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Original Article

Physiology Section

Knowledge, Attitude and Acceptability of Human Papilloma Virus Vaccine among Undergraduate Medical Students in a Teaching Hospital of North Karnataka: A Cross-sectional Study

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ABSTRACT

Introduction: Human Papilloma Virus (HPV) is associated with a wide range of diseases and cancers globally, affecting both the genders, and can be effectively prevented by the HPV vaccine. As the literature on the knowledge, attitude, and acceptability of the HPV vaccine is limited, the present study was undertaken.

Aim: To assess the knowledge, attitude, acceptability, and recommendations regarding the HPV vaccine among undergraduate medical students at Gadag Institute of Medical Sciences (GIMS), Gadag, and to suggest the appropriate recommendations as an effective measure to reduce the burden and mortality due to HPV-related cancers.

Materials and Methods: The present cross-sectional study was conducted from September to October 2024 among undergraduate medical students from first year to final year, as well as interns at Gadag Institute of Medical Sciences (GIMS), Gadag, Karnataka, India. A total of 620 students responded to the study. Informed consents were obtained, data was collected using a pre-validated, semistructured questionnaire about knowledge (Cronbach's Alpha value-0.854), attitude, acceptability, and recommendations (Cronbach's Alpha value-0.82) regarding HPV infection and the v accine. Assessment of knowledge of HPV infection and HPV vaccines was conducted by scoring 1 point for correct answers and 0 points for incorrect answers. The score of 50% or more was considered to indicate a good knowledge score, while those with less than 50% indicated a poor knowledge score. Assessment of attitude, acceptability, and recommendation-related questions was done using a 5-point Likert scale. The Chi-square test and Fisher's exact test were used to assess the associations.

Results: Amongst the participants, 435 (70.2%) students had good knowledge, and 505 (81.5%) demonstrated a positive attitude, believing that receiving the HPV vaccine would be beneficial for a teenage girl or boy's future health. Additionally, 425 (68.6%) were willing to receive the vaccine. Students with a good knowledge score showed the significant association with vaccine acceptability (p=0.001) and recommendations to others (p=0.001).

Conclusion: Our study revealed the knowledge and attitude gaps even among medical students that need to be addressed at the earliest. Therefore, we suggest Conducting more educational and awareness programmes on HPV infection and the vaccine, not only for medical students but also for those in primary and secondary schools, colleges, and public places by the experts can work as an effective tool to fill the gaps. Both government and non-governmental organisations should take the necessary steps to customise the cost and availability of the vaccine in health centers.

Keywords: Human papilloma virus infection, Recommendations, Vaccination

INTRODUCTION

Among numerous sexually transmitted diseases, Human Papillomavirus (HPV) infection remains the most common worldwide [1]. It manifests in a wide range of diseases such as genital warts, precancerous lesions, and it can lead to cancers of the cervix, oral cavity, penis, vulva, vagina, and anus, if left untreated at the earlier stages. [2]. Among 200, 15 HPV types have been identified in the literature which can directly cause cervical cancers. Out of these 15 types, HPV16 and HPV18 are the two types that are strongly associated with 70% of all cervical cancers. worldwide [3]. Typically one of the High-risk HPV varieties associated with the chronic infection is considered to be the most common and primary cause of cervical cancer [4]. It is the fourth leading cancer among women worldwide, with approximately 527,624 new cases and 265,672 deaths annually, [5]. The HPV virus causes infections not only in females but also affects males, as it poses health risks for men as well. [6]. According to a study conducted in China, oral HPV infection is more prevalent in males than in females [7]. Thus, HPV infection poses a significant health threat and a substantial disease burden for both the genders. Each year, around 60,000 cases of HPV-related cancers are reported in men. as well [8].

HPV-related infections caused by potent HPV strains can be effectively prevented by the HPV vaccine. Therefore, the WHO recommends that boys and girls receive the vaccine before their sixteenth birthday, as the majority of them become sexually active by this age, increasing the risk of transmitting the infection through sexual contact [9].

Despite the WHO's recommendations and the availability of effective and safe HPV vaccines, this vaccine has not yet been included in the immunisation schedule in India. However, it has been available in private hospitals since 2008. In 2016, the governments of Delhi and Punjab effectively launched the HPV vaccine programme. There are three types of vaccines available in the country: the Quadrivalent vaccine (Gardasil™, Merck, USA), which protects against four strains of HPV (6, 11, 16, and 18); the Bivalent vaccine (Cervarix™, GSK Biologicals, Belgium), which provides protection against HPV types 16 and 18; and the Nonavalent HPV vaccine

(Gardasil 9), which protects against strains 6, 11, 16, 18, 31, 33, 45, 52, and 58 [4,10].

Effective measures are urgently required to assess the knowledge of HPV infection and vaccination among various groups to identify the gaps in knowledge and to explore the association between knowledge and vaccine uptake [11].

Although the HPV vaccine is available, numerous barriers still hinder its acceptance, including cultural factors, vaccine costs, and a lack of knowledge. As data on knowledge, attitude, and acceptability of the HPV vaccine is limited, the present study was undertaken to assess the knowledge, attitude, acceptability, and recommendations regarding the HPV vaccine among undergraduate medical students at GIMS Gadag. These students are the future healthcare providers and can play a key role in suggesting appropriate recommendations to effectively reduce the burden and mortality associated with HPV-related cancers. This study aims to identify the knowledge and attitude gaps regarding HPV infection and vaccination among emerging doctors, who can set an example and improve vaccination rates in the future.

MATERIALS AND METHODS

A cross-sectional study was conducted from September to October 2024 at the Gadag Institute of Medical Sciences (GIMS), Gadag, Karnataka, India. Undergraduate medical students from the first to final year, as well as interns who provided consent, were included in the study. Students who were consecutively absent more than three times during the data collection period were excluded from the study.

Sample size: Shetty S et al., conducted a study in the year 2019, [4] in a tertiary care teaching hospital in Mangalore involving undergraduate medical, dental, and nursing students, reported that the proportion of students with good knowledge about HPV vaccination was 44%. Considering p=44%, q=100-p, and allowing for a 5% absolute error, the sample size was calculated using the formula 4pq/l2, resulting in a sample size of 394. A non-response rate of 10% was factored in, raising the required sample size to 433. There were a total of 750 medical students and interns at GIMS, Gadag. Out of them, 620 students responded and participated in the present study.

Data collection tool and procedure: Ethical clearance was obtained from our Institutional Ethical Committee (Ref No. GIMS/IEC/154/2024). After securing written informed consent via Google Sheets, data were collected using a pre-validated semistructured questionnaire designed with reference to various prior studies [4,12]. The questionnaire consisted of three sections:

1. **Socio-demographic information:** This section included gender, age, locality, year of study, socioeconomic status (classified based on modified B.G. Prasad classification) [13,14], parental education, parental occupation (divided based on the National Classification of Occupations) [15], marital status, sexual status, and personal habits.
2. **Knowledge assessment:** This section assessed knowledge about HPV infection and the HPV vaccine.
3. **Attitude assessment:** The third section included participants' attitudes towards HPV infection and the HPV vaccine.

The questionnaire had 20 questions on knowledge of HPV infection and HPV vaccines, with response options of True/False/I don't know. Each correct answer received one point, while incorrect answers and "I don't know" responses were scored as zero. A score of 50% or more of correct answers was considered a good knowledge score, while less than 50% indicated a poor knowledge score.

The assessment of attitudes related to HPV infection and HPV vaccines was conducted using 23 statements on a 5-point Likert scale (1=Strongly agree, 2=Agree, 3=Neutral, 4=Disagree, 5=Strongly disagree) [4,16]. In the attitude section, a response of "strongly agree" or "agree" for Question 21 was considered indicative of the acceptability of the HPV vaccine, while "strongly agree" or "agree" for Question 22 indicated a recommendation for HPV vaccination to others. Conversely, a neutral, disagree, or strongly disagree response was interpreted as non-acceptance and non-recommendation of HPV vaccination. The reliability of the questionnaire was tested using SPSS software, yielding a Cronbach's alpha value of 0.854 for the knowledge section and 0.820 for the attitude section.

STATISTICAL ANALYSIS

Statistical analysis was carried out using the Statistical Package for the Social Sciences (SPSS, version 20.0). The data were summarised using descriptive statistics. The Chi-square test and Fisher's exact test were applied to study the association of factors. A p-value less than or equal to 0.05 was considered statistically significant.

RESULTS

Among 620 medical students, 359 (57.9%) were males and 261 (42.1%) were females, with ages ranging from 18 to 26 years. The mean age was 21.27±1.42 years. Most of the students were single (616, 99.4%) and sexually inactive (610, 98.4%). Regarding personal habits, the majority were non-alcoholic and non-smokers (576, 92.9%). Most of the students belonged to the middle class in terms of socioeconomic status (456, 73.6%) [Table/Fig-1].

Variable	N=620 (100%)
Gender	
1. Male	359 (57.9%)
2. Female	261 (42.1%)
Age group	
1. 18-19	84 (13.5%)
2. 20-22	407 (65.6%)
3. 23-25	128 (20.7%)
4. >25	1 (0.2%)
Locality	
1. Urban	381 (61.5%)
2. Rural	239 (38.5%)
Year of course	
1. First year	137 (22.1%)
2. Second year	137 (22.1%)
3. Third year	130 (21%)
4. Fourth year	129 (20.8%)
5. Internship	87 (14.0%)
Socio-economic status [9]	
1. Upper and upper middle	66 (10.6%)
2. Middle	456 (73.6%)
3. Lower middle and lower	98 (15.8%)
Mother's education	
1. Illiterate	65 (10.5%)
2. Primary school	48 (7.7%)
3. High school	152 (24.5%)
4. Intermediate (PUC/Diploma/ITI)	83 (13.4%)
5. Graduates	192 (31.0%)
6. Postgraduate/PhD	80 (12.9%)
Mother's occupation [14]	
1. Professionals	15 (2.4%)
2. Semiprofessionals	137 (22.1%)
3. Skilled	16 (2.6%)
4. Semiskilled	4 (0.6%)
5. Unskilled	25 (4.0%)
6. Housewife	423 (68.2%)

Father's education	
1. Illiterate	21 (3.4%)
2. Primary school	36 (5.8%)
3. High school	64 (10.3%)
4. Intermediate (PUC/Diploma/ITI)	110 (17.7%)
5. Graduates	282 (45.5%)
6. Postgraduate/PhD	105 (16.9%)
7. Education status not known	02 (0.3%)
Father's occupation [14]	
1. Professionals	62 (10.0%)
2. Semi-professionals	231 (37.3%)
3. Skilled	10 (1.6%)
4. Semiskilled	265 (42.7%)
5. Unskilled	22 (3.5%)
6. Retired/unemployed	22 (3.5%)
7. Died	8 (1.3%)
Marital status	
1. Dating	4 (0.6%)
2. Single	616 (99.4%)
Sexual status	
1. No	610 (98.4%)
2. Yes	10 (1.6%)
If Yes,	
With contraception	9 (1.5%)
Without contraception	1 (0.2%)
Personal habits	
1. Alcohol abuse	32 (5.2%)
2. Tobacco abuse	12 (1.9%)
3. None	576 (92.9%)

[Table/Fig-1]: Distribution of Study participants by Socio-demographic Profile.

[Table/Fig-2] presents knowledge about HPV infection and the vaccine. Most students (547, 88.2%) were aware that cervical cancer is caused by persistent HPV infection and it is sexually transmitted; however, only 291 (46.9%) knew that more than 50% of sexually active men and women are infected with HPV at some point in their lives. The majority (419, 67.6%) of students knew that HPV infection also occurs in males, but (309, 49.8%) understood that HPV can cause oro-pharyngeal cancer. Additionally, 424 (68.4%) students incorrectly reported that condoms protect against HPV infection.

Furthermore, 488 (78.7%) of the students knew that HPV infection can be prevented by the HPV vaccine, and 409 (66.0%) reported that both males and females should be vaccinated against HPV. Only 249 (40.2%) of the students correctly stated that the HPV vaccine does not clear existing infections, and merely 209 (33.7%) were aware of the cost of the vaccine.

[Table/Fig-3] shows the overall knowledge score among the students, with 435 (70.2%) demonstrating good knowledge regarding HPV infection and vaccination, while the remaining 185 (29.8%) exhibited poor knowledge.

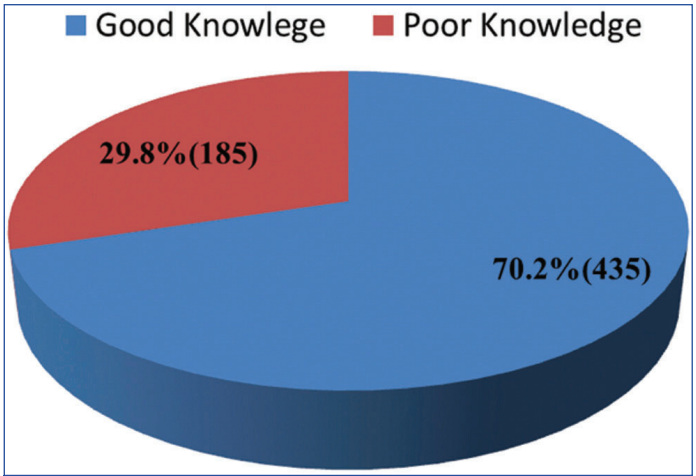
[Table/Fig-4] (Q1-Q23) shows the attitude scores. Most students (502, 81%) strongly agreed or agreed that HPV is a serious infection; however, only 93 (15%) strongly agreed or agreed that they could easily become infected with HPV. The majority of students (505, 81.5%) felt that HPV vaccination is beneficial for both teenage girls' and boys' future health. Additionally, 514 (82.9%) of the students reported that education regarding HPV infection should be provided in schools.

Furthermore, 484 (78.1%) of the students stated that the HPV vaccine should be made affordable by the Government of India for adolescents and young adults. A total of 473 (76.3%) medical students agreed on the recommendation of the vaccine for teenage girls and young women, while 395 (63.7%) agreed on the recommendation for teenage boys and young men.

However, 150 (24.2%) of the students found it difficult and embarrassing to inquire about the HPV vaccine, as it is associated with sexually transmitted diseases. Additionally, 104 (16.8%) of the students reported feeling embarrassed if others knew they had received the HPV vaccine. Despite this, 374 (60.3%) of the students expressed their willingness to receive and recommend the vaccine, regardless of whether they came from a conservative family or not.

	HPV infection, cervical cancer related statements	Correct answer	True	False	I don't know
1	Cervical cancer is most commonly associated with persistent HPV infection	True	547 (88.2%)	8 (1.3%)	65 (10.5%)
2	HPV sexually transmitted	True	547 (88.2%)	17 (2.7%)	56 (9.0%)
3	More than 50% of sexually active men and women are infected with HPV at some point in their lives	True	291 (46.9%)	102 (16.5%)	227 (36.6%)
4	HPV is transmitted to the partner only if the carrier shows symptoms	False	136 (21.9%)	296 (47.7%)	188 (30.3%)
5	HPV can cause oropharyngeal cancer	True	309 (49.8%)	90 (14.5%)	221 (35.6%)
6	There are specific HPV types that cause cervical cancer	True	475 (76.6%)	19 (3.1%)	126 (20.3%)
7	Most HPV infections will be cleared by the immune system	True	268 (43.2%)	129 (20.8%)	223 (36.0%)
8	HPV can infect males	True	419 (67.6%)	59 (9.5%)	142 (22.9%)
9	Most HPV infections don't cause any symptoms	True	264 (42.6%)	155 (25.0%)	201 (32.4%)
10	There is no current antiviral drug to cure HPV	True	241 (38.9%)	152 (24.5%)	227 (36.6%)
11	Condoms protect against HPV	False	424 (68.4%)	50 (8.1%)	146 (23.5%)
	HPV vaccine related statements				
12	There is a vaccine to prevent HPV infection	True	488 (78.7%)	36 (5.8%)	96 (15.5%)
13	Currently available HPV vaccines protect against 2 or more HPV types	True	369 (59.5%)	49 (7.9%)	202 (32.6%)
14	Both, males and females, should be vaccinated	True	409 (66.0%)	80 (12.9%)	131 (21.1%)
15	HPV vaccines help clear the existing HPV infection	False	207 (33.4%)	249 (40.2%)	164 (26.5%)
16	Adolescents and young adults are screened for HPV before getting vaccinated	True	342 (55.2%)	87 (14.0%)	191 (30.8%)
17	Girls/women who have already been vaccinated also require cervical cancer screening	True	386 (62.3%)	61 (9.8%)	173 (27.9%)
18	HPV vaccine is currently recommended for the age group between 9 to 26 years	True	409 (66.0%)	52 (8.4%)	159 (25.6%)
19	The market cost of HPV vaccine in India is ranging from 5000 to 10,000 rupees	True	209 (33.7%)	63 (10.2%)	348 (56.1%)
20	Two or more doses of HPV vaccine are required for protection	True	375 (60.5%)	45 (7.3%)	200 (32.3%)

[Table/Fig-2]: Knowledge statements of HPV infection and HPV vaccine (n=620).



[Table/Fig-3]: Distribution of subjects according to their knowledge scores.

Finally, 455 (73.4%) of the study participants indicated that they would like to receive education about HPV vaccination from experts.

[Table/Fig-5] shows the association factors for the acceptability (Q21) and recommendation (Q22) of the HPV vaccine. Among students with a good knowledge score, 336 (77.24%) were willing to receive the vaccine if it were available free of charge, whereas only 89 (48.11%) students with poor knowledge agreed to receive the HPV vaccine free of cost. This association was found to be statistically highly significant (p=0.0001). Among students with a good knowledge score, 344 (79.08%) were willing to recommend the vaccine to others, while 99 (53.51%) students with poor knowledge expressed a willingness to recommend the vaccine. This association was also found to be statistically highly significant (p=0.0001).

Furthermore, significant associations were observed between gender (p=0.0008) and year of study (p=0.005) with the acceptability of the

Q. No.	Attitude assessing statement	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
1	I think I can be easily infected by HPV	17 (2.7%)	76 (12.3%)	215 (34.7%)	189 (30.5%)	123 (19.8%)
2	I think HPV infection is a serious disease	173 (27.9%)	329 (53.1%)	102 (16.5%)	13 (2.1%)	3 (0.5%)
3	Getting the HPV vaccine would be beneficial to a teenage girl or boy's future health	241 (38.9%)	264 (42.6%)	99 (16.0%)	10 (1.6%)	6 (1.0%)
4	Getting the HPV vaccine will send a message to teenagers that it is OK to have sex	27 (4.4%)	116 (18.7%)	256 (41.3%)	176 (28.4%)	45 (7.3%)
5	Education on HPV should be implemented at school	278 (44.8%)	236 (38.1%)	93 (15.0%)	10 (1.6%)	3 (0.5%)
6	Men can get involved to prevent their partner from getting cervical cancer	166 (26.8%)	253 (40.8%)	172 (27.7%)	24 (3.9%)	5 (0.8%)
7	People who have only one sexual partner have a low-risk of becoming infected with HPV	103 (16.6%)	295 (47.6%)	173 (27.9%)	43 (6.9%)	6 (1.0%)
8	Using a condom can provide 100% protection against HPV infection	36 (5.8%)	147 (23.7%)	257 (41.5%)	159 (25.6%)	21 (3.4%)
9	HPV vaccination is not necessary because a Pap test can be done to rule out cervical cancer	28 (4.5%)	81 (13.1%)	234 (37.7%)	220 (35.5%)	57 (9.2%)
10	It is preferable to vaccinate both men and women against HPV	130 (21.0%)	280 (45.2%)	182 (29.4%)	21 (3.4%)	7 (1.1%)
11	I believe that Government of India must make the HPV vaccine affordable to all adolescents and young adults given the benefits it offers	238 (38.4%)	246 (39.7%)	122 (19.7%)	9 (1.5%)	5 (0.8%)
12	I have had family/friends sought my opinion regarding HPV vaccination	57 (9.2%)	167 (26.9%)	299 (48.2%)	76 (12.3%)	21 (3.4%)
13	I believe that the HPV vaccine should be recommended for all teenage girls and young women	215 (34.7%)	258 (41.6%)	129 (20.8%)	15 (2.4%)	3 (0.5%)
14	I believe that vaccination should be recommended for all teenage boys and young men	146 (23.5%)	249 (40.2%)	197 (31.8%)	23 (3.7%)	5 (0.8%)
15	I believe it would be difficult and embarrassing for meto ask for the HPV vaccine because it is associated with a sexually transmitted infection	29 (4.7%)	121 (19.5%)	217 (35.0%)	194 (31.3%)	59 (9.5%)
16	If other people knew I received the HPV vaccine, I would be embarrassed	16 (2.6%)	88 (14.2%)	189 (30.5%)	237 (38.2%)	90 (14.5%)
17	I would worry about what my partner or future partner would think if I received the HPV vaccine	30 (4.8%)	84 (13.5%)	216 (34.8%)	214 (34.5%)	76 (12.3%)
18	If other people knew I have HPV infection, I would be embarrassed	30 (4.8%)	139 (22.4%)	252 (40.6%)	158 (25.5%)	41 (6.6%)
19	I would be willing to get a PAP smear for cervical cancer screening	62 (10.0%)	192 (31.0%)	290 (46.8%)	55 (8.9%)	21 (3.4%)
20	I would like to receive or recommend HPV vaccination, whether or not they come from conservative families	110 (17.7%)	264 (42.6%)	221 (35.6%)	21 (3.4%)	4 (0.6%)
21	I believe that all physicians should recommend every teenage girl to be vaccinated and inform them about harmful effects of HPV	168 (27.1%)	282 (45.5%)	155 (25.0%)	13 (2.1%)	2 (0.3%)
22	Knowing the risks of HPV, I would like to be educated by the experts on HPV vaccination	147 (23.7%)	308 (49.7%)	151 (24.4%)	12 (1.9%)	2 (0.3%)
23	If this vaccine is freely available in schools/clinics, I would be willing to take the vaccine	169 (27.3%)	256 (41.3%)	181 (29.2%)	13 (2.1%)	1 (0.2%)
24	If this vaccine is freely available in school/clinics, I would be willing to recommend the vaccine to others	189 (30.5%)	254 (41.0%)	159 (25.6%)	13 (2.1%)	5 (0.8%)
25	Knowing the risks of HPV, I intend on taking HPV vaccine in the future	161 (26.0%)	264 (42.6%)	180 (29.0%)	12 (1.9%)	3 (0.5%)

[Table/Fig-4]: Attitude questions related to HPV infection and vaccine (n=620).
*p-value was calculated using Fisher's Exact test

Variables	Acceptability of HPV vaccine			Recommendation of HPV vaccine		
Gender	Accepted (n=425)	Not accepted (n=195)	p-value	Recommended (n=443)	Not recommended (n=177)	p-value
Males	227 (63.23%)	132 (36.76%)	**0.0008**	235 (65.46%)	124 (34.54%)	**0.0001**
Females	198 (75.86%)	63 (24.13%)		208 (79.69%)	53 (20.31%)	
Age						
18-22	338 (68.84%)	153 (31.16%)	0.76	356 (72.51%)	135 (27.49%)	0.25
>22	87 (67.44%)	42 (32.56%)		87 (67.44%)	42 (32.56%)	

Locality						
Rural	166 (69.46%)	73 (30.54%)	0.699	172 (71.97%)	67 (28.03%)	0.822
Urban	259 (67.98%)	122 (32.02%)		271 (71.13%)	110 (28.87%)	
Year of course						
Firs	88 (64.23%)	49 (35.77%)	**0.005**	98 (71.53%)	39 (28.47%)	**0.006**
Second	84 (61.31%)	53 (38.69%)		83 (60.58%)	54 (39.42%)	
Third	106 (81.54%)	24 (18.46%)		105 (80.77%)	25 (19.23%)	
Fourth	87 (67.44%)	42 (32.56%)		96 (74.42%)	33 (25.58%)	
Internship	60 (68.97%)	27 (31.03%)		61 (70.11%)	26 (29.89%)	
Socio-economic status						
High and Middle-high	53 (80.30%)	13 (19.70%)	0.06	56 (84.85%)	10 (15.15%)	**0.02**
Middle	310 (67.98%)	146 (32.02%)		322 (70.61%)	134 (29.39%)	
Middle low and low	62 (63.27%)	36 (36.73%)		65 (66.33%)	33 (33.67%)	
Marital status						
Single	421 (68.34%)	195 (31.66%)	0.423*	439 (71.27%)	177 (28.73%)	0.51*
Dating	4 (100%)	0 (0%)		4 (100%)	0 (0%)	
Sexual status						
Yes	6 (60%)	4 (40%)	0.55	8 (80%)	2 (20%)	0.54
No	419 (68.69%)	191 (31.31%)		435 (71.31%)	175 (28.69%)	
Personal habits						
Alcoholism	22 (68.75%)	10 (31.25%)	0.74	22 (68.75%)	10 (31.25%)	0.23
Smoking	7 (58.33%)	5 (41.67%)		6 (50%)	6 (50%)	
None	396 (68.75%)	180 (31.25%)		415 (72.05)%)	161 (27.95%)	
Knowledge						
Good	336 (77.24%)	99 (22.76%)	**≤0.001**	344 (79.08%)	91 (20.92%)	**≤0.001**
Poor	89 (48.11%)	96 (51.89%)		99 (53.51%)	86 (46.49%)	

[Table/Fig-5]: Association of Sociodemographic, Knowledge and with Acceptance and Recommendation of HPV vaccine.

vaccine. Statistically significant associations were noted between gender (p=0.0001), year of study (p=0.006), and socioeconomic status (p=0.020) with the recommendation of the vaccine.

Other socio-demographic variables did not significantly influence vaccine acceptability or its recommendation to others. The p-value was calculated using Fisher's exact test.

DISCUSSION

Screening knowledge regarding HPV infection and the HPV vaccine, as well as assessing the association of knowledge with vaccine acceptability and recommendations to others using a pre-validated questionnaire, is an effective measure to reduce the burden and mortality associated with HPV-related cancers. In the present study, approximately 88.2% of students were aware of the mode of HPV transmission, whereas a study conducted by Thakur M et al., reported that 71.26% of participants correctly identified the mode of transmission [17]. In contrast, a study by Khan TM et al., indicated that only 51% of students knew about the mode of HPV transmission [18]. This variation may be attributed to the fact that our study included only medical students, whereas Khan TM's study included non-medical students as well.

In the present study, 88.2% of students correctly reported that cervical cancer is mostly associated with HPV infection, whereas in the study by Thakur M et al., 71.49% of participants provided the correct response [17]. In contrast, the study by Khan TM et al., found that around 55% of students were aware of the association between HPV infection and cervical cancer [18].

Moreover, 67.6% of the students in our study acknowledged that HPV infection can occur in males, with similar findings of 62.6% reported in the study conducted by Shetty S et al., [4]. Additionally, a study by Harrison SE et al., indicated that 76.38% of parents of adolescents residing in the southern United States correctly recognised this association [11]. The similarities in the findings of these studies may be due to the participants' enhanced awareness of the risks associated with HPV infection.

However, only 38.9% of the students in our study knew that there is no antiviral drug to cure HPV infection, whereas 23.1% of the students were aware of the availability of antiviral drugs for HPV in the study conducted by Shetty S et al., [4]. In our study, 78.7% of the students knew about the HPV vaccine, while Thakur M et al., reported that 54.6% of their participants had this knowledge [17]. Similarly, Khan TM et al., found that 47% of their study subjects were aware of the vaccine [18]. The variations in knowledge regarding the HPV vaccine could be attributed to the inclusion of non-medical students in Khan TM et al.'s study.

Around 66.0% of the medical students in our present study understood that both females and males should be vaccinated against HPV. A similar finding was also observed in the study by Shetty S et al., [4], where 64.4% of medical students agreed. The results from both studies are comparable, possibly because the participants were all medical students. In our study, 40.2% of the students reported that the HPV vaccine cannot clear existing HPV infections, a finding that aligns with Shetty S et al., where approximately 47.1% of medical students reported correctly.

In our study, only 8.1% of students answered correctly that condoms do not protect against HPV, which is similar to the 8.9% of medical students who answered correctly in the study by Shetty S et al., [4]. The agreement in findings may be due to the participants sharing the same educational background. In contrast, Khan TM et al., reported that 21.54% of their participants believed that condoms protect against HPV [18]. The differing findings could be attributed to variations in study setting, locality, and the overall knowledge level of the participants.

In the present study, more than half of the participants, approximately 68.6%, were willing to receive the vaccine if it were made freely available at schools and clinics; the same proportion of students

expressed their willingness to take the vaccine in the future. Around 71.5% of the participants demonstrated a positive attitude towards recommending the vaccine to others if it were provided free of charge. Similar findings were reported in a study by Thakur M et al., where 76.63% of male participants agreed to recommend the HPV vaccine for girls [17]. Additionally, in a study conducted in China by Wu H et al., among male college students, 85.42% indicated they would recommend the vaccine to their female partners [6]. The results are consistent as the participants in these studies were all medical students, which likely increased their awareness of HPV infection-related risks and benefits of the HPV vaccine, including its efficacy. Consequently, they were more inclined to recommend the HPV vaccine to their partners.

In contrast, a study in Iran conducted by Sharjabad FN et al., among female college students found that only 54.1% were willing to receive the vaccine. The difference in acceptability may be attributed to variations in subjects, cultural differences, and health beliefs [19].

In the present study, among students with a good knowledge score, 77.24% intended to receive the vaccine, and 79.08% were willing to recommend the vaccine to others if it were available free of cost at schools or clinics. This association was found to be statistically significant. Similar findings were observed in the study conducted by Shetty S et al., [4], which included undergraduate medical, dental, and nursing students; among those with a good knowledge score, 77.24% were ready to accept the vaccine, and 79.08% were willing to recommend it. A similar association was reported in a study involving male college students in China, conducted by Wu H et al., [6].

The consistent observations across these studies may be due to the heightened awareness of HPV among the participants. Furthermore, a study conducted in Iran by Sharjabad FN et al., among female college students with moderate to good knowledge scores showed greater acceptance of the HPV vaccine compared to those with poor knowledge [19]. The similarities in findings across these studies can be attributed to the overall awareness regarding HPV infection and its associated risks.

Hence, it can be concluded that a good level of knowledge regarding HPV infection and the vaccine is significantly and positively associated with vaccine acceptability and recommendations to others. Therefore, it is crucial to increase awareness about HPV infection and the vaccine, not only among medical students-who are the future doctors-but also among all students and the parents of adolescents.

Limitation(s)

Our study included only medical students and was conducted in a single study setting. Additionally, convenience sampling was employed, and a pre- and post-test assessment was not carried out. Furthermore, there was gender variation, which means that the results cannot be generalised.

CONCLUSION(S)

Most of the students in our study had good knowledge and a positive attitude towards HPV vaccination. Two-thirds of the medical students accepted the idea of receiving the vaccine and recommending it to others. However, one-third of the students demonstrated poor knowledge, and nearly one-fourth felt embarrassed about receiving the HPV vaccine because it is associated with a sexually transmitted infection. These knowledge and attitude gaps need to be addressed.

Therefore, we suggest that more educational and awareness programmes should be conducted on HPV infection and vaccination. Such initiatives should not only target medical students but also reach higher primary and secondary school students, college students, and the general public, through expert-led sessions and advertisements in the media. The government and non-governmental organisations should take necessary steps to customise the cost and availability of the vaccine in health centers.

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