Investigating Bangladeshi Rural Women's Awareness and Knowledge of Cervical Cancer and Attitude Towards HPV Vaccination: a Community-Based Cross-Sectional Analysis

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Abstract

Cervical cancer remains a significant disease burden and contributes to prominent cancer-related mortality among women. This study aimed to assess awareness and knowledge of cervical cancer and attitude towards HPV vaccination among rural women in Bangladesh. A cross-sectional study was carried out from September 2019 to January 2020 involving 600 women selected using multi-stage sampling from six rural areas of Bangladesh. Face-to-face interviews were conducted using a semi-structured questionnaire consisting of socio-demographic information, knowledge (20-items) and, attitudes (5-items). Most of the participants (71.8%) were aware of cervical cancer. Women's awareness was significantly associated with marital status, education level, employment status, and internet/social media use ($p < 0.05$). Mass media was the main source of information and 2.3% of the women had previously undergone cervical cancer screening. Knowledge regarding symptoms, risk factors, and preventive measures was limited with a mean knowledge score of 8.73 (SD: 2.68). Only 5.3% of women had vaccinated against HPV, but the willingness to receive the HPV vaccine was high (76.6%) among those who were not vaccinated. The cost of the HPV vaccine (40.1%) and lack of adequate knowledge (34.3%) were the main reasons behind women's unwillingness to receive the vaccine. Higher odds of willingness to receive the HPV vaccine were found among women aged 15–29 years (aOR: 1.92, CI = 1.21–3.04, $p = 0.006$), had high education (aOR: 1.93, CI = 1.25–4.42, $p = 0.005$), and internet/social media users (aOR: 2.32, CI: 1.51–3.56, $p < 0.001$). These results highlight the urgent need for educational intervention on cervical cancer and the institution of national policies providing HPV vaccination coverage.

Keywords Awareness · Knowledge · Cervical cancer · HPV vaccine · Rural women · Bangladesh

Introduction

Cervical cancer is a worldwide public health problem that imposes a substantial social and economic burden [1, 2]. The World Health Organization recognized cervical cancer as the fourth most common cancer in women, accounting for 0.31million deaths worldwide in 2018 [3] with ~90% of deaths in low- and middle-income countries [4]. This high mortality rate was attributed to several factors, including lack of awareness and knowledge of cervical cancer, as well as lack of organized and high-quality cervical cancer screening and treatment programs [5, 6]. Cervical cancer is caused by specific human papillomavirus (HPV) strains, the most common reproductive tract infection. Persistent infection with one of about 15 human papillomaviruses (HPV) carcinogenic genotypes underlies the vast majority of cervical cancer cases [7, 8].

In Bangladesh, cervical cancer is the second most common cancer among women, with approximately 12,000 new cases and over 6000 deaths annually [3]. The high mortality rate is attributable to the fact that the majority of the women diagnosed with cervical cancer present at late and advanced stages of the disease when curative interventions are no longer possible [7]. However, such dire mortality is also due to limited access to primary and secondary prevention strategies in

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developing countries such as Bangladesh [9, 10]. In contrast, cervical cancer is almost universally preventable by ensuring quality screening and vaccination against HPV [9]. In 2004, Bangladesh launched a national, opportunistic cervical cancer screening program, called visual inspection with acetic acid (VIA) for women aged more than 29 years [11, 12]. From this initiative, it became apparent that lack of awareness and knowledge of cervical cancer and understanding of the screening concept constitute key barriers to screening uptake among women in Bangladesh [13]. Concurrently, the implementation of the HPV vaccine to prevent cervical cancer in low- and middle-income countries is an immediate and pragmatic solution to achieving global targets for women's health [14]. However, national HPV vaccine programs are currently unavailable in Bangladesh. Although the government has successfully piloted a school-based HPV vaccination program among pre-adolescent girls aged 10 years in 2016 funded by the Global Alliance for Vaccines and Immunizations (GAVI) [15] and had plans to introduce a universal HPV vaccination program in 2017, this initiative has yet to be implemented [16]. Furthermore, the acceptance of the HPV vaccine among Bangladeshi women is still remarkably low [17, 18]. Therefore, identifying the factors impeding the success of HPV vaccination programs becomes a priority. Instead of cultural and religious barriers, lack of awareness and knowledge of cervical cancer is the likely main obstacle to the acceptance of HPV vaccination in Bangladesh [13, 17, 19]. Meanwhile, evidence from developing countries revealed that cervical cancer is more prevalent among rural women than urban women [20, 21]. The higher prevalence of cervical cancer among rural women has been associated with living in poverty, unemployment, limited education, and barriers to preventive methods [22, 23]. Previous Bangladeshi studies focused on awareness and knowledge regarding cervical cancer, but women's attitudes towards HPV vaccination, including acceptance, willingness, and barriers to receiving the HPV vaccine, were not properly addressed [17–19].

The lack of information documented from underdeveloped and developing regions like Bangladesh demands further research, especially in terms of a high incidence of cervical cancer in such regions, and an even larger incidence among impoverished women in rural communities. Therefore, the objective of this study was to explore awareness and knowledge of cervical cancer and attitude towards HPV vaccination among women with reproductive age in rural areas of Bangladesh. The findings obtained will provide policymakers and healthcare system the opportunity to identify target areas for future education interventions focusing specifically on women with high-risk reproductive age and allocate resources to implement a country-wide HPV vaccination programs in emerging economies.

Methods and Materials

Participants and Setting

This cross-sectional study was conducted from September 25, 2019, to January 10, 2020, among women in rural areas of Bangladesh. These areas are located in the Dhaka district, which is situated almost in the middle of the country. Dhaka district consist of Dhaka city, Keraniganj, Dohar, Nababganj, Savar, and Dhamrai upazila with the total area of 1463.60 km^2 (565.00 sq. miles) [24]. The targeted population of this study consisted of women in their reproductive age [25], and this group was selected due to increased vulnerable to cervical cancer, along with a high mortality rate [26]. A multi-stage sampling technique was used. Firstly, three upazilas (Savar, Dohar, and Dhamrai) were selected, using a convenience sampling technique. In the second stage, a random sampling technique was implemented in selecting two villages from each of the upazilas. Finally, a total of six villages were included with 100 households randomly selected from each of the villages. Households required the presence of an eligible participant at the time of the survey. Eligibility criteria were women of reproductive age who had resided in that area for at least 6 months prior to the study. If a household had more than one eligible participant, one eligible member was randomly selected. A total of 600 participants were interviewed.

Data Collection

A semi-structured questionnaire was developed after a brief review of the literature based on previous studies [17, 18, 27]. The questionnaire was translated into Bangla and then translated back to English by a different person to assess validity. The questionnaire was pilot-tested in a sample of 40 subjects before study initiation. The questionnaire consists of three sections. The first section includes questions on the participant's socio-demographic and other information. The second section includes questions on awareness and knowledge about cervical cancer, while questions concerning attitude towards HPV vaccination were included in the third section. Face-to-face interviews were performed. The interviews were conducted in Bangla (the national language of Bangladesh) and took 15–20 min on average. Data were collected by trained female interviewers with experience conducting community-based surveys.

Measures

Socio-demographic characteristics of participants were gathered through both open and close-ended questions, including age, marital status, education level, employment status, socio-economic class, parity, using internet/social media (i.e., Facebook, YouTube), and living distance to the nearest health

facility. To assess awareness of cervical cancer, participants were asked if they had "ever heard of cervical cancer?" If a participant responded "Yes," then a series of questions assessing women's knowledge related to the disease were asked; however, if a participant responded "No," then knowledge of cervical cancer was not further assessed. Sources of their information and if they had undergone cervical cancer screening were also explored. In the knowledge assessment section, the questionnaire included 20 items with multiple response formats that assessed participant's knowledge about cervical cancer, including its symptoms (items 1–6), risk factors (items 7–14), and preventive measures (items 15–20). Participants were able to answer knowledge questions with "True," "False," or "Do not know" responses. The response "Do not know" was considered as an incorrect answer. Each correct response to a knowledge item was assigned 1 point, while 0 points were assigned to each incorrect response and the total score ranged from 0 to 20 for all knowledge items. Participant's attitude towards the HPV vaccination was assessed using five items. One of those attitude items has a multiple response format with possible response options and other attitude items had two possible options: "Yes" or "No."

Data Management and Statistical Analysis

A standardized system for data entry, data management, and statistical analysis was established. All data were double entered by two independent data clerks into form-specific databases (REDCap) [28]. Data validation and cleaning were done using the same software. Data were analyzed using SPSS (version 22.0, IBM, Chicago, IL, USA). Data analysis consisted of descriptive statistics including frequency distribution for demographic variables such as age, marital status, education level, employment status, socio-economic class, parity, use of social media, the living distance of the nearest health facilities and responses obtained to awareness of cervical cancer, knowledge regarding symptoms, risk factors, and preventive measures of cervical cancer, willingness to receive the HPV vaccine, and reasons behind unwillingness to receive the HPV vaccine. Data were presented as mean (SD) for continuous variables. Test of significance was performed using the chi-square test at a 5% level of significance. Mean knowledge regarding symptoms, risk factors, and preventive measures of different participants according to demographic characteristics were compared with independent samples t test and one-way analysis of variance (ANOVA) as appropriate. Associations between outcome variables and socio-demographic variables were explored using logistic regression analysis. The results of logistic regression were reported with adjusted odds ratios (aOR) and 95% confidence intervals. Participant's age were defined using two groups, whether being between 15 and 29 years old, or ≥ 30 years old. Level of education was categorized as having low education (less than secondary education) or high education (secondary education

or more). Monthly household income served as a proxy measure for socio-economic class and was represented as a low class (family income < 25,000 Bangladeshi taka [BDT]) and high class (family income ≥ 25,000 BDT). The distance of the women's residence from the nearest health facility was categorized as the short distance (< 5 km) and long distance (≥ 5 km).

Results

Socio-demographic Characteristics

A summary of the overall socio-demographic characteristics of participants is presented in Table 1. A total of 600 women were included, with the majority (65.0%) in the ≥ 30 years, and a mean age of 36.8 (SD: 2.0) years. Most of the women (62.8%) were married. There was a significant relationship between marital status and awareness of cervical cancer ($p < 0.05$). Among single women, 31.0% had never heard of cervical cancer. Most women had low education (64.7%) and 54.3% were employed. Participant's awareness of cervical cancer was significantly different in terms of education levels ($p < 0.01$) and 32.2% of women with low education were not aware of cervical cancer. About 70% of the women belonged to a low socio-economic class and 86.3% were Muslim. There was also a statistically significant relationship between the women's socio-economic class and awareness of cervical cancer ($p < 0.05$). Among women with high socio-economic class, 78.6% were aware of cervical cancer. The majority (66.0%) of the participants had no children followed by 25.7% who had 1–3 children, and 8.3% had more than 3 children. More than half of the participants (54.7%) were internet/social media (i.e., Facebook, YouTube) users and lived within a short distance from the nearest health facilities (59.7%). Participants who were using the internet/social media had increased awareness of cervical cancer ($p < 0.05$).

Awareness and Knowledge

Participant's awareness and knowledge of cervical cancer are shown in Table 2. Approximately 72% reported having heard of cervical cancer. About half (53.4%) of the participants heard about cervical cancer from mass media (i.e., Television, Newspaper, Radio), health care providers (35.3%), internet/social media (i.e., Facebook, YouTube; 30.4%), family members (23.7%), and neighbors/friends (14.5%), and only a minority from reading books or other written sources (2.6%); (Fig. 1). Among the participants who had heard about cervical cancer, only 2.3% ($n = 10$) had undergone cervical cancer screening.

For knowledge assessments, we will reiterate that only those who had heard about cervical cancer before were included in the study, and those who had never heard about cervical

Table 1 Socio-demographic characteristics of the participants (*n* = 600)

Characteristic	Total (% total)	Awareness of cervical cancer				
		Aware (% within aware)	Not-aware (% not-aware)	χ^2-value	*df*	*p* value
Age (years)						
15–29	210 (35.0)	150 (71.4)	60 (28.6)	0.026	1	0.872
≥ 30	390 (65.0)	281 (72.1)	109 (27.9)			
Marital status						
Married	223 (37.2)	171 (76.7)	52 (23.3)	4.123	1	0.042
Single	377 (62.8)	260 (69.0)	117 (31.0)			
Education level						
High education	212 (35.3)	168 (79.2)	44 (20.8)	8.901	1	0.003
Low education	388 (64.7)	263 (67.8)	125 (32.2)			
Employment status						
Employed	326 (54.3)	245 (75.2)	81 (24.8)	3.889	1	0.049
Unemployed	274 (45.7)	186 (67.9)	88 (32.1)			
Socio-economic class						
Low	418 (69.7)	288 (68.9)	130 (31.1)	5.862	1	0.015
High	182 (30.3)	143 (78.6)	39 (21.4)			
Religion						
Muslim	518 (86.3)	365 (70.5)	153 (29.5)	3.516	1	0.061
Non-Muslim	82 (13.7)	66 (80.5)	16 (19.5)			
Parity						
0	396 (66.0)	292 (73.7)	104 (26.3)	2.236	2	0.327
1–3	154 (25.7)	106 (68.8)	48 (31.2)			
3+	50 (8.3)	33 (66.0)	17 (34.0)			
Using internet/social media						
Yes	328 (54.7)	248 (75.6)	80 (24.4)	5.100	1	0.024
No	272 (45.3)	183 (67.3)	89 (32.7)			
Living distance of the nearest health facility						
Long	242 (40.3)	154 (63.6)	88 (36.4)	3.469	1	0.071
Short	358 (59.7)	277 (77.4)	81 (22.6)			

p ≤ 0.05 was considered to be statistically significant

df degree of freedom

cancer (28.2%) were excluded. In general, participants scored relatively low on the knowledge section with a mean score of 8.73 (SD: 2.68) out of a maximum of 20 points. The mean score of knowledge of cervical cancer symptoms for all participants (*n* = 431) was 2.61 (SD: 1.05) out of 6. Among the 431 participants, 64% (*n* = 276) correctly stated increased vaginal discharge as a symptom of cervical cancer. Nearly half of them correctly stated intensive periods or bleeding between periods and discomfort during sex or dyspareunia. Thirty-seven percent and 29% correctly stated post-menopausal bleeding and pelvic/back pain. Only 37.1% of participants were able to identify prolong fever is not a symptom of cervical cancer. Reduced knowledge was found for cervical cancer risk factors among participants with a mean score of 3.70 (SD: 1.32) out of 8 maximal points. While exploring the knowledge of women regarding risk factors, the majority (63.6%) correctly identified multiple sexual partners as a risk factor of cervical

cancer, and more than half of the women correctly identified early sexual initiation (55.7%) and infection with HPV (55.2%). Some women stated prolonged use of birth control pills (> 5 years) (48.3%), poor hygiene management (43.2%), smoking cigarettes/tobacco (39%), and not using a condom (28.1%). About 39% identified using infected needles is not a risk factor of cervical cancer. Knowledge regarding preventive measures for cervical cancer was relatively high with a mean of 2.91 (SD: 0.95) out of 6 maximal points. When asked about preventive measures, about 57% and 52% of respondents correctly stated that cervical cancer could be prevented by avoiding multiple sex partners and using a condom respectively. Slightly less than half of the participants knew that the HPV vaccine (48.3%) and delaying sexual initiation (44.1%) is a preventive measure. About 41% and only 39.9% knew that HPV could not be prevented by medications and oral contraceptives, respectively. Table 3 shows the association

Table 2 Awareness and knowledge of cervical cancer among participants (n = 600)

Question	Frequency (n)	Percentage (%)
Ever heard of cervical cancer		
Yes	431	71.8
No	169	28.2
Ever underwent cervical cancer Screening[b]		
Yes	10	2.3
No	421	97.7
Knowledge items[a,b] (correctly answered)		
Symptoms of cervical cancer		
Increased vaginal discharge (true)	276	64.0
Intensive periods or bleeding between periods (true)	209	48.5
Discomfort during sex or dyspareunia (true)	207	48.0
Prolong fever (false)	160	37.1
Post-menopausal bleeding (true)	151	35.0
Pelvic/back pain (true)	125	29.0
Score (mean ± SD)	**2.61 ± 1.05**	
Risk factors of cervical cancer		
Multiple sexual partners (true)	274	63.6
Early sexual initiation (true)	240	55.7
Infection with HPV (true)	238	55.2
Prolonged use of birth control pills (> 5 years) (true)	208	48.3
Poor hygiene management (true)	186	43.2
Using infected needles (false)	168	39.0
Smoking cigarettes/tobacco (true)	152	35.3
Not using condom (true)	121	28.1
Score (mean ± SD)	**3.70 ± 1.32**	
Preventive measures of cervical cancer		
Avoiding multiple sex partners (true)	244	56.6
Condom use (true)	225	52.2
HPV vaccination (true)	208	48.3
Delaying sexual initiation (true)	190	44.1
Medications (false)	174	40.4
Oral contraceptive pills (false)	172	39.9
Score (mean ± SD)	**2.91 ± 0.95**	
Total mean knowledge score (mean ± SD)	**8.73 ± 2.68**	

SD standard deviation

[a] Percent may exceed 100% due to multiple responses

[b] Sample is limited to those who reported to have heard of cervical cancer (n = 431)

between participant's socio-demographic characteristics and mean knowledge scores. The mean knowledge score was significantly higher among women who were married, had a high education, employed, and belonged to high socio-economic class ($p < 0.05$).

Attitude Towards HPV Vaccination

Only 5.3% of the participants received at least one dose of the HPV vaccine. Among those (94.7%) who did not receive the HPV vaccine, 76.6% expressed willingness to receive the HPV vaccine as a protective measure against cervical cancer if offered. Participants showed an unwillingness to receive HPV vaccine because of the high cost of the vaccine (40.1%), lack of adequate information (34.3%), doubts on the safety and efficacy (21.7%), being sexually inactive (18.5%), and no recommendations form caregivers (10.9%). Participants who had a daughter were asked if they would be willing to provide such a vaccine to their daughters to whom 89.5% of women responded affirmatively, and 70.2% of the women stated that they would be willing to suggest to their relatives/friends to receive the HPV vaccine (Table 4).

Fig. 1 Common sources of information regarding cervical cancer among participants (n = 431)
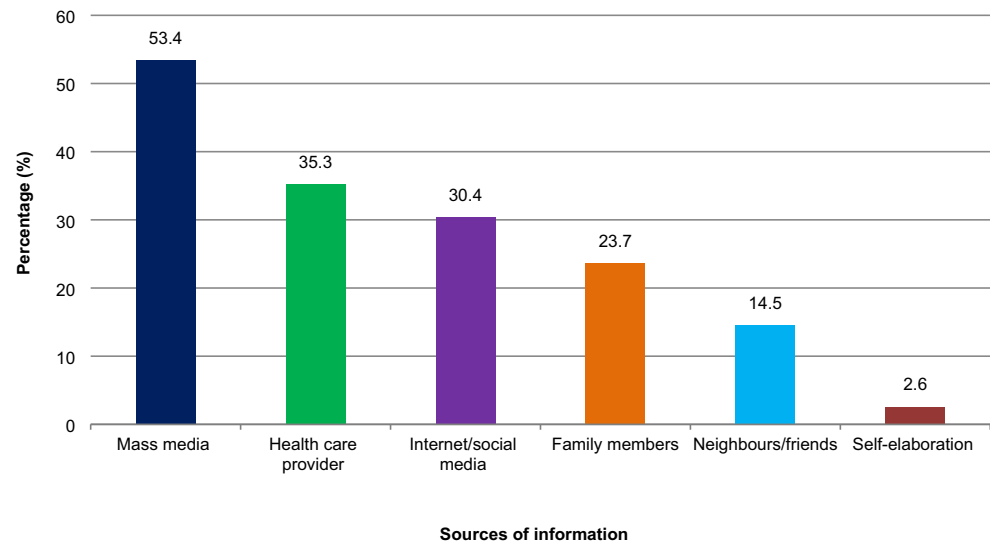

Table 5 presents our findings from the multivariable logistic regression models of factors associated with receiving the HPV vaccine and the willingness to receive the HPV vaccine among the participants. After controlling for potential confounders, marital status, education level, socio-economic class, and awareness of cervical cancer were significantly associated with receiving the HPV vaccine. Married women had higher odds of receiving the HPV vaccine than single women (aOR: 6.09, 95% CI = 1.93–19.26, p = 0.002). Women who had high education had increased odds to receive the HPV

Table 3 Association between socio-demographic characteristics and mean knowledge scores of the participants (n = 431)

Characteristic	Mean knowledge score (mean ± SD)				
	Symptoms (0–6 items scale)	Risk factors (0–8 items scale)	Preventive measures (0–6 items scale)	Total knowledge (0–20 items scale)	p-value[a]
Age (years)					
15–29	2.64 ± 1.07	3.75 ± 1.32	2.85 ± 1.03	8.73 ± 2.73	0.974
≥ 30	2.59 ± 1.04	3.68 ± 1.32	2.94 ± 0.89	8.74 ± 2.65	
Marital status					
Married	2.71 ± 0.99	4.04 ± 1.36	3.00 ± 0.86	9.40 ± 2.86	0.007
Single	2.54 ± 1.08	3.49 ± 1.26	2.85 ± 0.99	8.33 ± 2.48	
Education level					
High education	2.65 ± 1.07	3.90 ± 1.39	2.98 ± 0.99	9.26 ± 2.98	0.024
Low education	2.58 ± 1.04	3.58 ± 1.26	2.86 ± 0.92	8.40 ± 2.41	
Employment status					
Employed	2.66 ± 1.02	3.90 ± 0.89	3.02 ± 0.89	9.14 ± 2.69	0.039
Unemployed	2.54 ± 1.09	3.44 ± 0.79	2.75 ± 0.99	8.19 ± 2.57	
Socio-economic class					
Low	2.58 ± 1.05	3.56 ± 1.27	2.86 ± 0.96	8.38 ± 2.60	0.018
High	2.66 ± 1.05	4.00 ± 1.38	3.00 ± 0.91	9.45 ± 2.91	
Religion					
Muslim	2.61 ± 1.05	3.62 ± 1.28	2.90 ± 0.94	8.73 ± 2.54	0.118
Non-Muslim	2.61 ± 1.08	3.72 ± 1.56	2.92 ± 0.97	8.73 ± 3.08	
Parity					
0	2.57 ± 1.08	3.58 ± 1.28	2.89 ± 0.99	8.50 ± 2.62	0.779
1–3	2.67 ± 0.98	4.08 ± 1.41	3.00 ± 0.85	9.42 ± 2.69	
3+	2.72 ± 0.99	3.69 ± 1.26	2.82 ± 0.76	8.72 ± 2.82	
Using internet/social media					
Yes	2.69 ± 1.08	3.80 ± 1.36	2.96 ± 0.94	8.98 ± 2.85	0.162
No	2.49 ± 0.99	3.56 ± 1.26	2.83 ± 0.95	8.38 ± 2.37	
Living distance of the nearest health facility					
Long	2.60 ± 1.05	3.56 ± 1.25	2.73 ± 0.91	8.34 ± 2.67	0.360
Short	2.61 ± 1.06	3.78 ± 1.36	3.00 ± 0.95	8.94 ± 2.66	

[a] p value calculated by using t test and ANOVA test

SD standard deviation

Table 4 Attitudes of the participants towards HPV vaccination (n = 600)

Attitude items	Frequency (n)	Percentage (%)
Ever received HPV vaccine (at least one dose of the vaccine)		
Yes	32	5.3
No	568	94.7
Willingness to receive the HPV vaccine (if the vaccine works against cervical cancer)[a]		
Yes	435	76.6
No	133	23.4
Reasons for unwillingness to receive the HPV vaccine[a, b]		
High cost of the vaccine	228	40.1
Lack of adequate information	195	34.3
Doubts on the safety and efficacy	123	21.7
Sexually inactive	105	18.5
No recommendations form caregivers	62	10.9
Willingness to vaccinate your daughter[c]		
Yes	154	89.5
No	18	11.5
Willingness to suggest the HPV vaccine to others (i.e., relatives, friends)		
Yes	421	70.2
No	179	29.8

[a] Sample is limited to those who showed willingness to take HPV vaccine (n = 568)

[b] Percent may exceed 100% due to multiple responses

[c] Sample is limited to those who had at least one daughter (n = 172)

vaccine when compared with women with low education (aOR: 6.26, 95% CI = 2.50–15.65, $p < 0.001$). The odds of receiving the HPV vaccine among women with a high socio-economic class were 4.73-fold higher than women with a low socio-economic class (aOR: 4.73, 95% CI = 1.89–11.84, $p = 0.001$). Women who were aware of cervical cancer had higher odds to receive the HPV vaccine (aOR: 5.62, 95% CI = 2.19–14.44, $p < 0.001$). In terms of women's willingness to receive the HPV vaccine, age, education level, and using internet/social media were found as being significantly associated. Among women, higher odds of willingness to receive the HPV vaccine was found among those aged 15–29 years when compared with those aged ≥ 30 years (aOR: 1.92, CI = 1.21–3.04, $p = 0.006$). Similarly, increased odds to exhibit a willingness to receive the HPV vaccine emerged among women with high education (aOR: 1.93, CI = 1.25–4.42, $p = 0.005$) and women who were using internet/social media (aOR: 2.32, CI: 1.51–3.56, $p < 0.001$).

Discussion

In the present study, we evaluated the level of awareness and knowledge of cervical cancer and attitude towards HPV

vaccination among rural women in Bangladesh. To our knowledge, this is the first study conducted in Bangladesh and specifically focused on rural women. The study revealed that 71.8% of rural women were aware of cervical cancer, somewhat less than the higher level of awareness reported in a similar study among women in midlife (81.3%) and ever-married women (89.7%) living in Bangladesh [13, 18]. This finding was not unexpected due to the low level of education and reduced exposure to information on cervical cancer through health campaigns or by health caregivers. Notwithstanding, a relatively high level of awareness on cervical cancer was found in previous studies in India [29], Mozambique [27], and Cambodia [30], suggesting that intrinsic effort to remediate this situation can yield marked improvements in awareness. Socio-demographic characteristics such as marital status, education level, employment status, socio-economic class, and using internet/social media were significantly and independently associated with cervical cancer awareness. Moshi et al. [25] showed that socio-demographic characteristics, education level, age group, occupation, and place of residence were significantly correlated with the participant's awareness of cervical cancer. On the other hand, education level and income status were associated with awareness of cervical cancer, as reported by Patra et al. [29]. Akinlaja et al. [31] demonstrated cervical cancer awareness as significantly correlating with education levels. Likewise, we found that higher socio-economic class was more likely to be aware of cervical cancer, which concurs with previous findings in other countries [29, 32]. Also, being an internet/social media user had a higher level of cervical cancer awareness, likely by being a source of information dissemination regarding cervical cancer among women.

Interestingly, the majority of the participants reported that mass media (i.e., television, newspapers, radio) was the main source of information regarding cervical cancer and HPV vaccination a finding that is supported by Bhuiyan et al. [19] and Rahman et al. [17] in Bangladesh. This finding suggests that mass media is the widely used media among Bangladeshi women and can be influential in the dissemination of information on cervical cancer. Therefore, an urgent health education program is required that incorporates mass media with a variety of advertisements on cervical cancer. We also found evidence for a relatively minor impact by health professionals on the population in terms of cervical cancer awareness. This study also revealed that only 35.3% of participants accessed information from health care providers (i.e., doctors, nurses) regarding cervical cancer, expressing the minimal impact of health professionals in information dissemination among Bangladeshi rural women. Efforts should be made to engage all stakeholders including physicians and other healthcare professionals in the implementation of the aforementioned effective awareness campaigns and any HPV vaccine programs [19, 30]. In our study, very few (2.3%) of the women had

Table 5 Factors associated with attitude towards HPV vaccination among the participants: results of logistic regression model

Predictor variable	Received HPV vaccine[a]			Willingness to receive HPV vaccine[b]		
	n (%)	aOR (95% CI)	p value	n (%)	aOR (95% CI)	p value
Age (years)						
15–29	10 (31.3)	0.86 (0.36–2.09)	0.741	162 (37.2)	1.92 (1.21–3.04)	0.006
≥ 30	22 (68.7)	Ref.		273 (62.8)	Ref.	
Marital status						
Married	18 (56.3)	6.09 (1.93–19.26)	0.002	149 (34.3)	0.98 (0.46–2.11)	0.966
Single	14 (43.8)	Ref.		286 (65.7)	Ref.	
Education level						
High education	21 (65.6)	6.26 (2.50–15.65)	< 0.001	249 (57.2)	1.93 (1.25–4.42)	0.005
Low education	11 (34.4)	Ref.		186 (42.8)	Ref.	
Employment status						
Employed	23 (71.9)	1.44 (0.53–3.91)	0.477	161 (37.0)	1.45 (1.06–2.08)	0.068
Unemployed	9 (28.1)	Ref.		274 (63.0)	Ref.	
Socio-economic class						
High	20 (62.5)	4.73 (1.89–11.84)	0.001	298 (68.5)	1.57 (0.88–2.81)	0.127
Low	12 (37.5)	Ref.		137 (31.5)	Ref.	
Using internet/social media						
Yes	20 (62.5)	1.82 (0.82–4.03)	0.139	255 (58.6)	2.32 (1.51–3.56)	< 0.001
No	12 (37.5)	Ref.		180 (41.4)	Ref.	
Living distance of the nearest health facility						
Long	13 (40.6)	1.91 (0.81–4.50)	0.138	169 (38.9)	1.16 (0.74–1.81)	0.530
Short	19 (59.4)	Ref.		266 (61.1)	Ref.	
Aware of cervical cancer[c]						
Yes	18 (56.3)	5.62 (2.19–14.44)	< 0.001	327 (75.2)	1.37 (0.87–2.15)	0.174
No	14 (43.8)	Ref.		108 (24.8)	Ref.	

[a] Sample is limited to those who received at least one dose of the HPV vaccine (n = 32)

[b] Sample is limited to those who showed willingness to take HPV vaccine (n = 568)

[c] Sample is limited to those who heard of cervical cancer (n = 431)

aOR adjusted odds ratio, *CI* confidence interval

previously undergone screening for cervical cancer, a situation that is comparable with similar studies conducted in Bangladesh, which estimated the prevalence of cervical cancer screening at 1.1% and 1.9% in studies performed in 2003 and 2011, respectively [18, 33]. Thus, screening is markedly rare, and overall much less frequent than in other developing countries (19%) [34]. Therefore, the government of Bangladesh should take appropriate measures for widespread screening campaigns to increase awareness among women as well as foster increases in screening.

Our study has revealed significant knowledge gaps regarding cervical cancer with an overall mean knowledge score of 8.73 (SD: 2.68). Al-Shaikh et al. [35] found that the average total score of cervical cancer's knowledge among students was 8.33 (SD:4.58). This knowledge deficit about cervical cancer among Bangladeshi women is consistent with several other studies in Bangladesh [13, 19]. Women participating in this study poorly identified the common symptoms of cervical

cancer and the majority stated increased vaginal discharge but less than half of the women identified intensive periods or bleeding between periods and discomfort during sex or dyspareunia. The findings of our study concurred with similar studies performed in other countries (e.g., India, Malaysia, Mozambique) [27, 29, 36]. Low level of knowledge on clinical manifestations of cervical cancer can be one of the reasons reducing participation in cervical cancer screening and prevention programs in Bangladesh. In this study, approximately 64% percent of women considered having multiple sexual partners as the prime risk factors of cervical cancer. A similar study conducted by Islam et al. [18] found a sexual relationship with someone other than their husband as a potential risk factor to develop cervical cancer. Studies conducted among Malaysian and Indian women also found similar findings [29, 36]. More than half of the women stated early sexual initiation as a risk factor. Masika et al. showed that early sexual initiation constitutes a risk factor of cervical cancer in up to 44.3%

of women [37]. However, less than half of women reported prolonged use of birth control pills (> 5 years), poor hygiene management, and smoking cigarettes/tobacco as risk factors. Women taking oral contraceptives with at least 5 years exhibit a twofold risk of developing cervical cancer [38], yet very few women in India and Togo or Bangladesh for that matter knew about it [29, 39]. Knowledge regarding preventive measures of cervical cancer was not adequate among women. The majority of participants reported avoiding multiple sex partners and condom use as the major preventive measures against cervical cancer, which is supported by previous Bangladeshi study [18]. Only a limited number of women mentioned HPV vaccination and delaying sexual initiation as preventive measures of cervical cancer, and this corroborates the study by Di Giuseppe et al. [40] who reported that less than half of the women in their study knew about HPV vaccination and about delaying sexual initiation as preventive measures. HPV vaccination may be an effective approach for the prevention of cervical cancer, notably in a country with limited resources and treatment options [7], which further highlights the need for widespread coverage of HPV vaccination. In our cohort, we found a widespread lack of knowledge, as manifested by the extremely low knowledge scores in all categories. These knowledge deficits need to be addressed since lack of knowledge may lead to low-risk perception and low acceptability of the vaccine. Thus, the findings suggest the urgent need for public education that explicitly addresses knowledge deficits among rural women. In this study, we found that mean knowledge scores of women about cervical cancer significantly differ in terms of socio-demographic characteristics, such as marital status, educational level, employment status, and socio-economic class. A study conducted by Baloch et al. [32] found that cervical cancer knowledge was strongly associated with socio-demographic characteristics, such as ethnicity, age group, education level, and monthly income. Similarly, a study conducted among female university students showed that the mean knowledge score differed in terms of demographic variables [35].

This study found that a limited proportion of women (5.3%) had received at least one dose of the HPV vaccine to protect against cervical cancer. Evidence from previous studies found the percentage of HPV vaccine implementation ranged from 1 to 5.6% among Chinese, Saudi Arabian, and Cambodian women [30, 32, 41]. It is important to note that our study was conducted approximately 3 years after the release of the HPV vaccine in Bangladesh. Lack of media coverage about the HPV vaccine may be a contributing factor to low awareness. As such, resources should be allocated to a broad-ranging and culturally sensitive education campaign to increase acceptance of HPV vaccination among women in Bangladesh. Interestingly, the HPV vaccination rate was slightly higher than the screening rate among women in this study. A research performed by Montgomery et al. showed

that while only 5% of Indian women had previously screened the acceptance rate of HPV vaccines among them was 46% [42]. This finding is not surprising because, in the conservative culture like Bangladesh, the screening protocol is very sensitive and even less feasible for women. Multivariate logistic regression analysis found that women who were married, highly educated, and who belong to a high socio-economic class were more likely to be vaccinated against cervical cancer. It is not startling that married women were more vaccinated than their opposite counterparts due to the fact that women without any prior sexual activity are at lower risk for developing cervical cancer [43]. Women with high education and who belong to a high socio-economic class were also more vaccinated because they were more aware of their health and knowledgeable about cervical cancer.

The present study has shed some light on the interest among rural Bangladeshi women in receiving the HPV vaccine and found high willingness levels (76.6%) to receive the HPV vaccine. This further buttresses the need for vaccination campaigns. However, Islam et al. [18] reported that despite reduced knowledge on cervical cancer, Bangladeshi women showed high (urban: 93.9%, rural: 99.4%) willingness to receive the HPV vaccine. Our lower figures may be due to lower knowledge and limited exposure to information about HPV vaccination among the rural women surveyed, a finding that is consistent with other studies conducted in low- and middle-income countries [22, 27, 44]. Therefore, health education, barrier-specific counseling and outreach, and community-based interventions would be implemented in a population that is highly receptive and could lead to high HPV vaccination rates, if offered as part of a government-sponsored campaign. Indeed, the reasons behind the unwillingness towards vaccination among rural women suggested that financial barriers are an important factor influencing the adoption of the HPV vaccine. This finding is consistent with other studies [44, 45]. The financial burden associated with access to the HPV vaccine should be reduced, and whenever possible, the HPV vaccine should be provided free of cost to increase access for all women who wish to be vaccinated. Lack of knowledge about the vaccine and doubts about the safety and efficacy of the new vaccine are other barriers that prevent vaccination among Bangladeshi women [17, 30]. In the multivariate analysis, age, high education, and access to Internet/social media were factors associated with willingness to receive the HPV vaccination. Johnson et al. [46] found that younger women were more aware of cervical cancer and showed more willingness to be vaccinated. Women with higher education and those using Internet/social media had a higher willingness to receiving the HPV vaccine, a finding that corroborates a previous study in Bangladesh [17]. In addition, the present study revealed that among the study participants who have a daughter, a high interest (89.5%) to vaccinate their children were present, and 70.2% were willing to suggest HPV vaccine to

their neighbors and friends. High willingness (77.5%) was also found among Nepalese mothers to vaccinate their children [46]. Findings from studies conducted in other regions showed that maternal willingness to vaccinate their daughters was 83.6% and 74.5% in Mexico and Mali, respectively [6, 47]. It is proposed that efforts should be made in Bangladesh to remove barriers to knowledge, and resources should be committed to a broad-ranging and culturally responsive education campaign to increase acceptance among Bangladeshi women of HPV vaccination.

Conclusion

Finally, the findings from this study revealed even though Bangladeshi rural women remained aware of cervical cancer, an in-depth understanding of different aspects of cervical cancer along with the manifestations, risk factors, and preventive measures was not satisfactory. Meanwhile, the HPV vaccination rate among women was extremely low but still, a notable percentage demonstrated their willingness to receive the vaccine. These findings underscore the necessity for culturally appropriate and targeted educational interventions to improve knowledge of cervical cancer causes and its primary prevention through the HPV vaccine. This study also revealed a high willingness to be vaccinated among women to prevent cervical cancer. Findings from this study have important implications for designing and implementing HPV vaccine programs and educational interventions for the reduction in cervical cancer–related mortality and morbidity in Bangladesh.

Strengths and Limitations

The major strength of this study is the robust sampling of a socioeconomically homogeneous group of women in rural settings which will be helpful in designing effective health programs. However, this study has a few limitations. The study was cross-sectional and conducted only in some rural areas of the Dhaka district; as a result, it may not be generalizable. Furthermore, we utilized nonprobability-based convenience sampling to recruit participants.

Compliance with Ethical Standards

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