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Cervical Cancer, HPV, and HPV Vaccine Knowledge and Willingness to be Vaccinated Among Adolescent Girls in Dhaka, Bangladesh: A Cross-Sectional Study

Rezaul Karim Ripon[1] | Md Jamil Hossain[2] | Narayana G. Prasad[3] | Nachiket Thakkar[4] | Edima Ottoho[5] | Shishir Gokhale[6] | Saloni Munot[7] | Mayra Volquez[8] | Priyanka Manghani[9] | Robert Paulino-Ramírez[10] | Modesto Cruz[11] | Sujata Saunik[1] | Piyusha Majumdar[12] | Elizabeth Meda-Monzon[13]

[1]Harvard T H Chan School of Public Health, Boston, Massachusetts, USA | [2]Jahangirnagar University, Dhaka, Bangladesh | [3]Harvard Medical School, Boston, Massachusetts, USA | [4]Northeastern University, Boston, Massachusetts, USA | [5]Boston University, Boston, Massachusetts, USA | [6]Manipal College of Medical Sciences, Kaski, Nepal | [7]Sarathi Healthcare, Jodhpur, India | [8]Public Health Literacy/UT Southwestern, Dallas, Texas, USA | [9]California Rural Indian Health Board, Roseville, California, USA | [10]Universidad Iberoamericana, Santo Domingo, Dominican Republic | [11]University Autonoma Santo Domingo, Santo Domingo, Dominican Republic | [12]IIHMR University, Jaipur, India | [13]Pharmamanagement EAS De RL, Mexico City, Mexico

Correspondence: Md Jamil Hossain (jamilphi49@gmail.com)

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ABSTRACT

Background: The Bangladesh government took an important step towards preventing cervical cancer by initiating a widespread HPV vaccination campaign directed at girls aged 10 to 14. The campaign aims to reach 10 million girls in three phases. Assessing knowledge about HPV and cervical cancer and willingness to get vaccinated is essential for government success.

Objective: This study examines Bangladeshi girls' knowledge about human papillomavirus (HPV), cervical cancer, and their willingness to receive the HPV vaccine, providing information needed to improve vaccination strategies and programs.

Methods: We used a communitybased cross-sectional survey of 416 girls aged 10 to 15 years to assess their knowledge of cervical cancer, vaccination against HPV, and factors influencing their willingness to vaccinate. Parental consent was obtained from all participants before data collection, ensuring ethical compliance for the study. Logistic regression models and descriptive statistics were used to find significant predictors of vaccine uptake.

Results: The study's findings highlighted that awareness levels regarding cervical cancer and HPV vaccination were low among Bangladeshi girls. Among participants, only 23% identified HPV as the primary cause of cervical cancer. Overall, 45% of the girls expressed a willingness to receive the HPV vaccine. This willingness was significantly associated with discussions with their mothers (aOR = 6.64, 95% CI: 2.65–22.3, $p < 0.001$) and living in urban areas (aOR = 0.13, 95% CI: 0.04–0.32, $p < 0.001$). Participants who had heard about the HPV vaccination had 2.28 times the odds of being willing to receive the HPV vaccine (aOR: 2.28, 95% CI: 1.27–4.29, $p = 0.007$).

Conclusion: Despite moderate willingness to vaccinate, substantial knowledge gaps remain among Bangladeshi girls. This study highlights the necessity for comprehensive education and awareness programs. These conversations with mothers and healthcare providers can significantly increase vaccine acceptance, emphasizing the critical role of targeted communication in the success of vaccination campaigns.

Abbreviations: aOR, Adjusted Odds Ratio; CI, Confidence Interval; EPI, Expanded Program on Immunization; HIV, Human immunodeficiency virus; HPV, Human papillomavirus; VIA, Visual inspection with acetic acid.

1 | Introduction

Cervical cancer is the fourth most common cancer in women worldwide, and the highest rates of cervical cancer incidence and mortality are found in developing countries [1]. It has become a global public health threat that differs significantly between developed and developing countries [2]. In Bangladesh, cervical cancer is the second most prevalent cancer among women, accounting for an estimated 12,000 new cases and over 6,000 deaths annually [3].

Human papillomavirus (HPV) is considered the most widespread sexually transmitted infection globally [4], responsible for approximately 90% of cervical cancer cases [5]. Among the genotypes, HPV-16 and HPV-18 are responsible for around 70%–80% of cases [6]. HPV-16 is the most prevalent high-risk HPV genotype found in Bangladeshi women [7]. Epidemiological studies reported that sexually active women are 80% more vulnerable to being infected by HPV [8], with age playing a critical role in HPV infection [9]. Additionally, women with HIV positive have a higher chance of developing cervical cancer and getting infected by HPV at a younger age (13–18 years) [10]. Furthermore, women who get married at an early age are more likely to have multiple pregnancies, which can cause cervical tissue injury and increase their risk of getting infected [11]. Similarly, the women who had early sexual experience, having multiple sexual partners, having a weakened immune system, and smoking are more vulnerable to infection [12].

Cervical cancer can be avoided with appropriate screening and HPV vaccination [1]. In Bangladesh, a nationwide cervical cancer screening program known as visual inspection with acetic acid (VIA) was launched in 2004 [13]. The main obstacle to Bangladeshi women's willingness to receive screenings is a lack of awareness and information about cervical cancer and the screening [14]. The vaccination program was launched in 2006 to reduce the mortality and morbidity from HPV infection [15]. However, the HPV vaccination was first made available in Bangladesh in 2016 under the Ministry of Health and Family Welfare [16]. Swedish research showed that the girls who were immunized before the age of 17 had an 88% reduced chance of developing cervical cancer compared to girls who were not vaccinated [17].

In contrast, the acceptability of the HPV vaccination among Bangladeshi women remains relatively low [18, 19]. The biggest challenge to HPV vaccination in Bangladesh is probably ignorance and lack of information about cervical cancer [18–20]. Previous research revealed that the media was the key source of information about cervical cancer [21]. About 95% of women in underdeveloped nations had never been for cervical cancer screening [22]. However, awareness was associated with the increasing willingness to vaccinate one's children [23]. According to a study conducted in Brazil, less than 10% of women knew the causes and prevention of cervical cancer [24]. In the United States, the mortality rate from cervical cancer has fallen to 50% during the previous four decades due to an increase in the use of Pap tests [25]. A Bangladeshi study showed that women who had a lack of awareness about cervical cancer had a strong desire to get HPV vaccines [19].

Vaccination plays a crucial role in preventing infectious diseases and premature death. However, vaccine hesitancy has become a significant barrier to the successful implementation of vaccination programs [26, 27]. Vaccine hesitancy can be influenced by various factors, including social media, beliefs in natural immunity, and past vaccine experiences [26]. Studies show that vaccine hesitancy significantly impacts vaccination intentions and uptake, leading to lower coverage [28, 29]. In our literature search, we found minimal evidence about the knowledge regarding cervical cancer and HPV vaccination. While numerous studies have examined cervical cancer and HPV vaccination globally, no previous study has been found on the willingness to get the HPV vaccine among Bangladeshi girls. Moreover, the Bangladesh government's target is to vaccinate over 10 million girls [30]. In 2023, the Bangladesh government launched an HPV vaccination program for girls aged 10 to 14 years across the country [31]. Since this is a newly launched campaign in our country, there is no reliable evidence on girls' attitudes and willingness to get vaccinated. However, this information is crucial for implementing an appropriate vaccination program. Therefore, the aim of this study is to examine Bangladeshi girls' knowledge of HPV and cervical cancer and their willingness to receive the HPV vaccine. Moreover, these findings will help policymakers and the government identify the challenges of lack of awareness among girls, and they will also help improve HPV vaccination strategies and programs.

2 | Methods

2.1 | Study Settings and Participants

A cross-sectional study was conducted from February to March 2024 in selected urban and rural areas of Savar Upazila, Dhaka, Bangladesh. The study focused on high school girls aged 10 to 15 years. This age group was chosen because girls in this stage are at a higher risk of developing cervical cancer, and the Bangladesh government has initiated HPV vaccination for girls in this age range.

2.2 | Eligibility Criteria

The study included girls from urban and rural communities who had resided in the area for at least 6 months prior to the survey. Participants were eligible if they were available during data collection, willing to participate, and provided parental consent. Parental consent was obtained from all participants before data collection, ensuring ethical compliance and the involvement of guardians in the study process. If multiple eligible participants lived in the same household, one was randomly selected.

2.3 | Sample Size Determination

The following equations were used for calculating sample size:

$$n = \frac{z^2 pq}{d^2}; \quad n = \frac{1.96^2 \times 0.5 \times (1 - 0.5)}{0.05^2} \approx 384$$

where, z = 1.96 at 5% level of significance.

d = 0.05 (5% acceptable margin of error)

$p = 0.5$ (sample proportion assumed for maximum sample size)

$q = 1 - p = 0.5$

Therefore, the minimum required sample size calculated for this study was 384. Moreover, this study recruited 416 participants to strengthen the study.

2.4 | Sampling Technique

A non-probability sampling (convenience sampling) technique was used to select the participants. The sample size was adjusted to ensure broad appeal, with a minimum of 416 respondents estimated, accounting for a 10% non-response rate.

2.5 | Data Collection Tools and Procedure

A semi-structured questionnaire was developed for this study, based on a brief literature review of prior research [19, 20, 32–34]. The questionnaire comprised three sections: the first covered socio-demographic information, the second focused on awareness and knowledge of cervical cancer and screening; and the third explored participants' willingness to receive the HPV vaccine and their personal/family health history. Initially, the questionnaire was prepared in English; it was then translated into Bangla and back-translated into English by an independent translator to ensure accuracy and validity. Data were collected in Bangla, the native language of Bangladesh, through face-to-face interviews lasting an average of 10–15 min.

Experienced female interviewers with expertise in community-based surveys conducted the interviews. A 5-day training program was arranged to train the interviewers. Before each interview, the study's objectives, procedures, and confidentiality measures were thoroughly explained to participants and their parents, ensuring that all information would be used solely for research purposes. Participants were also informed of their right to withdraw from the study at any time without consequence. After agreeing to participate, written informed consent was obtained from both parents and participants. All methods adhered to relevant guidelines and regulations.

2.6 | Pretesting

A pilot test was conducted on 32 participants to refine the questionnaire before the main data collection. The pretest aimed to evaluate the clarity, comprehension, and relevance of the questions, ensuring that participants could easily understand and respond to them. Feedback from the pretest was used to make necessary adjustments to the wording and structure of the questionnaire, enhancing its overall reliability and validity. Pretesting data were not included in the final data set.

2.7 | Measure

2.7.1 | Socio-Demographic Information

The socio-demographic section of the questionnaire collected information on participants' age, which was categorized into three groups: 10–11 years, 12–13 years, and 14–15 years. The residence was classified as rural or urban. Educational status was recorded by grade level: Grade 6, Grade 7, Grade 8, and Grade 9. Parental education was assessed for both the father and mother and categorized as uneducated, secondary, higher secondary, and honors or higher.

2.7.2 | Awareness and Knowledge of Cervical Cancer and Screening

The second section of the questionnaire focused on assessing participants' awareness and knowledge of cervical cancer and its screening methods [19, 20, 32]. Participants were asked whether they knew what actions to take if they detected any cervical health issues. Questions covered knowledge of cervical cancer, including whether they had received any training on cervical cancer examination, whether they knew that only females are affected by cervical cancer, and whether they believed it could be transmitted from person to person. Additional questions addressed the most common age group at risk for cervical cancer, the primary cause of cervical cancer, and the transmission routes of HPV. Participants were also asked about the most effective methods of preventing HPV infection and the optimal age or time to receive the HPV vaccine. To assess sources of information, participants were asked to indicate where they had learned about cervical cancer and HPV, with options including books, doctors or healthcare staff, magazines, mass media, and newspapers.

2.7.3 | Willingness to Receive the HPV Vaccine and Personal/Family Health History

The third section of the questionnaire explored participants' willingness to receive the HPV vaccine and their personal and family health history. Questions assessed whether participants had heard about the HPV vaccination and the Pap test, and whether they had discussed cervical cancer or the HPV vaccine with their mother or friends. Additionally, participants were asked about their familiarity with cervical cancer symptoms and prevention methods, as well as whether they had received the HPV vaccination. Personal and family medical histories were examined by asking whether the participant or a first-degree relative had ever been diagnosed with cervical or uterine cancer and whether there was a history of cervical cancer examination training. Participants were also asked about their perceived need for a training program on proper cervical cancer examination and whether they had a history of sexual activity or cervical cancer diagnosis. These questions aimed to understand the knowledge and health backgrounds that influencince participants' willingness to get vaccinated. This section was designed by following the previous study [33, 34].

2.8 | Data Analysis

Data entry was done using Microsoft Excel and R programming was used for all statistical analysis. Descriptive statistics, including frequency distributions, were used for demographic variables, awareness of cervical cancer, reasons for not being screened, knowledge of symptoms, risk factors, and preventive measures, as well as willingness to receive the

HPV vaccine and reasons for unwillingness. The chi-square test was used to determine significance at a 5% level. Multivariable logistic regression analysis was conducted to assess associations between outcome variables and socio-demographic factors. Multicollinearity among predictors was assessed using variance inflation factors (VIF < 5) and tolerance statistics for all predictors. Model fit was assessed using the Hosmer–Lemeshow goodness-of-fit test, which indicated good fit ($p > 0.05$). Sample adequacy was assessed using the events-per-variable (EPV > 12), indicating sufficient statistical power. Results are reported as adjusted odds ratios (aOR) with 95% confidence intervals. The Cronbach's alpha of 0.786 indicates good internal consistency for the whole questionnaire, which assessed knowledge, willingness, and personal health history.

2.9 | Ethical Statement

Formal ethical approval for this study was obtained from the Biosafety, Biosecurity, and Ethical Review Board of Jahangirnagar University, Savar, Dhaka-1342, Bangladesh (Ref No: BBEC, JU/M/2023(4)1). Informed consent was taken from both participants and their parents. Before conducting the survey, all participants were clearly informed about the purpose of the study, their voluntary participation rights, and the confidentiality of their responses.

3 | Result

3.1 | Demographic Characteristics of the Participants

Out of 416 participants, most participants in the age group were between 10 and 11 years old (49%), and mostly lived in urban areas (70%). Participants' education varied across grades, most commonly Grade 6 (37%). Moreover, most of the participants' fathers and mothers' educational status was uneducated, 52% and 66%, respectively Table 1.

3.2 | Knowledge and Awareness of Cervical Cancer and HPV

Regarding the leading cause of cervical cancer, most participants (44%) do not know the reason, whereas only 23% of the participants correctly reported that it was caused by HPV transmission. However, only a minority received cervical cancer examination training (7.7%), and a higher number of participants (55%) correctly identified the transmission route of HPV. HPV vaccination was recognized as the most effective preventive measure (44%), yet a significant portion remained uncertain about vaccination timing (39%). Large participants (39%) didn't know the vaccination age Table 1. Furthermore, information sources about cervical cancer and HPV varied, with doctors/healthcare staff being a common source (65%). Additionally, 69% of the respondents never knew about Pap smear tests, and 49% of the respondents were not familiar with the symptoms of cervical cancer. Notably, a majority had not received the HPV vaccination (90%), while only 13% of the participants had a family history of cervical cancer Table 1.

3.3 | Predictors of HPV Vaccine Willingness

Participants aged 10–11 and 12–13 were more willing to be vaccinated, 50% and 43% respectively, compared to those aged 14–15 (6.8%). Similarly, the participants in urban areas showed higher willingness (66%) than rural residents (34%). Regarding higher education, the participants in Grade 6 and Grade 8 demonstrated higher willingness, 39% and 35%, respectively, compared to other grade students. Most of the participants whose fathers and mothers were uneducated showed a higher willingness to get vaccinated, 52% and 65%, respectively. The participants who knew how to seek medical help immediately upon detecting cervical problems exhibited a higher willingness (82%) Table 2.

The descriptive plot shows that younger age, rural residence, and lower parental education are associated with a higher willingness to receive the HPV vaccine Figure 1. The forest plot illustrates that several factors, such as education, awareness, discussions about cervical cancer, and medical beliefs, are associated with a significantly higher willingness to receive the HPV vaccine. Conversely, urban residency and misconceptions about cervical cancer transmission decrease the likelihood of willingness. All variables shown in this plot have statistically significant associations with HPV vaccine willingness, as their CIs do not cross the null value Figure 2.

3.4 | Factors Associated With Willingness to HPV Vaccine ($p < 0.05$)

Urban residents had significantly lower odds of being willing to receive the HPV vaccine compared to rural residents (aOR: 0.13, 95% CI: 0.04–0.32). In terms of cervical cancer knowledge, participants who knew to seek medical help immediately upon detecting cervical problems had 3.50 times the odds of willingness to get vaccinated (aOR: 3.50, 95% CI: 1.98–6.15), while those who believed that only females are affected by cervical cancer had 1.50 times the odds of willingness (aOR: 1.50, 95% CI: 1.08–2.11) compared to those unsure about these facts. In contrast, participants who believed cervical cancer could be transmitted from person to person had lower odds of willingness to get vaccinated (aOR: 0.54, 95% CI: 0.41–0.72) Table 3.

Participants who had heard about the HPV vaccination had 2.28 times the odds of being willing to receive the HPV vaccine (aOR: 2.28, 95% CI: 1.27–4.29) compared to those who had not heard about it. Similarly, participants who were aware of the Pap test had 2.13 times the odds of willingness to get vaccinated (aOR: 2.13, 95% CI: 1.13–4.32). Likewise, participants who felt the need for a training program in cervical cancer examination had 6.21 times the odds of being willing to receive the vaccine (aOR: 6.21, 95% CI: 3.16–12.2). Additionally, having a positive family history of uterine cancer significantly increased the odds of willingness to receive the HPV vaccine by 3.59 times (aOR: 3.59, 95% CI: 1.42–12.1) Table 3.

4 | Discussion

In this study, we evaluated the level of knowledge about cervical cancer, vaccination against HPV, and factors

TABLE 1 | Sociodemographic Characteristics and Awareness of Cervical Cancer and HPV.

Variable	Characteristic	$N = 416^1$
Age (in years)	10–11	204 (49%)
	12–13	184 (44%)
	14–15	28 (6.7%)
Residence	Rural	124 (30%)
	Urban	292 (70%)
Educational status	Grade 6	152 (37%)
	Grade 7	88 (21%)
	Grade 8	152 (37%)
	Grade 9	24 (5.8%)
Father educational	Uneducated	216 (52%)
	Secondary	32 (7.7%)
	Higher Secondary	68 (16%)
	Honors or higher	100 (24%)
Mother education	Uneducated	276 (66%)
	Secondary	64 (15%)
	Higher Secondary	36 (8.7%)
	Honors or higher	40 (9.6%)
Knowledge of action if a cervical health problem is detected	Not sure	92 (22%)
	Seek medical help immediately	324 (78%)
Knowledge that cervical cancer affects only females	No	116 (28%)
	Yes	144 (35%)
	Do not know	156 (38%)
Knowledge that cervical cancer is transmissible from person to person	No	308 (74%)
	Yes	8 (1.9%)
	Do not know	100 (24%)
The most common age group at risk for cervical cancer is	10–19 years	4 (1.0%)
	20–29 years	60 (14%)
	30–39 years	148 (36%)
	40 years	36 (8.7%)
	No response	168 (40%)
The main cause of cervical cancer	Bacterial infection	52 (13%)
	Genetic factors	28 (6.7%)
	HPV infection	96 (23%)
	Lifestyle factors	24 (5.8%)
	Poor hygiene habits	24 (5.8%)
	Too many sexual partners	8 (1.9%)
	Unknown	184 (44%)
The transmission route of HPV	Air transmission	16 (3.8%)
	All the above	156 (38%)
	Food transmission	16 (3.8%)
	Sexual transmission	228 (55%)
The most effective method of preventing HPV infection	Avoid multiple sexual partners	36 (8.7%)
	HPV vaccination	184 (44%)
	Unknown	176 (42%)
	Use of condom	20 (4.8%)
The best time or age to get vaccinated	Any time	68 (16%)

(Continues)

TABLE 1 | (Continued)

Variable	Characteristic	$N = 416^1$
	College and above	64 (15%)
	Junior middle school	20 (4.8%)
	Primary school	12 (2.9%)
	Senior middle school	44 (11%)
	Unknown	164 (39%)
	Vaccinate immediately after birth	44 (11%)
Sources books	No	332 (80%)
	Yes	84 (20%)
Sources doctor/healthcare staff	No	144 (35%)
	Yes	272 (65%)
Sources magazines	No	324 (78%)
	Yes	92 (22%)
Sources mass media	No	228 (55%)
	Yes	188 (45%)
Sources newspapers	No	352 (85%)
	Yes	64 (15%)
Willing to be vaccinated against HPV	No	187 (45%)
	Yes	229 (55%)
You heard about the HPV vaccination	No	248 (60%)
	Yes	168 (40%)
Heard about the Pap test	No	288 (69%)
	Yes	128 (31%)
Talked about cervical cancer with your mother	No	304 (73%)
	Yes	112 (27%)
Talked about cervical cancer and vaccine with your friends	No	296 (71%)
	Yes	120 (29%)
Familiar with the symptoms of cervical cancer?	No	204 (49%)
	Yes	212 (51%)
Know about cervical cancer prevention	No	308 (74%)
	Yes	108 (26%)
Received the HPV vaccination	No	376 (90.4%)
	Yes	40 (9.6%)
Now, or have you ever had; a first-degree relative who has been diagnosed with cervical cancer	No	368 (88%)
	Yes	48 (12%)
Ever been diagnosed with cervical cancer issue	No	368 (88%)
	Yes	48 (12%)
Feeling the need for a training program in proper cervical cancer-examination	No	44 (11%)
	Yes	372 (89%)
A history of uterine cancer	No	400 (96.2%)
	Yes	16 (3.8%)
A positive family history of uterine	No	344 (83%)
	Yes	72 (17%)
Cervical cancer examination training history	No	384 (92.3%)
	Yes	32 (7.7%)
Positive family history of cervical cancer	No	360 (87%)
	Yes	56 (13%)

(Continues)

TABLE 1 | (Continued)

Variable	Characteristic	$N = 416^1$
Sexual Activities history	No	372 (89%)
	Yes	44 (11%)
History of cervical cancer	No	340 (82%)
	Yes	76 (18%)
	^1n (%)	

influencing the willingness to be vaccinated among Bangladeshi girls. In our literature search, this is the first study among Bangladeshi girls aged between 10 and 15 years. The finding revealed that willingness to receive the HPV vaccine was significantly associated with factors such as urban residence, maternal education, knowledge about cervical health, awareness about cervical cancer, information sources, communication about cervical health, perception of the need for training, and family history.

According to Bangladesh Education Statistics, Bangladesh is a developing country with more than 10 million students enrolled in secondary-level education, where 54.67% were girls [35]. Initially, to lower the risk of cervical cancer in women in the future, the HPV vaccination was first attached to the Expanded Program on Immunization (EPI) and made mandatory for school-age girls [16]. However, the vaccination program's launch and execution brought up several ethical issues. Many of them neglect the vaccination program because of their lack of awareness about cervical cancer, social stigma, poor knowledge about HPV vaccination, and lack of information sources [16]. This study revealed that only 23% of the participants correctly identified HPV as the primary cause of cervical cancer. These indicated inferior knowledge among the participants. A previous study in Bangladesh reported that (73.4%) of university students identified HPV as causing cervical cancer [36]. In South Africa and Iraq, about 49% and 37% of the participants were aware that HPV is the primary cause of cervical cancer [37, 38]. In contrast, a study on Brazil showed that only 19% of the paricipants were aware that HPV can cause cervical cancer [39]. This dissimilarity of our research may be due to our participants' educational level and age.

Cultural norms in Bangladesh significantly contribute to the low awareness of cervical cancer and HPV vaccination among adolescent girls. In Bangladesh, mothers often serve as the primary source of SRH information to girls due to shared gender norms and culturally restricted mobility [37]. However, many mothers are reluctant to discuss sexual health topics with their daughters because of traditional cultural values and religious beliefs, limiting communication to socially acceptable subjects [40, 41]. These constraints, combined with widespread social stigma and misconceptions that associate HPV vaccination with inappropriate sexual behavior, further suppress public awareness [42]. Such perceptions may discourage parents from vaccinating their daughters, particularly in rural communities where misinformation and stigma surrounding sexually transmitted infections are more pronounced [42]. These factors underscore the urgent need for culturally sensitive educational interventions and strengthened parent–daughter communication to improve awareness and acceptance of HPV vaccination.

Our findings illustrate that 44% of participants recognized that HPV vaccination was the most effective preventive measure to prevent cervical cancer [40]. A study reported that over 25% of the respondents believed that HPV vaccination may stop cervical cancer [41]. It also found that 24% of the participants in the slum area agreed that HPV vaccines give protection against cervical cancer. The findings of these two studies remained low because most participants had limited educational backgrounds and were more than 35 years old. Our findings also illustrate that 55% of the participants were Willing to be vaccinated against HPV [32]. A study reported that 76.6% of respondents expressed a willingness to be vaccinated. Another study on Bangladeshi urban and rural women found that willingness to receive the HPV vaccine was both higher in urban (93.9%) and rural areas (99.4%) [19]. Our lower figures may be due to the lower age of the participants and their limited knowledge about cervical cancer and HPV compared to others. Higher educational status has increased the willingness to get vaccines [32]. Previous studies in China showed that the respondent's willingness to get vaccinated was 53.5% [42]. A study among Greek adults revealed that 66% of respondents expressed willingness to get the HPV vaccine [43]. Older people have expressed a higher willingness to be vaccinated than younger women [42]. In our study, the targeted participants were younger and had limited knowledge about the vaccination program, reducing their willingness to be vaccinated. School-based health education programs should be run to make people aware of and enrich their understanding of cervical cancer and vaccination to increase their willingness to be vaccinated.

Regarding accessed information about cervical cancer, 65% of the participants get it through health care providers. A previous study [32] reported that 35.3% of the respondents got that information through healthcare providers. In urban areas, there is a greater scope to meet the health care providers more frequently than in village areas. Most of our respondents were from urban areas, whereas in another study, most were from rural areas. The findings showed that urban residency emerged as a strong predictor of vaccine acceptance. A similar result was found in a Chinese study that students in urban settings expressed a higher willingness to get vaccines [44]. Urban residents had higher knowledge about cervical cancer [45].

TABLE 2 | Bivariate analysis of willingness to HPV Vaccine and other predictors.

Variable	Characteristic	Willing to be vaccinated against HPV		*p* value
		No	Yes	
Age (in years)	10–11	28 (44%)	176 (50%)	0.324
	12–13	32 (50%)	152 (43%)	
	14–15	4 (6.3%)	24 (6.8%)	
Residence	Rural	4 (6.3%)	120 (34%)	< 0.001
	Urban	60 (94%)	232 (66%)	
Educational status	Grade 6	16 (25%)	136 (39%)	0.044
	Grade 7	16 (25%)	72 (20%)	
	Grade 8	28 (44%)	124 (35%)	
	Grade 9	4 (6.3%)	20 (5.7%)	
Father educational	Uneducated	32 (50%)	184 (52%)	
	Secondary	4 (6.3%)	28 (8.0%)	
	Higher Secondary	8 (13%)	60 (17%)	
	Honors or higher	20 (31%)	80 (23%)	
Mother education	Uneducated	48 (75%)	228 (65%)	0.027
	Secondary	4 (6.3%)	60 (17%)	
	Higher Secondary	4 (6.3%)	32 (9.1%)	
	Honors or higher	8 (13%)	32 (9.1%)	
Knowledge of action if a cervical health problem is detected	Not sure	28 (44%)	64 (18%)	< 0.001
	Seek medical help immediately	36 (56%)	288 (82%)	
Knowledge that cervical cancer affects only females	No	24 (38%)	92 (26%)	0.001
	Yes	24 (38%)	120 (34%)	
	Do not know	16 (25%)	140 (40%)	
Knowledge that cervical cancer is transmissible from person to person	No	32 (50%)	276 (78%)	< 0.001
	Yes	4 (6.3%)	4 (1.1%)	
	Do not know	28 (44%)	72 (20%)	
The most common age group at risk for cervical cancer is	10–19 years	4 (6.3%)	0 (0%)	0.432
	20–29 years	20 (31%)	40 (11%)	
	30–39 years	4 (6.3%)	144 (41%)	
	40 years	8 (13%)	28 (8.0%)	
	No response	28 (44%)	140 (40%)	
The main cause of cervical cancer	Bacterial infection	8 (13%)	44 (13%)	0.123
	Genetic factors	0 (0%)	28 (8.0%)	
	HPV infection	16 (25%)	80 (23%)	
	Lifestyle factors	4 (6.3%)	20 (5.7%)	
	Poor hygiene habits	4 (6.3%)	20 (5.7%)	
	Too many sexual partners	0 (0%)	8 (2.3%)	
	Unknown	32 (50%)	152 (43%)	
The transmission route of HPV	Air transmission	4 (6.3%)	12 (3.4%)	0.312
	All of the above	32 (50%)	124 (35%)	
	Food transmission	4 (6.3%)	12 (3.4%)	
	Sexual transmission	24 (38%)	204 (58%)	
The most effective method of preventing HPV infection	Avoid multiple sexual partners	12 (19%)	24 (6.8%)	0.754
	HPV vaccination	20 (31%)	164 (47%)	

(Continues)

TABLE 2 | (Continued)

Variable	Characteristic	Willing to be vaccinated against HPV		*p* value
		No	Yes	
	Unknown	28 (44%)	148 (42%)	
	Use of condom	4 (6.3%)	16 (4.5%)	
The best time or age to get vaccinated	Any time	0 (0%)	68 (19%)	0.601
	College and above	12 (19%)	52 (15%)	
	Junior middle school	4 (6.3%)	16 (4.5%)	
	Primary school	4 (6.3%)	8 (2.3%)	
	Senior middle school	0 (0%)	44 (13%)	
	Unknown	28 (44%)	136 (39%)	
	Vaccinate immediately after birth	16 (25%)	28 (8.0%)	
Sources books	No	48 (75%)	284 (81%)	0.710
	Yes	16 (25%)	68 (19%)	
Sources doctor/healthcare staff	No	28 (44%)	116 (33%)	0.314
	Yes	36 (56%)	236 (67%)	
Sources magazines	No	56 (87.5%)	324 (92.0%)	0.231
	Yes	8 (12.5%)	28 (8.0%)	
Sources mass media	No	40 (63%)	188 (53%)	0.523
	Yes	24 (38%)	164 (47%)	
Sources newspapers	No	52 (81%)	300 (85%)	0.231
	Yes	12 (19%)	52 (15%)	
You heard about the HPV vaccination	No	48 (75%)	200 (57%)	0.006
	Yes	16 (25%)	152 (43%)	
Heard about the Pap test	No	52 (81%)	236 (67%)	0.001
	Yes	12 (19%)	116 (33%)	
Talked about cervical cancer with your mother	No	60 (94%)	244 (69%)	0.001
	Yes	4 (6.3%)	108 (31%)	
Talked about cervical cancer and vaccine with your friends	No	48 (75%)	248 (70%)	0.349
	Yes	16 (25%)	104 (30%)	
Familiar with the symptoms of cervical cancer	No	32 (50%)	172 (49%)	0.564
	Yes	32 (50%)	180 (51%)	
Know about cervical cancer prevention	No	44 (69%)	264 (75%)	0.452
	Yes	20 (31%)	88 (25%)	
Received the HPV vaccination	No	60 (94%)	316 (90%)	0.331
	Yes	4 (6.3%)	36 (10%)	
Now, or have you ever had; a first-degree relative who has been diagnosed with cervical cancer	No	60 (94%)	308 (88%)	0.782
	Yes	4 (6.3%)	44 (13%)	
Ever been diagnosed with cervical cancer issue	No	60 (94%)	308 (88%)	0.705
	Yes	4 (6.3%)	44 (13%)	
Feeling the need for a training program in proper cervical cancer-examination	No	20 (31%)	24 (6.8%)	0.213
	Yes	44 (69%)	328 (93%)	
A history of uterine cancer	No	60 (94%)	340 (97%)	
	Yes	4 (6.3%)	12 (3.4%)	< 0.001
A positive family history of uterine	No	60 (94%)	284 (81%)	0.614
	Yes	4 (6.3%)	68 (19%)	

(Continues)

TABLE 2 | (Continued)

Variable	Characteristic	Willing to be vaccinated against HPV		*p* value
		No	Yes	
Cervical cancer examination training history	No	60 (94%)	324 (92%)	< 0.001
	Yes	4 (6.3%)	28 (8.0%)	
Positive family history of cervical cancer	No	52 (81%)	308 (88%)	0.553
	Yes	12 (19%)	44 (13%)	
Sexual activities history	No	56 (88%)	316 (90%)	0.788
	Yes	8 (13%)	36 (10%)	
History of cervical cancer	No	56 (88%)	284 (81%)	0.049
	Yes	8 (13%)	68 (19%)	

FIGURE 1 | Descriptive plot to willingness to receive HPV vaccine.

Furthermore, a limited portion (31%) of the respondents never knew about Pap smear tests [46]. The study reported that only 8.7% of women were aware of Pap smear tests. Another study in a medical college reported that 22.44% of the participants knew about this test [47]. In Pakistan, a similar result showed that 34.2% of individuals were know about Pap smear tests [48]. However, it has been found screening tests can significantly reduce the rate of cervical cancer as well as the death case [49]. It can reduce the chance of cervical cancer by almost 80% [50]. So, screening tests need to be more available across the country to reduce cervical cancer. A limited portion of girls (9.6%) had been

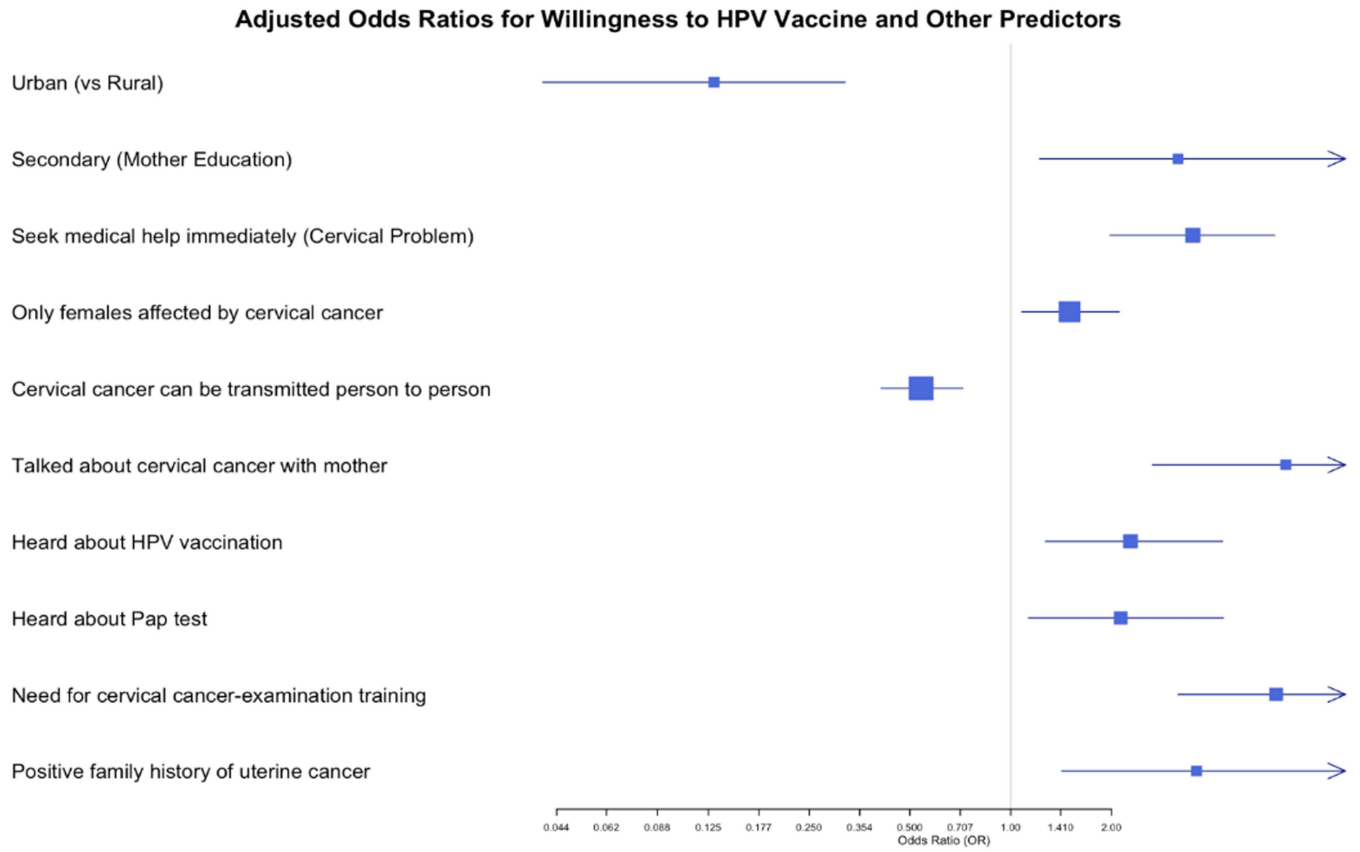

FIGURE 2 | Forest plot for willingness to receive HPV vaccine.

receiving the HPV vaccine [32]. A study found the similarity that 5.3% women got at least their first dose of the HPV vaccine. In Ethiopia, only 2% of the participants had taken a vaccine to prevent cervical cancer [51]. In India, the HPV vaccination prevalence among adolescents was about 5% [52]. A study on Chinese college students found similar findings, with 11.0% having received the HPV vaccine [42]. The HPV vaccination program has been launched in our country in recent years. The knowledge status was so low about cervical cancer as well as HPV vaccination, which causes a low prevalence of vaccination.

Our study suggests that finding out possible obstacles and running school-based health awareness programs regularly increases the willingness to vaccinate. Additionally, knowing the potential advantages of the HPV vaccine may overcome any barriers to getting the vaccination [42]. In our study, the awareness and knowledge of cervical cancer and HPV vaccination willingness among young girls in both urban and rural areas of Bangladesh showed significant variations. When comparing our findings to recent studies, we observed parallel issues in awareness levels, despite differences in educational outreach programs [53, 54]. These comparisons suggest that cultural factors, coupled with the availability and visibility of health education programs, play a critical role in shaping public perception and acceptance. The insights from other geographic regions underscore the necessity for tailored interventions in Bangladesh to address gaps in awareness and enhance vaccination uptake, particularly by leveraging successful strategies observed in similar socio-cultural contexts.

4.1 | Limitations of the Study

Although this study provides valuable insights into cervical cancer, HPV, and HPV vaccine knowledge and willingness to be vaccinated among Bangladeshi girls, several limitations should be acknowledged. First, a cross-sectional design restricts the ability to establish causal relationships between variables. Second, participants were recruited through convenience sampling, which may limit the generalizability of the findings. Third, as the study relied solely on quantitative data and self-reported, it may not fully capture the underlying reasons, perceptions, or contextual factors influencing participants' responses. Future studies should include a larger and more diverse sample across multiple regions and incorporate mixed-method approaches to gain a deeper understanding of HPV-related knowledge and vaccine acceptance.

5 | Conclusion

The study has revealed significant gaps in cervical cancer and HPV knowledge among Bangladeshi girls, indicating low awareness of HPV transmission and prevention. The willingness to receive the HPV vaccine was higher among rural participants, younger age groups, and those with uneducated parents. Although most had not been vaccinated, the willingness to receive the HPV vaccine was strongly influenced by factors such as maternal education, cervical cancer knowledge, and discussions about the disease with family members. These findings emphasize the need for targeted awareness programs to improve HPV vaccine uptake. The study suggests that

TABLE 3 | Adjusted Odd ratio for Willingness to HPV Vaccine and other Predictors.

Characteristic	aOR	95% CI[a]	*p*-value
Age (in years)			
10–11	—	—	
12–13	0.76	0.43, 1.31	0.3
14–15	0.95	0.34, 3.43	> 0.9
Residence			
Rural	—	—	
Urban	0.13	0.04, 0.32	< 0.001
Educational status			
Grade 6	—	—	
Grade 7	0.53	0.25, 1.13	0.10
Grade 8	0.52	0.26, 1.00	0.053
Grade 9	0.59	0.19, 2.21	0.4
Father educational			
Uneducated	—	—	
Secondary	1.22	0.44, 4.31	0.7
Higher secondary	1.30	0.59, 3.18	0.5
Honors or higher	0.70	0.38, 1.31	0.2
Mother education			
Uneducated	—	—	
Secondary	3.16	1.22, 10.8	0.033
Higher secondary	1.68	0.63, 5.85	0.3
Honors or higher	0.84	0.38, 2.06	0.7
Knowledge of action if a cervical health problem is detected			
Not sure	—	—	
Seek medical help immediately	3.50	1.98, 6.15	< 0.001
Knowledge that cervical cancer affects only females	1.50	1.08, 2.11	0.018
Knowledge that cervical cancer is transmissible from person to person	0.54	0.41, 0.72	< 0.001
The most common age group at risk for cervical cancer is			
10–19 years	—	—	
20–29 years	1.1	0.5, 3.2	> 0.9
30–39 years	2.07	1.8, 2.6	> 0.9
40 years	2.0	1.5, 3.4	> 0.9
No response	2.8	1.8, 3.5	> 0.9
Sources books			
No	—	—	
Yes	0.72	0.39, 1.37	0.3
Sources doctor/HealthCare staff			
No	—	—	
Yes	1.58	0.92, 2.71	0.10
Sources magazines			
No	—	—	
Yes	0.60	0.27, 1.48	0.2
Sources MassMedia			
No	—	—	
Yes	1.45	0.85, 2.54	0.2

(Continues)

Sources newspapers			
No	—	—	
Yes	0.75	0.39, 1.56	0.4
You heard about the HPV vaccination			
No	—	—	
Yes	2.28	1.27, 4.29	0.007
Heard about the Pap test			
No	—	—	
Yes	2.13	1.13, 4.32	0.026
Talked about cervical cancer with your mother			
No	—	—	
Yes	6.64	2.65, 22.3	< 0.001
Talked about cervical cancer and vaccine with your friends			
No	—	—	
Yes	1.26	0.70, 2.38	0.5
Familiar with the symptoms of cervical cancer?			
No	—	—	
Yes	1.05	0.61, 1.79	0.9
Know about cervical cancer prevention			
No	—	—	
Yes	0.73	0.41, 1.33	0.3
Received the HPV vaccination			
No	—	—	
Yes	1.71	0.65, 5.87	0.3
Now, or have you ever had; a first-degree relative who has been diagnosed with cervical cancer			
No	—	—	
Yes	2.14	0.83, 7.31	0.2
Ever been diagnosed with cervical cancer issue			
No	—	—	
Yes	2.14	0.83, 7.31	0.2
Feeling the need for a training program in proper cervical cancer-examination			
No	—	—	
Yes	6.21	3.16, 12.2	< 0.001
A history of uterine cancer			
No	—	—	
Yes	0.53	0.18, 1.94	0.3
A positive family history of uterine			
No	—	—	
Yes	3.59	1.42, 12.1	0.017
Cervical cancer examination training history			
No	—	—	
Yes	1.30	0.49, 4.49	0.6
Positive family history of cervical cancer			
No	—	—	
Yes	0.62	0.31, 1.30	0.2
Sexual activities history			
No	—	—	
Yes	0.80	0.37, 1.93	0.6

(Continues)

History of cervical cancer			
No	—	—	
Yes	1.68	0.80, 3.95	0.2

Note: Adjusted demographic variables.
[a]aOR = Adjusted Odds Ratio, CI = Confidence Interval.

community-based awareness and intervention programs and social campaigns to educate both children and their parents would help mitigate this problem.

Author Contributions

Rezaul Karim Ripon: methodology, writing – original draft, investigation, formal analysis, writing – review and editing, supervision, conceptualization, visualization. **Md Jamil Hossain:** investigation, writing – original draft, methodology, formal analysis, writing – review and editing, visualization. **Narayana G Prasad:** methodology, writing – original draft, investigation, formal analysis, writing – review and editing, supervision, conceptualization, visualization. **Nachiket Thakkar:** validation, writing – review and editing. **Edima Ottoho:** validation, writing – review and editing. **Shishir Gokhale:** validation, writing – review and editing. **Saloni Munot:** validation, writing – review and editing. **Mayra Volquez:** validation, writing – review and editing. **Priyanka Manghani:** validation, writing – review and editing. **Robert Paulino-Ramírez:** validation, writing – review and editing. **Modesto Cruz:** validation, writing – review and editing. **Sujata Saunik:** validation, writing – review and editing. **Piyusha Majumdar:** validation, writing – review and editing. **Elizabeth Meda-Monzon:** validation, writing – review and editing.

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Ethics Statement

The study received approval from the Biosafety, Biosecurity, and Ethical Review Board of Jahangirnagar University, Savar, Dhaka-1342, Bangladesh (Ref No: BBEC, JU/M/2023(4)1). Informed consent was obtained from all participants before data collection. Additionally, we also take informed consent from the local guardians. They were assured that their identity and contact information would not be disclosed without their consent. All information has been kept private to protect respondents' privacy for ethical reasons.

Conflicts of Interest

The authors declare no conflicts of interest.

Data Availability Statement

The datasets generated and/or analyzed during the current study are not publicly available due to the ongoing intervention of this study but are available from the corresponding author upon reasonable request.

Transparency Statement

The lead author Md Jamil Hossain affirms that this manuscript is an honest, accurate, and transparent account of the study being reported; that no important aspects of the study have been omitted; and that any discrepancies from the study as planned (and, if relevant, registered) have been explained.

References

1. WHO. Cervical cancer. (2025), https://www.who.int/news-room/fact-sheets/detail/cervical-cancer.

2. C. Allemani, H. K. Weir, H. Carreira, et al., "Global Surveillance of Cancer Survival 1995–2009: Analysis of Individual Data for 25 676 887 Patients From 279 Population-Based Registries in 67 Countries (CONCORD-2)," *The Lancet* 385, no. 9972 (2015): 977–1010.

3. WHO. National Strategy for Cervical Cancer Prevention and Control in Bangladesh, 2017-2022. 2017, https://www.who.int/bangladesh/news/detail/24-09-2017-national-strategy-for-cervical-cancer-prevention-and-control-in-bangladesh-2017-2022.

4. J. Wolf, L. F. Kist, S. B. Pereira, et al., "Human Papillomavirus Infection: Epidemiology, Biology, Host Interactions, Cancer Development, Prevention, and Therapeutics," *Reviews in Medical Virology* 34, no. 3 (2024): e2537, https://doi.org/10.1002/rmv.2537.

5. P. Guan, R. Howell-Jones, N. Li, et al., "Human Papillomavirus Types in 115,789 HPV-Positive Women: A Meta-Analysis From Cervical Infection to Cancer," *International Journal of Cancer* 131, no. 10 (2012): 2349–2359.

6. J. Singh and S. S. Baliga, "Knowledge Regarding Cervical Cancer and HPV Vaccine Among Medical Students: A Cross-Sectional Study," *Clinical Epidemiology and Global Health* 9 (2021): 289–292.

7. Q. Nahar, F. Sultana, A. Alam, et al., "Genital Human Papillomavirus Infection Among Women in Bangladesh: Findings From a Population-Based Survey," *PLoS One* 9, no. 10 (2014): e107675.

8. H. W. Chesson, E. F. Dunne, S. Hariri, and L. E. Markowitz, "The Estimated Lifetime Probability of Acquiring Human Papillomavirus in the United States," *Sexually Transmitted Diseases* 41, no. 11 (2014): 660–664.

9. N. Osazuwa-Peters, E. Adjei Boakye, R. L. Rohde, et al., "Understanding of Risk Factors for the Human Papillomavirus (HPV) Infection Based on Gender and Race," *Scientific Reports* 9, no. 1 (2019): 297, https://doi.org/10.1038/s41598-018-36638-z.

10. S. Vaccarella, J. Lortet-Tieulent, M. Plummer, S. Franceschi, and F. Bray, "Worldwide Trends in Cervical Cancer Incidence: Impact of Screening Against Changes in Disease Risk Factors," *European Journal of Cancer* 49, no. 15 (2013): 3262–3273.

11. P. Basu, A. Nessa, M. Majid, J. N. Rahman, and T. Ahmed, "Evaluation of the National Cervical Cancer Screening Programme of Bangladesh and the Formulation of Quality Assurance Guidelines," *Journal of Family Planning and Reproductive Health Care* 36, no. 3 (2010): 131–134.

12. R. M. Islam, R. J. Bell, B. Billah, M. B. Hossain, and S. R. Davis, "Lack of Understanding of Cervical Cancer and Screening is the Leading Barrier to Screening Uptake in Women at Midlife in Bangladesh: Population-Based Cross-Sectional Survey," *The Oncologist* 20, no. 12 (2015): 1386–1392.

13. M. Salwa and T. Abdullah Al-Munim, "Ethical Issues Related to Human Papillomavirus Vaccination Programs: An Example From Bangladesh," *BMC Medical Ethics* 19 (2018): 39.

14. J. Lei, A. Ploner, K. M. Elfström, et al., "HPV Vaccination and the Risk of Invasive Cervical Cancer," *New England Journal of Medicine* 383, no. 14 (2020): 1340–1348.

15. M. E. Rahman, M. S. Moonajilin, M. S. Bishwas, R. Banik, G. N. Pinky, and S. I. Alin, "Awareness, Knowledge About Human Papillomavirus and Attitude Towards Its Vaccine Among University Students: A Bangladeshi Pilot Study," *Asian Journal of Health Sciences* 5, no. 2 (2019): 11.

16. J. Y. Islam, F. Khatun, A. Alam, et al., "Knowledge of Cervical Cancer and HPV Vaccine in Bangladeshi Women: A Population Based, Cross-Sectional Study," *BMC Women's Health* 18 (2018): 15.

17. A. Bhuiyan, F. Sultana, J. Y. Islam, M. A. K. Chowdhury, and Q. Nahar, "Knowledge and Acceptance of Human Papillomavirus Vaccine for Cervical Cancer Prevention Among Urban Professional Women in Bangladesh: A Mixed Method Study," *BioResearch Open Access* 7, no. 1 (2018): 63–72.

18. A. Mengesha, A. Messele, and B. Beletew, "Knowledge and Attitude Towards Cervical Cancer Among Reproductive Age Group Women in Gondar Town, North West Ethiopia," *BMC Public Health* 20 (2020): 209.

19. WHO. Comprehensive Cervical Cancer Control. Geneva. 2014, https://iris.who.int/bitstream/handle/10665/144785/9789241548953_eng.pdf.

20. S. A. Francis, J. Nelson, J. Liverpool, S. Soogun, N. Mofammere, and R. J. Thorpe, "Examining Attitudes and Knowledge About HPV and Cervical Cancer Risk Among Female Clinic Attendees in Johannesburg, South Africa," *Vaccine* 28, no. 50 (2010): 8026–8032.

21. M. D. S. B. Nascimento, F. C. B. Vidal, M. A. C. N. Silva, et al., "Prevalence of Human Papillomavirus Infection Among Women From Quilombo Communities in Northeastern Brazil," *BMC Women's Health* 18 (2018): 1–10.

22. N. U. Ahmed, P. Rojas, and A. Degarege, "Knowledge of Cervical Cancer and Adherence to Pap Smear Screening Test Among Female University Students in a Multiethnic Institution, USA," *Journal of the National Medical Association* 112, no. 3 (2020): 300–307.

23. J. H. T. Dang, A. Gori, L. Rios, A. M. Rolon, J. Zhang, and M. S. Chen, "You Don't Know If It's the Truth or a Lie": Exploring Human Papillomavirus (HPV) Vaccine Hesitancy Among Communities With Low HPV Vaccine Uptake in Northern California," *Vaccines* 12, no. 4 (2024): 372.

24. R. S. Purvis, R. Moore, D. E. Willis, et al., "Understanding HPV Vaccine Hesitancy and What Helped Hesitant Adopter Parents Have Their Children Vaccinated Despite Their Hesitancy," *Journal of Pediatric Health Care* 38, no. 4 (2024): 468–479, https://doi.org/10.1016/j.pedhc.2023.11.013.

25. G. M. Breakwell and R. Jaspal, "Vaccine Hesitancy," *In: The Blackwell Encyclopedia of Sociology* 1 (2023): 1–3, https://doi.org/10.1002/9781405165518.wbeos1921.

26. W. K. M. Pan, "The Application of Behavioral Change Theories in Addressing Vaccine Hesitancy: A Literature Review," *Public Health Nursing* 41, no. 2 (2024): 318–324, https://doi.org/10.1111/phn.13280.

27. WHO. Human Papillomavirus (HPV) Vaccination Launching in Bangladesh: A Single Dose Vaccine has Potential to Prevent Cervical Cancer! [Internet]. 2023, https://www.who.int/bangladesh/news/detail/10-10-2023-human-papillomavirus-(hpv)-vaccination-launching-in-bangladesh–a-single-dose-vaccine-has-potential-to-prevent-cervical-cancer.

28. UNICEF. Securing a Healthier Future for Girls: The Bede Community's Journey to Embrace the HPV Vaccine. 2023, https://www.unicef.org/bangladesh/en/stories/securing-healthier-future-girls-bede-communitys-journey-embrace-hpv-vaccine#:~:text=Vaccinating 1.5 million girls against,gaps and empowering marginalized communities.

29. R. Banik, S. Naher, M. Rahman, and D. Gozal, "Investigating Bangladeshi Rural Women's Awareness and Knowledge of Cervical Cancer and Attitude Towards HPV Vaccination: A Community-Based Cross-Sectional Analysis," *Journal of Cancer Education* 37, no. 2 (2022): 449–460.

30. B. Tran, P. Than, T. Doan, et al., "Knowledge, Attitude, and Practice on and Willingness to Pay for Human Papillomavirus Vaccine: A Cross-Sectional Study in Hanoi,Vietnam," *Patient Preference and Adherence* 12 (2018): 945–954, https://doi.org/10.2147/PPA.S165357.

31. G. N. Mihretie, T. M. Liyeh, A. D. Ayele, H. G. Belay, T. S. Yimer, and A. D. Miskr, "Knowledge and Willingness of Parents Towards Child Girl HPV Vaccination in Debre Tabor Town, Ethiopia: A Community-Based Cross-Sectional Study," *Reproductive Health* 19, no. 1 (2022): 136, https://doi.org/10.1186/s12978-022-01444-4.

32. BANBEIS. Bangladesh Education Statistics 2021. 2022.

33. K. T. Chew, N. Kampan, and M. N. Shafiee, "Perception and Knowledge of Human Papillomavirus (HPV) Vaccine for Cervical Cancer Prevention Among Fully Vaccinated Female University Students in the Era of HPV Vaccination: A Cross-Sectional Study," *BMJ Open* 11, no. 12 (2021): e047479.

34. A. Haseeb Hwaid, "Knowledge and Awareness of Papillomavirus and Cervical Cancer Among College Students and Health Care Workers Women in Diyala, Iraq," *American Journal of Public Health Research* 1, no. 8 (2013): 221–225.

35. E. Hoque and M. Hoque, "Knowledge of and Attitude Towards Cervical Cancer Among Female University Students in South Africa," *Southern African Journal of Epidemiology and Infection* 24, no. 1 (2009): 21–24.

36. C. H. Rama, L. L. Villa, S. Pagliusi, et al., "Awareness and Knowledge of HPV, Cervical Cancer, and Vaccines in Young Women After First Delivery in São Paulo, Brazil—A Cross-Sectional Study," *BMC Women's Health* 10 (2010): 35.

37. M. Zakaria, J. Xu, F. Karim, and F. Cheng, "Reproductive Health Communication Between Mother and Adolescent Daughter in Bangladesh: A Cross-Sectional Study," *Reproductive Health* 16, no. 1 (2019): 114.

38. M. Ayalew, B. Mengistie, and A. Semahegn, "Adolescent-Parent Communication on Sexual and Reproductive Health Issues Among High School Students in Dire Dawa, Eastern Ethiopia: A Cross Sectional Study," *Reproductive Health* 11, no. 1 (2014): 77.

39. M. Salauddin, F. Irin, P. Disha, et al., "Human Papillomavirus in Bangladesh: Challenges and Opportunities for Prevention," *Gynecologic Oncology Reports* 59 (2025): 101747, https://www.sciencedirect.com/science/article/pii/S2352578925000724.

40. O. Qayum, M. Billah, R. Akhter, and M. Flora, "Women's Knowledge, Attitude and Practice on Cervical Cancer and Its Screening in Dhaka, Bangladesh," *Asian Pacific Journal of Cancer Prevention* 22, no. 10 (2021): 3327–3335.

41. F. Haseen, H. Hridi, S. A. Sony, et al., "Mental Model of Mothers of Adolescent Girls and Health Service Providers on HPV Vaccination in Urban Slum Areas of Dhaka, Bangladesh: A Mixed-Method Study," *Journal of Health and Medical Sciences* 5, no. 4 (2022): 1.

42. D. You, L. Han, L. Li, et al., "Human Papillomavirus (HPV) Vaccine Uptake and the Willingness to Receive the HPV Vaccination Among Female College Students in China: A Multicenter Study," *Vaccines* 8, no. 1 (2020): 31.

43. M. Sidiropoulou, G. Gerogianni, F. E. Kourti, et al., "Perceptions, Knowledge and Attitudes Among Young Adults About Prevention of HPV Infection and Immunization," *Healthcare* 10 (2022): 1721.

44. X. Zhang, Z. Wang, Z. Ren, et al., "HPV Vaccine Acceptability and Willingness-Related Factors Among Chinese Adolescents: A Nation-Wide Study," *Human Vaccines & Immunotherapeutics* 17, no. 4 (2021): 1025–1032, https://doi.org/10.1080/21645515.2020.1812314.

45. Z. Baloch, N. Yasmeen, Y. Li, et al., "Knowledge and Awareness of Cervical Cancer, Human Papillomavirus (HPV), and HPV Vaccine Among HPV-Infected Chinese Women," *Medical Science Monitor* 23 (2017): 4269–4277.

46. N. E. Alam, M. S. Islam, F. Rayyan, et al., "Lack of Knowledge is the Leading Key for the Growing Cervical Cancer Incidents in Bangladesh: A Population Based, Cross-Sectional Study," *PLOS Global Public Health* 2, no. 1 (2022): e0000149.

47. F. S. Papri, Z. Khanam, F. Islam, and M. M. Hakim, "Knowledge and Awareness About Risk Factors of Cervical Cancer, Its Screening and Vaccination Among the Women Attending Chittagong Medical College Hospital," *Chattagram Maa-O-Shishu Hospital Medical College Journal* 14, no. 2 (2015): 57–60.

48. L. Riaz, S. Manazir, F. Jawed, S. Arshad Ali, and R. Riaz, "Knowledge, Perception, and Prevention Practices Related to Human Papillomavirus-Based Cervical Cancer and Its Socioeconomic Correlates Among Women in Karachi, Pakistan," *Cureus* 12, no. 3 (2020): e7183.

49. S. Ghosh, S. D. Mallya, R. S. Shetty, et al., "Knowledge, Attitude and Practices Towards Cervical Cancer and Its Screening Among Women From Tribal Population: A Community-Based Study From Southern India," *Journal of Racial and Ethnic Health Disparities* 8 (2021): 88–93.

50. A. Nessa, C. Wistrand, S. A. Begum, et al., "Evaluation of Stationary Colposcope and the Gynocular, by the Swede Score Systematic Colposcopic System in via Positive Women: A Crossover Randomized Trial," *International Journal of Gynecological Cancer* 24, no. 2 (2014): 339–345.

51. R. K. Gupta, P. Singh, B. Langer, R. Kumari, P. Sharma, and R. Gupta, "Cervical Cancer: A Hospital Based KAP Study Among Women Aged 18 Years and Above in Northern India," *International Journal of Community Medicine and Public Health* 6 (2019): 1628.

52. M. S. Rane, L. C. Page, E. McVeigh, et al., "Improving Adolescent Human Papillomavirus (HPV) Immunization Uptake in School-Based Health Centers Through Awareness Campaigns," *Vaccine* 39, no. 12 (2021): 1765–1772.

53. U. Rani, E. Darabaner, M. Seserman, R. A. Bednarczyk, and J. Shaw, "Public Education Interventions and Uptake of Human Papillomavirus Vaccine: A Systematic Review," *Journal of Public Health Management & Practice* 28, no. 1 (2022): E307–E315.

54. S. V. Joshi, H. R. Chaudhari, and N. A. Chaudhari, "Effect of Education on Awareness, Knowledge, and Willingness to be Vaccinated in Females of Western India," *Journal of Cancer Education* 35, no. 1 (2020): 61–68.