores correlated weakly but significantly with participants' education (rs = 0.184, $P = 0.047$, $\tau = 0.157$, $P = 0.009$) and mothers' education (rs = 0.233, $P = 0.003$, $\tau = 0.196$, $P = 0.007$).

Multivariate Regression Analyses

Knowledge

Participant education (adjusted odds ratio [AOR] = 0.813, 95% confidence interval [CI]: 0.662–0.998, $P = 0.048$) and mother's education (AOR = 1.730, 95% CI: 1.000–2.993,

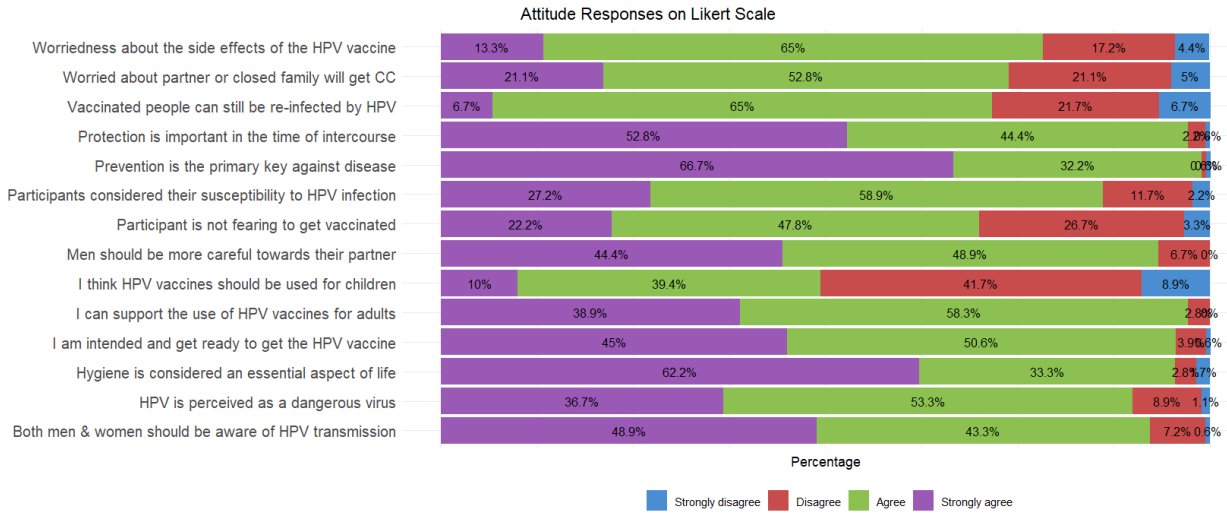

Figure 3. Responses of Participants on Attitude-Based Questions
Note. CC: Cervical cancer; HPV: Human papillomavirus

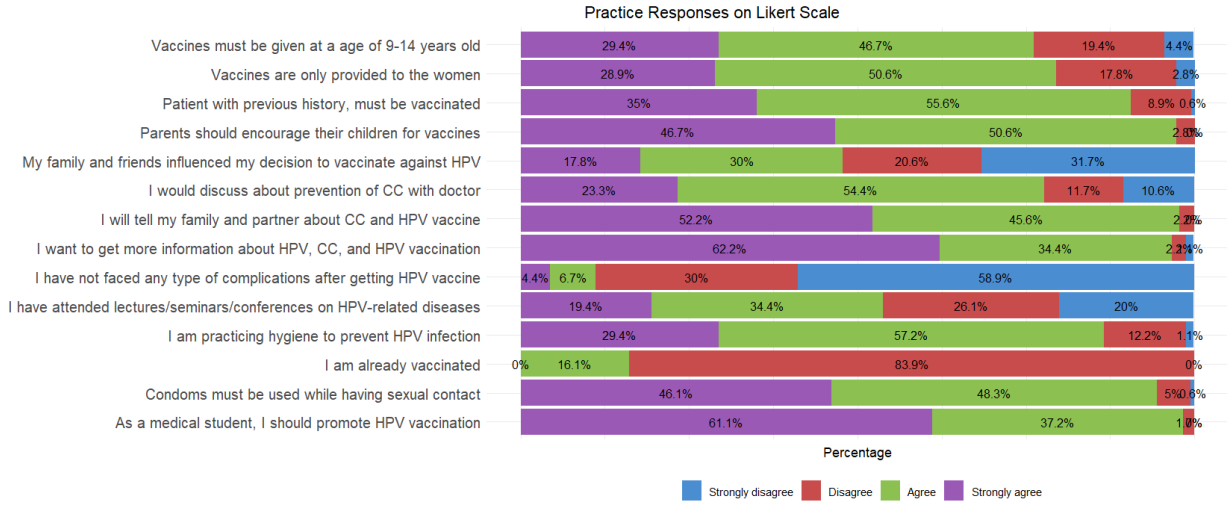

Figure 4. Responses of Participants on Practice-Based Questions
Note. CC: Cervical cancer; HPV: Human papillomavirus

$P = 0.050$) were significant predictors (Table 1). Conversely, religion ($P = 0.151$) and marital status ($P = 0.080$) were not significant.

Attitude

None of the sociodemographic factors were statistically significant (all $P > 0.20$, Table 2).

Practice

Mother's education was meaningfully associated (AOR = 2.123, 95% CI: 1.224–3.681, $P = 0.007$), while other factors, such as age ($P = 0.090$) and father's education ($P = 0.206$), represented no relationship (Table 3).

Summary of Key Findings

Overall, participants demonstrated high levels of knowledge and positive attitudes but comparatively lower preventive practices, particularly vaccination uptake.

Discussion

HPV infection and CC remain critical public health challenges in LMICs, including Bangladesh, where limited vaccine access, insufficient health education, and sociocultural factors increase vulnerability.[31,32] In this study, female medical students exhibited high knowledge and overwhelmingly positive attitudes toward HPV and CC prevention. Nonetheless, actual preventive practices, particularly vaccination uptake, were notably low, highlighting a substantial knowledge-practice gap.

Comparable studies reported similar patterns in Bangladesh and other LMICs.[18] found that 78.2% of Bangladeshi medical students had "moderate" knowledge of CC prevention, According to a observation, it has been noted that only 44.9% with good knowledge among Indian medical students.[33,34,35] Similar high positive attitudes have been reported in India and Nigeria, where 73.6% and > 80% of medical students, respectively, endorsed HPV vaccination.[34-36] Despite high awareness, vaccine coverage among medical students often remains below 15%.[18,33,35] Similar findings in Malaysia and Indonesia suggest that high knowledge alone does not ensure the adoption of preventive measures.[36-38] In contrast, countries

Table 1. Multivariate Logistic Regression Analysis for Factors Toward Overall Knowledge of HPV, CC, and HPV Vaccination (N = 180)

Factors	Overall Knowledge Toward HPV, CC, and HPV Vaccination			
	Unadjusted OR (95% CI)	*P* Value[a]	Adjusted OR (95% CI)	*P* Value[b]
Age (year)				
17-19 20-22 23-25 26-28	Ref. -0.013 (-0.399-0.372)	0.946	Ref. -	n/a
Religion				
Muslim Hindu	Ref. 0.464 (-0.170-1.099)	0.151	Ref. 1.591 (0.844-3.001	0.151
Level of education				
1st year 2nd year 3rd year 4th year 5th year	Ref. -0.207 (-0.413--0.002)	0.047	Ref. 0.813 (0.662-0.998)	0.048
Level of father's education				
High Low	Ref. 0.039 (-0.666-0.744)	0.913	Ref. -	n/a
Level of mother's education				
High Low	Ref. 0.548 (0.000-1.096)	0.049	Ref. 1.730 (1.000-2.993)	0.050
Marital status (year)				
Married Unmarried	Ref. -0.659 (-1.398-0.079)	0.080	Ref. 0.517 (0.247-1.083)	0.080

Note. [a]Bivariate analysis using chi-square odds ratio estimate, any corresponding variables with $P < 0.20$ were considered suitable for inclusion in the multivariate analysis model. [b]Multivariate logistic regression analysis; 95% CI. HPV: Human papillomavirus; CC: Cervical cancer; OR: Odds ratio; CI: Confidence interval.

Table 2. Multivariate Logistic Regression Analysis for Factors Toward Overall Attitude Toward HPV, CC, and HPV Vaccination (N = 180)

Factors	Overall Attitude Toward HPV, CC, and HPV Vaccination			
	Unadjusted OR (95% CI)	*P* Value[a]	Adjusted OR (95% CI)	*P* Value[b]
Age (year)				
17-19 20-22 23-25 26-28	Ref. 0.023 (-0.350-0.396)	0.904	Ref. -	n/a
Religion				
Muslim Hindu	Ref. -0.257 (-0.903-0.389)	0.436	Ref. -	n/a
Level of education				
1st year 2nd year 3rd year 4th year 5th year	Ref. -0.085 (-0.291-0.120)	0.415	Ref. -	n/a
Level of father's education				
High Low	Ref. -0.148 (-0.872-0.576)	0.688	Ref. -	n/a
Level of mother's education				
High Lows	Ref. 0.170 (-.372-0.711)	0.539	Ref. -	n/a
Marital status				
Married Unmarried	Ref. -0.387 (-1.138-0.364)	0.313	Ref. -	n/a

Note. [a]Bivariate analysis using chi-square odds ratio estimate, any corresponding variables with $P < 0.20$ were considered suitable for inclusion in the multivariate analysis model. [b]Multivariate logistic regression analysis; 95% CI. HPV: Human papillomavirus; CC: Cervical cancer; OR: Odds ratio; CI: Confidence interval.

Table 3. Multivariate Logistic Regression Analysis for Factors Toward Overall Practice Toward HPV, CC, and HPV Vaccination (N = 180)

Factors	Overall Practice Toward HPV, CC, and HPV Vaccination			
	Unadjusted OR (95% CI)	*P* Value[a]	Adjusted OR (95% CI)	*P* Value[b]
Age (year)				
17-19	Ref.	0.091	Ref.	0.090
20-22				
23-25	0.340 (-0.053-0.733)		1.405 (0.949-2.082)	
26-28				
Religion				
Muslim	Ref.	0.765	Ref.	n/a
Hindu	-0.091 (-0.688-0.506)		-	
Level of education				
1st year	Ref.	0.155	Ref.	0.155
2nd year				
3rd year				
4th year	0.152 (-0.058-0.363)		1.165 (0.943-1.438)	
5th year				
Level of father's education				
High	Ref.	0.205	Ref.	0.206
Low	0.463 (-0.255-1.181)		1.589 (0.775-3.259)	
Level of mother's education				
High	Ref.	0.007	Ref.	0.007
Low	0.753 (0.202-1.303)		2.123 (1.224-3.681)	
Marital status				
Married	Ref.	0.975	Ref.	n/a
Unmarried	-0.012 (-0.763-0.739)		-	

Note. [a]Bivariate analysis using chi-square odds ratio estimate, any corresponding variables with $P<0.20$ were considered suitable for inclusion in the multivariate analysis model. [b]Multivariate logistic regression analysis; 95% CI. HPV: Human papillomavirus; CC: Cervical cancer; OR: Odds ratio; CI: Confidence interval.

with organized school-based vaccination programs (e.g., Australia and the UK) report coverage exceeding 70%, indicating the influence of structural and policy-level interventions.[5]

Several factors likely contribute to the low practice levels observed in this study. Cost and limited vaccine availability restrict access for students, while cultural perceptions and stigma surrounding STIs may discourage vaccination among unmarried individuals. Vaccine safety concerns, reported by a substantial proportion of participants, further impede uptake, consistent with prior findings from Southeast Asia.[38-40] Likewise, the lack of national or institutional vaccination campaigns in Bangladesh plays a role in low adoption rates, reinforcing the idea that knowledge alone is insufficient to drive preventive behaviors.[39,40]

Knowledge gaps persisted despite overall awareness. While most participants correctly identified HPV as a cause of CC and recognized its sexual transmission, their understanding of male susceptibility and appropriate vaccination timing was limited. This knowledge-practice gap and such misconceptions are in line with the findings of previous studies from India and Malaysia, demonstrating that cultural norms and gaps in health education affect accurate knowledge, even among medical students.[38,41]

In Bangladesh, only 11.2% of medical students had received the vaccine despite high awareness.[34] In India, 33 found uptake at 6.8%.[35] Another study observed only 7% vaccination among 300 students.[38] Similarly low rates (~10%) were found in recent Indian cohorts (2025).[18] Reported barriers included high cost, limited availability, stigma around STIs, and misconceptions about vaccine safety.[35,36,38]

Correlation analyses revealed moderate positive associations between knowledge and attitude, as well as between attitude and practice. However, only weak associations were found between knowledge and practice. These results suggest that favorable attitudes, although necessary, may not directly translate into protective behaviors, a pattern similarly reported in KAP studies across LMICs.[41,42]

Maternal education emerged as a consistent predictor of both knowledge and practice, indicating the role of family health literacy and social support in shaping preventive behaviors. This finding conforms to the results from Indonesia, where maternal education significantly influenced HPV-related knowledge, attitudes, and vaccination practices.[2]

The low uptake of HPV vaccination among future healthcare providers is concerning, given their anticipated

role in promoting vaccination to the broader population. Nonetheless, addressing this gap requires multifaceted strategies, including subsidized or campus-based vaccination programs, targeted communication to counter misinformation, and gender-inclusive education about HPV risks and vaccine benefits. According to evidence, combining education with improved access is far more effective than knowledge enhancement alone in increasing vaccine adoption.[32,43]

Overall, the findings of this study highlight that high knowledge and positive attitudes are necessary but not sufficient for translating awareness into preventive practices. This discrepancy corroborates the findings from Bangladesh, India, and other LMICs, where awareness has not been translated into behavior due to structural and cultural barriers.[34-38] Structural barriers, cultural perceptions, and policy limitations must be addressed to improve HPV vaccination uptake, ultimately reducing CC burden in Bangladesh and similar LMIC contexts.

Limitations and Strengths

This cross-sectional study could not establish causal relationships. Female students from four colleges in Khulna were purposively selected, as CC exclusively affects women, and these students, as future physicians, are expected to play a central role in counseling and awareness initiatives. This rationale justified the focus on women only, while the authors acknowledge this as a study limitation.[6,11] Self-reported responses may have been affected by social desirability bias, and structural factors, such as vaccine availability, cost, and institutional policies, were not fully assessed in this study.

Conclusion

The participants had high knowledge and positive attitudes regarding HPV infection, CC, and HPV vaccination, but preventive practices, particularly vaccination uptake, remained comparatively low. Educational and training initiatives targeting medical students are essential to bridge this knowledge-practice gap and promote vaccine acceptance. Moreover, mothers' influence should be leveraged, as it significantly impacts vaccination uptake. Eventually, it is recommended that nationwide studies assess the broader KAP scenario among medical students in Bangladesh and guide effective public health interventions.

Acknowledgements

The authors acknowledge the faculty members of the corresponding medical colleges, Dr. Nuhash Tabassum Novera and Dr. S. M. Tanvir Hassan Abir, for their support during data collection. We are also thankful to the respondents for their participation in the study.

Authors' Contribution

Conceptualization: Farhana Tasnim Promi, Kazi Mohammed Didarul Islam, Fouzia Akhter.
Data curation: Farhana Tasnim Promi, Shich-Al-Abrar, Fouzia Akhter, Shatapdi Mallick.
Formal analysis: Farhana Tasnim Promi, Shich-Al-Abrar, Narayon Chandro Sarker Nirob, Anti Islam.
Funding acquisition: Farhana Tasnim Promi, Kazi Mohammed Didarul Islam.
Investigation: Farhana Tasnim Promi, Kazi Mohammed Didarul Islam, Anti Islam.
Methodology: Farhana Tasnim Promi, Shich-Al-Abrar.
Project administration: Kazi Mohammed Didarul Islam, Fouzia Akhter.
Resources: Farhana Tasnim Promi, Narayon Chandra Sarker Nirob, Shich-Al-Abrar, Kazi Mohammed Didarul Islam, Anti Islam.
Software: Farhana Tasnim Promi, Narayon Chandra Sarker Nirob, Anti Islam.
Supervision: Kazi Mohammed Didarul Islam, Fouzia Akhter.
Validation: Kazi Mohammed Didarul Islam, Fouzia Akhter.
Visualization: Farhana Tasnim Promi, Shich-Al-Abrar, Narayon Chandra Sarker Nirob, Anti Islam.
Writing–original draft: Farhana Tasnim Promi, Shich-Al-Abrar.
Writing–review & editing: Kazi Mohammed Didarul Islam, Anti Islam.

Competing Interests

The authors declare they have no conflict of interests.

Ethical Approval

Ethical Committee: Prof. Dr. Kazi Mohammed Didarul Islam, Chairman, Ethical Clearance Committee and Director, Research and Innovation Centre, Khulna University, Khulna-9208, Bnagladesh. Ethical Code: KUECC-2024-02-10.

Funding

This study was self-funded by the authors and received no external financial support from any funding organization.

References

1. Van Doorslaer K, Bernard HU, Chen Z, de Villiers EM, zur Hausen H, Burk RD. Papillomaviruses: evolution, Linnaean taxonomy and current nomenclature. Trends Microbiol. 2011;19(2):49-50. doi: 10.1016/j.tim.2010.11.004
2. Singh D, Vignat J, Lorenzoni V, Eslahi M, Ginsburg O, Lauby-Secretan B, et al. Global estimates of incidence and mortality of cervical cancer in 2020: a baseline analysis of the WHO Global Cervical Cancer Elimination Initiative. Lancet Glob Health. 2023;11(2):e197-206. doi: 10.1016/s2214-109x(22)00501-0
3. GBD 2016 Occupational Carcinogens Collaborators. Global and regional burden of cancer in 2016 arising from occupational exposure to selected carcinogens: a systematic analysis for the Global Burden of Disease Study 2016. Occup Environ Med. 2020;77(3):151-9. doi: 10.1136/oemed-2019-106012
4. Bruni L, Diaz M, Castellsagué X, Ferrer E, Bosch FX, de Sanjosé S. Cervical human papillomavirus prevalence in 5 continents: meta-analysis of 1 million women with normal cytological findings. J Infect Dis. 2010;202(12):1789-99. doi: 10.1086/657321
5. Sung H, Ferlay J, Siegel RL, Laversanne M, Soerjomataram I, Jemal A, et al. Global cancer statistics 2020: GLOBOCAN estimates of incidence and mortality worldwide for 36 cancers in 185 countries. CA Cancer J Clin. 2021;71(3):209-49. doi: 10.3322/caac.21660
6. World Health Organization (WHO). WHO Health Workforce Support and Safeguards List 2023. Geneva: WHO; 2023.
7. Deo SVS, Sharma J, Kumar S. GLOBOCAN 2020 report on global cancer burden: challenges and opportunities for surgical oncologists. Ann Surg Oncol. 2022;29(11):6497-500. doi: 10.1245/s10434-022-12151-6
8. Konno R. Human Papillomavirus and Related Cancers: Fact Sheet 2019 [Internet]. ICO/IARC HPV Information Centre;

2019. Available from: https://hpvcentre.net/statistics/reports/XWX.pdf. Accessed September 17, 2025.
9. Bruni L, Saura-Lázaro A, Montoliu A, Brotons M, Alemany L, Diallo MS, et al. HPV vaccination introduction worldwide and WHO and UNICEF estimates of national HPV immunization coverage 2010-2019. Prev Med. 2021;144:106399. doi: 10.1016/j.ypmed.2020.106399
10. Chakraborty S, Nessa A, Ferdous NE, Rahman MM, Harun-Ur-Rashid M, Sonia AA, et al. Prevalence and genotypic distribution of high-risk human papillomavirus (HPV) among ever-married women in coastal regions of Bangladesh. PLoS One. 2024;19(12):e0313396. doi: 10.1371/journal.pone.0313396
11. Nessa A, Begum SA, Munshi SU, Begum F, Chowdhury A. High-risk human papillomavirus infection among urban and rural women in Bangladesh. Cancer Screen Prev. 2024;3(1):36-46. doi: 10.14218/csp.2023.00033
12. Noreen K, Naeem Khalid S, Murad MA, Baig M, Khan SA. Uptake and determinants of HPV vaccination in South Asia: a systematic review and meta-analysis. Front Public Health. 2024;12:1453704. doi: 10.3389/fpubh.2024.1453704
13. Anderer S. CDC: overall deaths, especially from COVID-19, lower in 2023. JAMA. 2024;332(13):1043. doi: 10.1001/jama.2024.17606
14. Salwa M, Abdullah Al-Munim T. Ethical issues related to human papillomavirus vaccination programs: an example from Bangladesh. BMC Med Ethics. 2018;19(Suppl 1):39. doi: 10.1186/s12910-018-0287-0
15. Sultana A, Shimu SJ, Faika MJ, Islam T, Ferdous NE, Nessa A. Bangladeshi parents' knowledge and awareness about cervical cancer and willingness to vaccinate female family members against human papilloma virus: a cross sectional study. Int J Community Med Public Health. 2023;10(10):3446-53. doi: 10.18203/2394-6040.ijcmph20232830
16. Nahar Q, Rahman M, Sultana T, et al. Awareness and screening practices on cervical cancer in Khulna division, Bangladesh. Asian Pac J Cancer Prev. 2020;21(7):2031-8.
17. Salauddin M, Irin F, Disha P, Ishi NS, Akter S, Ara R, et al. Human papillomavirus in Bangladesh: challenges and opportunities for prevention. Gynecol Oncol Rep. 2025;59:101747. doi: 10.1016/j.gore.2025.101747
18. Rahman MM, Sharif AB, Uddin BM, Bari S, Khan SI, Jerin IA, et al. Knowledge, attitude and practice related to cervical cancer prevention among medical students in Bangladesh: a cross-sectional study. Discov Educ. 2025;4(1):273. doi: 10.1007/s44217-025-00675-4
19. Urrutia MT, Hall R. Beliefs about cervical cancer and Pap test: a new Chilean questionnaire. J Nurs Scholarsh. 2013;45(2):126-31. doi: 10.1111/jnu.12009
20. Pandey D, Vanya V, Bhagat S, Shetty J. Awareness and attitude towards human papillomavirus vaccine among medical students in India. Asian Pac J Cancer Prev. 2012;13:499-502.
21. GBD 2019 Hepatitis B Collaborators. Global, regional, and national burden of hepatitis B, 1990-2019: a systematic analysis for the Global Burden of Disease Study 2019. Lancet Gastroenterol Hepatol. 2022;7(9):796-829. doi: 10.1016/s2468-1253(22)00124-8
22. Lwanga SK, Lemeshow S. Sample Size Determination in Health Studies. Geneva: World Health Organization; 1991.
23. Tavakol M, Dennick R. Making sense of Cronbach's alpha. Int J Med Educ. 2011;2:53-5. doi: 10.5116/ijme.4dfb.8dfd
24. Zibako P, Tsikai N, Manyame S, Ginindza TG. Knowledge, attitude and practice towards cervical cancer prevention among mothers of girls aged between 9 and 14 years: a cross sectional survey in Zimbabwe. BMC Womens Health. 2021;21(1):426. doi: 10.1186/s12905-021-01575-z
25. Chowdhury S, Ara R, Roy S, Tanvir SMS, Eva FN, Neela TM, et al. Knowledge, attitude, and practices regarding human papillomavirus and its' vaccination among the young medical professionals and students of Bangladesh. Clin Exp Vaccine Res. 2022;11(1):63-71. doi: 10.7774/cevr.2022.11.1.63
26. Adejuyigbe FF, Balogun MR, Sekoni AO, Adegbola AA. Cervical cancer and human papilloma virus knowledge and acceptance of vaccination among medical students in Southwest Nigeria. Afr J Reprod Health. 2015;19(1):140-8.
27. Ali AN, Kar Mun L, Prajapati SK, Iqbal MZ, Ahmed NZ. Cervical cancer, its screening and vaccination: a KAP study among female healthcare students in a private university, Malaysia. MOJ Bioequivalence & Bioavailability. 2018;5(5):275-82.
28. Almazrou S, Saddik B, Jradi H. Knowledge, attitudes, and practices of Saudi physicians regarding cervical cancer and the human papilloma virus vaccine. J Infect Public Health. 2020;13(4):584-90. doi: 10.1016/j.jiph.2019.09.002
29. Mohamed ML, Tawfik AM, Mohammed GF, Elotla SF. Knowledge, attitude, and practice of cervical cancer screening, and HPV vaccination: a cross-sectional study among obstetricians and gynecologists in Egypt. Matern Child Health J. 2022;26(3):565-74. doi: 10.1007/s10995-021-03352-8
30. Qayum MO, Hassan MR, Henderson A, Billah MM, Nurunnahar M, Afser S, et al. Knowledge, attitude and practice of commercial sex workers regarding cervical cancer and its screening, Daulatdia brothel, Rajbari district, Bangladesh, 2020-2021. Asian Pac J Cancer Prev. 2022;23(12):4085-92. doi: 10.31557/apjcp.2022.23.12.4085
31. Rahman SH. Awareness of Bangladeshi women about a preventable cancer. Cancer J Bangladesh. 2023;4(1):1-2.
32. Taniya SA. Awareness of Cervical Cancer Vaccination Among Educated Females: A Bangladeshi Perspective [dissertation]. Dhaka: BRAC University; 2021.
33. Swarnapriya K, Kavitha D, Reddy GM. Knowledge, attitude and practices regarding HPV vaccination among medical and para medical in students, India a cross sectional study. Asian Pac J Cancer Prev. 2015;16(18):8473-7. doi: 10.7314/apjcp.2015.16.18.8473
34. Winarto H, Habiburrahman M, Dorothea M, Wijaya A, Nuryanto KH, Kusuma F, et al. Knowledge, attitudes, and practices among Indonesian urban communities regarding HPV infection, cervical cancer, and HPV vaccination. PLoS One. 2022;17(5):e0266139. doi: 10.1371/journal.pone.0266139
35. Okunade KS. Human papillomavirus and cervical cancer. J Obstet Gynaecol. 2020;40(5):602-8. doi: 10.1080/01443615.2019.1634030
36. Canavan TP, Doshi NR. Cervical cancer. Am Fam Physician. 2000;61(5):1369-76.
37. Manso L, Ramchandani-Vaswani A, Romero I, Sánchez-Lorenzo L, Bermejo-Pérez MJ, Estévez-García P, et al. SEOM-GEICO Clinical Guidelines on cervical cancer (2023). Clin Transl Oncol. 2024;26(11):2771-82. doi: 10.1007/s12094-024-03604-3
38. Bray F, Ferlay J, Soerjomataram I, Siegel RL, Torre LA, Jemal A. Global cancer statistics 2018: GLOBOCAN estimates of incidence and mortality worldwide for 36 cancers in 185 countries. CA Cancer J Clin. 2018;68(6):394-424. doi: 10.3322/caac.21492
39. Alam NE, Islam MS, Rayyan F, Ifa HN, Khabir MI, Chowdhury K, et al. Lack of knowledge is the leading key for the growing cervical cancer incidents in Bangladesh: a population based, cross-sectional study. PLOS Glob Public Health. 2022;2(1):e0000149. doi: 10.1371/journal.pgph.0000149
40. Islam MF, Nessa A, Zaki QA, Akbar Ashrafi SA, Qayum MO, Hassan MR, et al. Evaluation of the National cervical cancer surveillance program in Bangladesh: performance, strengths, and opportunities for improvement. PLOS Glob Public Health. 2025;5(5):e0004595. doi: 10.1371/journal.pgph.0004595

41. Uddin A, Sumon MA, Pervin S, Sharmin F. Cervical cancer in Bangladesh. South Asian J Cancer. 2023;12(1):36-8. doi: 10.1055/s-0043-1764202
42. Fontham ETH, Wolf AM, Church TR, Etzioni R, Flowers CR, Herzig A, et al. Cervical cancer screening for individuals at average risk: 2020 guideline update from the American Cancer Society. CA Cancer J Clin. 2020;70(5):321-46. doi: 10.3322/caac.21628
43. Tippins A, Mutamba G, Boyd EM, Coy KC, Kriss JL. Human papillomavirus vaccination coverage among adolescent girls aged 13-17 years - US-Affiliated Pacific Islands, 2013-2023. MMWR Morb Mortal Wkly Rep. 2024;73(33):715-21. doi: 10.15585/mmwr.mm7333a2