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An analysis of knowledge, awareness, and attitude about cervical cancer and its prevention among urban Indian adolescents: A cross-sectional study

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Abstract

Cervical cancer is the third leading malignancy among women in the world and the leading cause of mortality among women accounting for 23.3% of all cancer deaths. Cervical cancer is a preventable gynecological cancer provided that the HPV infection is detected and established early. The prevention, early diagnosis, and treatment of cervical cancer largely depend on the level of awareness and knowledge about different aspects of the disease and its vaccine. This study aimed to assess the level of awareness and knowledge of cervical cancer among urban adolescents. A cross-sectional online survey was conducted, involving 208 participants aged 12 to 19 years. Categorical variables were presented in the form of numbers and percentages and quantitative data as the means \pm SD and as median with 25th and 75th percentiles (Interquartile range). The association of the variables was analyzed using the Chi-Square test, Fisher's exact test, and Kruskal Wallis test.

The results revealed 174 (83.65%) participants had heard about cervical cancer with social media as the main source of knowledge, 142 (68.27%). An overwhelming majority of respondents, 206 (99.04%), indicated they were not aware of any warning signs of cervical cancer. Furthermore, while 120 (57.69%) were aware of the availability of vaccines for the prevention of cervical cancer for females, only 19 (9.13%) were aware of its recommendation for males. Age, education level, and stream of education showed a significant correlation with certain aspects of awareness and prevention ($p < 0.05$).

In conclusion, this study highlights the critical need for improved cervical cancer awareness and prevention among adolescents including boys in urban settings. Appropriate strategies should be developed to provide proper information to this segment of the population. Implementing educational programs in school curricula, increasing healthcare professionals' involvement in patient education, and creating awareness workshops are vital steps to reaching a wider audience.

Keywords: Cervical cancer, awareness, adolescents, vaccination, human papilloma virus, risk factors

Introduction

Cervical cancer is presently the most common cancer affecting the female genital tract in the world. It is the third leading malignancy among women in the world and the second most common cancer among women in developing countries. In India, it is one of the leading causes of mortality among women accounting for 23.3% of all cancer deaths [1]. The risk factors for cervical cancer are early incidence of first sexual intercourse, multiparity, tobacco smoking, and multiple sex partners [2]. Cervical cancer is one of the preventable gynecological cancers with an identifiable etiological factor of infection by human papillomavirus (HPV) especially the high-risk subtypes—HPV-16 and HPV-18, which are responsible for approximately 70% of CC cases [3]. Reproductive and sexual factors, such as multiple sexual partners, multiparity, and early age at first intercourse and first childbirth, are attributable to an increased risk of HPV infection [2].

Therefore, provided that the HPV infection is detected and established early, this cancer is easily curable [3]. The prevention, early diagnosis, and treatment of cervical cancer largely depend to a great extent on the level of awareness and knowledge about different aspects of the disease and the vaccine [4].

Youth brings significant physical, psychological, and social development. Risk-taking behavior and susceptibility to social influence increase at a time when young people are becoming more independent in decision-making and action. Initiation and persistence of risk behavior are influenced by youths' perception of the conditional risk associated with specific behaviours, as

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well as a n understanding of the potential short-term and long-term health consequences associated with such behaviours [5].

Several studies have been conducted on awareness and prevention of cervical cancer but their primary focus has been on either “nursing staff” working in hospitals or women. Not many studies have explored the knowledge of adolescents who form an integral part of the infection chain. [1]. It is therefore important to target immunizable young adult college-going girls and boys, since they are at risk for HPV infection as they are living a more independent lifestyle but have a choice to undergo vaccination with the consent from parents and are within the age group of successful vaccination outcome. Hence, assessment of their knowledge, awareness, and attitude towards the causes of cervical cancer, HPV infection, and vaccination available for the disease including adequate participation in immunization programs can lead to a successful reduction in disease burden and control of cervical cancer in India [4].

The adolescent’s knowledge and attitude about the disease are influenced by socio-demographic factors and the availability and accessibility of health services [5]. The present study aimed at exploring the extent of knowledge, awareness, and attitude towards HPV, HPV vaccine, and cervical cancer and the acceptability of cervical cancer vaccine among adolescent boys and girls in urban settings. Additionally, the study was undertaken to identify and analyze a probable relationship between the knowledge about cervical cancer and sociodemographic parameters.

Materials and Methods

This cross-sectional, observational study was carried out in an urban setting in India over 2 months from February 2024 to March 2024 after obtaining institutional scientific and ethical committee approval. Participants with access to the internet and of ages 14 to 19 years who were able to understand English and willing to participate were included.

An informed consent was obtained from all the study participants. The objective of the study was explained and the time required to fill the questionnaire was informed to the respondents. They were informed that they could refuse to participate and could withdraw from the study at any time without any loss/penalty. No pressure/coercion was exerted on the participants for participation in the study. Confidentiality of information was assured to all the participants.

An online structured questionnaire was developed by using Google Forms, with a description form appended to it. The link of the questionnaire was sent through WhatsApp to the school students of English medium schools and the participants were encouraged to rollout the survey to as many as possible. Thus, the link was forwarded to people apart from the first point of contact and so on. On receiving and clicking the link the participants got auto-directed to the information about the study. A set of several questions appeared sequentially, which the participants were supposed to answer. The identity of the participants was not divulged to the investigators.

This self-constructed questionnaire was used to assess participants’ knowledge about cervical cancer, based on data retrieved from Medscape and with reference to other

questionnaires used in similar studies with modifications tailored to the background of the study population. The questionnaire was drafted with 3 sections. The first set included three questions related to sociodemographic details (age, gender, level of education, and stream of education). The second set included questions on awareness and the last section was on prevention.

Data and Statistical Analysis

The presentation of the Categorical variables was done in the form of numbers and percentage (%). On the other hand, the quantitative data with non-normal distribution were presented as median with 25th and 75th percentiles (Interquartile range). The data normality was checked by using Shapiro-Wilk test. In the cases in which the data was not normal, we used non-parametric tests. The following statistical tests were applied to the results:

1. The association of the variables which were quantitative and not normally distributed in nature was analysed using Mann-Whitney Test (for two groups) and Kruskal Wallis test (for more than two groups).
2. The association of the qualitative variables was analysed using Chi-Square test. If any cell had an expected value of less than 5 then Fisher’s exact test was used.

The data entry was done in the Microsoft EXCEL spreadsheet and the final analysis was done using Statistical Package for Social Sciences (SPSS) software, IBM manufacturer, Chicago, USA, ver 25.0.

Sample size

The study by Ramavath Krishna Kavita, *et al.* observed that 28% of the participants know about cervical cancer or HPV. Taking this value as reference, the minimum required sample size with 6.5% margin of error and 5% level of significance is 184. To reduce margin of error, total sample size taken was 208. (6)

Formula used is:-

$$n \geq (p(1-p))/(ME/z\alpha)^2$$

Where $Z\alpha$ is value of Z (normal variate) at two sided alpha error of 5%, ME is margin of error p is proportion of patients who know about cervical cancer or HPV Calculations:-

$$n \geq ((.28*(1-.28))/(.065/1.96)^2 = 183.31 = 184(\text{approx.})$$

Results

Out of 208 participants, 90 (43.27%) were aged between 16 and 17 years, while 84 (40.38%) fell within the age range of 14-15 years. Only 34 out of the total participants (16.35%) were in the age group of 18-19 years. Regarding gender distribution, the majority were females, accounting for 139 (66.83%) participants, followed by 68 (32.69%) males, and 1 (0.48%) case categorized as others. 175 (84.13%) participants were currently enrolled in school, while 33 (15.87%) participants were attending college. 125 (60.10%) participants were pursuing science-related subjects, while 83 (39.90%) were studying non-science subjects.

Table 1: Awareness about cervical cancer distribution.

Awareness about cervical cancer	Frequency	Percentage
Heard of cervical cancer		
No	24	11.54%
Maybe	10	4.81%
Yes	174	83.65%
Do you think it can lead to death?		
No	3	1.44%
Maybe	44	21.15%
Yes	161	77.40%
Is it infectious and if so can it get transferred through sexual contact?		
No	78	37.50%
Maybe	74	35.58%
Yes	56	26.92%

Among the respondents, 174 (83.65%) reported having heard of cervical cancer, while 24 (11.54%) stated they had not heard of it, and 10 (4.81%) were uncertain. Regarding the perception of its lethality, 161 (77.40%) respondents believed cervical cancer could lead to death, 44 (21.15%) were unsure, and 3 (1.44%) did

not think it could be fatal. Regarding its infectious nature and the possibility of transmission through sexual contact, 78 (37.50%) respondents stated that cervical cancer is not infectious, while 74 (35.58%) were uncertain, and 56 (26.92%) believed it could be transmitted through sexual contact. (Table 1).

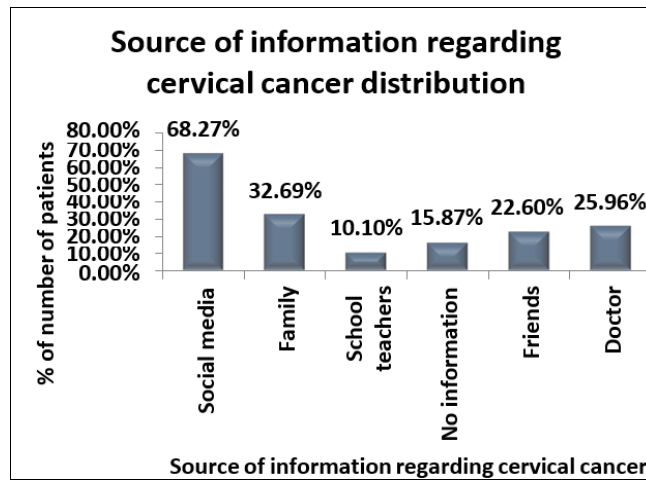


Fig 1: Source of information regarding cervical cancer distribution.

Among the respondents, 142 (68.27%) reported obtaining information about cervical cancer from social media, while 68 (32.69%) relied on family members. Additionally, 54 (25.96%) respondents received information from healthcare professionals,

47 (22.60%) from friends, and 21 (10.10%) from school teachers. However, 33 (15.87%) respondents indicated they had not received any information about cervical cancer (Figure 1).

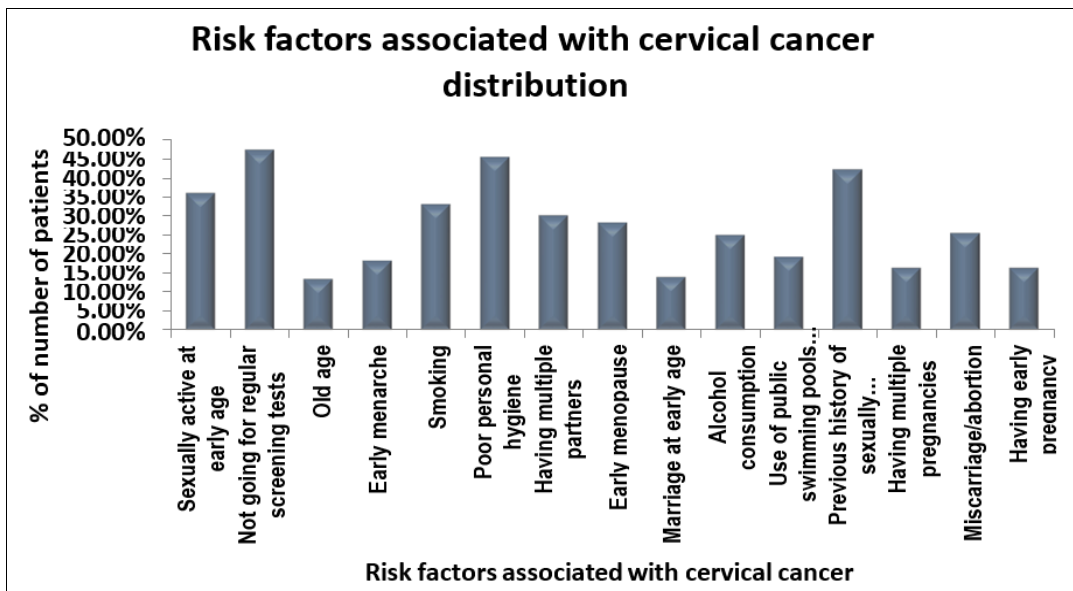


Fig 2: Risk factors associated with cervical cancer distribution.

Various risk factors associated with cervical cancer were reported by the respondents. The most commonly cited risk factor by 47.60% participants was not going for regular screening tests. Poor personal hygiene was noted by 45.67% participants, followed by a previous history of sexually transmitted diseases by 42.31% participants. Other significant risk factors included being sexually active at an early age

36.06%, smoking 33.17%, and having multiple sexual partners 30.29%.

Additionally, factors such as early menopause, miscarriage/abortion, alcohol consumption, and use of public swimming pools and restrooms were also identified as contributing factors. (Figure 2).

Table 2: Awareness about warning signs of cervical cancer distribution.

Awareness about warning signs of cervical cancer	Frequency	Percentage
Do you know any warninz sign of cervical cancer?		
No	206	99.04%
Yes	2	0.96%
Could you name any one?		
Rashes	1	50.00%
Swelling in the region	1	50.00%
How did you get to know about this		
Other	1	50.00%
Social Media	1	50.00%

An overwhelming majority of respondents, 206 (99.04%), indicated they were not aware of any warning signs of cervical

cancer, while only 2 (0.96%) respondents reported being aware of at least one sign. (Table 2).

Table 3: Awareness about prevention of cervical cancer distribution.

Awareness about prevention cervical cancer	Frequency	Percentage
Can cervical cancer be prevented by vaccine?		
No	8	3.85%
Not sure	80	38.46%
Yes	120	57.69%
What is the recommended age group of females for taking the vaccine?		
No	15	7.21%
Adolescence	93	44.71%
Any age group	36	17.31%
Menopause	3	1.44%
Reproductive age group	61	29.33%
What is your knowledge about the cervical cancer vaccine?		
Aware and not taken	60	28.85%
Aware and taken	52	25.00%
Unaware and not taken	96	46.15%
Is the same vaccine recommended for males as well?		
No	49	23.56%
Not sure	140	67.31%
Yes	19	9.13%

When queried about whether cervical cancer can be prevented by vaccine, 120 (57.69%) respondents answered affirmatively, while 80 (38.46%) were unsure, and 8 (3.85%) responded negatively. Regarding the recommended age group for females to receive the vaccine, 93 (44.71%) respondents indicated adolescence, followed by 61 (29.33%) who mentioned the reproductive age group. A smaller proportion, 36 (17.31%) respondents, believed it could be taken at any age, while 15 (7.21%) were uncertain, and 3 (1.44%) mentioned menopause.

96 (46.15%) respondents stated they were unaware and had not taken the vaccine, while 60% were aware but had not taken it, and 52 (25.00%) reported being aware and having taken the vaccine.

When asked whether the same vaccine is recommended for males, 140 (67.31%) respondents were unsure, while 49 (23.56%) believed it was not recommended for males, and 19 (9.13%) thought it was recommended. (Table 3).

Table 4: Association of awareness about cervical cancer with age (years). Awareness

Awareness about cervical	14-15 years (n=84)	16-17 years (n=90)	18-19 years (n=34)	Total	P value
Heard of cervical cancer					
No	16 (19.05%)	6 (6.67%)	2 (5.88%)	24 (11.54%)	
Maybe	4 (4.76%)	6 (6.67%)	0 (0%)	10 (4.81%)	0.044'
Yes	64 (76.19%)	78 (86.67%)	32 (94.12%)	174 (83.65%)	
Do you think it can lead to death?					
No	3 (3.57%)	0 (0%)	0 (0%)	3 (1.44%)	
Maybe	23 (27.38%)	14 (15.56%)	7 (20.59%)	44 (21.15%)	0.075
Yes	58 (69.05%)	76 (84.44%)	27 (79.41%)	161 (77.40%)	
Is it infectious and if so can it get transferred through sexual contact					
No	24 (28.57%)	39 (43.33%)	15 (44.12%)	78 (37.50%)	
Maybe	39 (46.43%)	27 (30%)	8 (23.53%)	74 (35.58%)	0.077
Yes	21 (25%)	24 (26.67%)	11 (32.35%)	56 (26.92%)	

Fisher's exact test, † Chi square test

The proportion of participants who answered "yes" to hearing about cervical cancer was significantly higher in the 16-17 years and 18-19 years age groups compared to the 14-15 years age group (Yes: 86.67%, 94.12% vs 76.19% respectively) with a p-value of 0.044. Conversely, the proportion of participants who answered "no" to the same question was significantly higher in the 14-15 years age group compared to the 16-17 years and 18-

19 years age groups (No: 19.05% vs 6.67%, 5.88% respectively).

The distribution of responses to the other questions "Do you think it can lead to death?" and "Is it infectious and if so, can it get transferred through sexual contact?" were comparable across different age groups with a p-value of 0.075 and 0.077 respectively. (Table 4).

Table 5: Association of source of information regarding cervical cancer with age (Years).

Source of information regarding cervical cancer	14-15 Years (n=84)	16-17 Years (n=90)	18-19 Years (n=34)	Total	P value
Social media	53 (63.10%)	64 (71.11%)	25 (73.53%)	147 (68.27%)	0.405†
Family	30 (35.71%)	28 (31.11%)	10 (29.41%)	68 (32.69%)	0.734†
School teachers	6 (7.14%)	9 (10%)	6 (17.65%)	21 (10.10%)	0.216*
No information	18 (21.43%)	15 (16.67%)	0 (0%)	33 (15.87%)	0.015†
Friends	12 (14.29%)	25 (27.78%)	10 (29.41%)	47 (22.60%)	0.061†
Doctor	29 (34.52%)	15 (16.67%)	10 (29.41%)	54 (25.96%)	0.024†

*Fisher's exact test, † Chi square test

The source of information regarding cervical cancer varied across different age groups. Those aged 16-17 years and 18-19 years, cited an increase in social media as their source of information, 71.11% and 73.53%, respectively. The proportions between these age groups were, however, not significantly different (p = 0.405). Family members were also a common

source of information showing no significant difference across age groups (p = 0.734). The proportion of respondents with no information about cervical cancer decreased significantly with age, with 21.43% of those aged 14-15 years, 16.67% of those aged 16-17 years, and 0% of those aged 18-19 years reporting this lack of information (p = 0.015). (Table 5).

Table 6: Association of awareness about prevention of cervical cancer with age (years).

Awareness about Prevention of cervical cancer cervical	14-15 Years (n=84)	16-17 Years (n=90)	18-19 Years (n=34)	Total	P value
Can cervical cancer be prevented by vaccine?					
No	2 (2.38%)	5 (5.56%)	1 (2.94%)	8 (3.85%)	
Not sure	36 (42.86%)	34 (37.78%)	10 (29.41%)	80 (38.46%)	0.571*
Yes	46 (54.76%)	51 (56.67%)	23 (67.65%)	120 (57.69%)	
What is the recommended age group of females for taking the vaccine?					
No	7 (8.33%)	7 (7.78%)	1 (2.94%)	15 (7.21%)	
Adolescence	37 (44.05%)	38 (42.22%)	18 (52.94%)	93 (44.71%)	
Any age group	18 (21.43%)	13 (14.44%)	5 (14.71%)	36 (17.31%)	0.733*
Menopause	2 (2.38%)	1 (1.11%)	0 (0%)	3 (1.44%)	
Reproductive age group	20 (23.81%)	31 (34.44%)	10 (29.41%)	61 (29.33%)	
What is your knowledge about the cervical cancer vaccine?					
Aware and not taken	21 (25%)	24 (26.67%)	15 (44.12%)	60 (28.85%)	
Aware and taken	18 (21.43%)	24 (26.67%)	10 (29.41%)	52 (25%)	0.092
Unaware and not	45 (53.57%)	42 (46.67%)	9 (26.47%)	96 (46.15%)	
Is the same vaccine recommended for males as well?					
No	16 (19.05%)	22 (24.44%)	11 (32.35%)	49 (23.56%)	
Not sure	61 (72.62%)	59 (65.56%)	20 (58.82%)	140 (67.31%)	0.586*
Yes	7 (8.33%)	9 (10%)	3 (8.82%)	19 (9.13%)	

Fisher's exact test, † Chi square test

The distribution of beliefs regarding the prevention of cervical cancer through vaccination and the recommended age group for females to receive the vaccine did not significantly differ across age groups (p value=0.571) and (p value=0.733) respectively.

Responses across all age groups were consistent, with the majority indicating adolescence as the recommended age group. (Table 6). The distribution of awareness regarding cervical cancer was comparable across different genders.

Table 7: Association of source of information regarding cervical cancer with gender.

Source of information regarding cervical cancer	Female (n=139)	Male (n=68)	Other (n=1)	Total	P value
Social media	98 (70.50%)	43 (63.24%)	1 (100%)	142 (68.27%)	0.55*
Family	54 (38.85%)	14 (20.59%)	0 (0%)	68 (32.69%)	0.013*
School teachers	16 (11.51%)	5 (7.35%)	0 (0%)	21 (10.10%)	0.519*
No information	14 (10.07%)	18 (26.47%)	1 (100%)	33 (15.87%)	0.001*
Friends	31 (22.30%)	15 (22.06%)	1 (100%)	47 (22.60%)	0.315*
Doctor	45 (32.37%)	9 (13.24%)	0 (0%)	54 (25.96%)	0.004*

* Fisher's exact test

The distribution of information source regarding cervical cancer varied across genders. Among females, social media was the most common source, with 70.50% reporting it. Significant differences were observed in the sources of information between genders. Notably, family and doctor were significantly more

common sources of information for females compared to males (p values = 0.013 and 0.004, respectively). Conversely, males were more likely to report no information as their source compared to females (p value = 0.001). (Table 7)

Table 8: Association of awareness about prevention of cervical cancer with gender

Awareness about prevention of cervical cancer	Female(n=139)	Male(n=68)	Other(n=1)	Total	P value
Cervical cancer Can cervical cancer be prevented by vaccine?					
No	3 (2.16%)	4 (5.88%)	1 (100%)	8 (3.85%)	
Not sure	47 (33.81%)	33 (48.53%)	0 (0%)	80 (38.46%)	0.002*
Yes	89 (64.03%)	31 (45.59%)	0 (0%)	120 (57.69%)	
What is the recommended age group of females for taking the vaccine?					
No	8 (5.76%)	6 (8.82%)	1 (100%)	15 (7.21%)	
Adolescence	66 (47.48%)	27 (39.71%)	0 (0%)	93 (44.71%)	
Any age group	17 (12.23%)	19 (27.94%)	0 (0%)	36 (17.31%)	0.014*
Menopause	2 (1.44%)	1 (1.47%)	0 (0%)	3 (1.44%)	
Reproductive age group	46 (33.09%)	15 (22.06%)	0 (0%)	61 (29.33%)	
What is your knowledge about the cervical cancer vaccine?					
Aware and not taken	43 (30.94%)	17 (25%)	0 (0%)	60 (28.85%)	<.0001*
Aware and taken	47 (33.81%)	5 (7.35%)	0 (0%)	52 (25%)	
Unaware and not	49 (35.25%)	46 (67.65%)	1 (100%)	96 (46.15%)	
Is the same vaccine recommended for males as well?					
No	33 (23.74%)	15 (22.06%)	1 (100%)	49 (23.56%)	
Not sure	95 (68.35%)	45 (66.18%)	0 (0%)	140 (67.31%)	0.392*
Yes	11 (7.91%)	8 (11.76%)	0 (0%)	19 (9.13%)	

Fisher's exact test

The analysis of responses regarding cervical cancer prevention and vaccine-related knowledge reveals notable gender disparities. Firstly, a significantly higher proportion of females expressed belief in the preventability of cervical cancer through vaccination compared to males (64.03% vs 45.59%). Conversely, males were significantly more uncertain about the preventive efficacy of the vaccine compared to females (48.53% vs 33.81%). Notably, individuals categorized as "Other" expressed disbelief in the vaccine's preventive capabilities, contrasting sharply with responses from females and males (100% vs 2.16% vs 5.88% respectively; p value=0.002).

In terms of the recommended age group for vaccination, females

were more likely to identify adolescence and the reproductive age group, while males were more inclined to suggest adolescence and any age group. The "Other" category asserted that no specific age group was recommended for vaccination. Moreover, awareness and uptake of the vaccine were significantly higher among females compared to males and "Other," while the latter group exhibited a notably higher rate of unawareness and non-uptake (100% vs 35.25% vs 67.65% respectively; p-value < 0.0001). The perception of whether the vaccine is recommended for males showed no significant gender-based differences. (p-value=0.392). (Table 8)

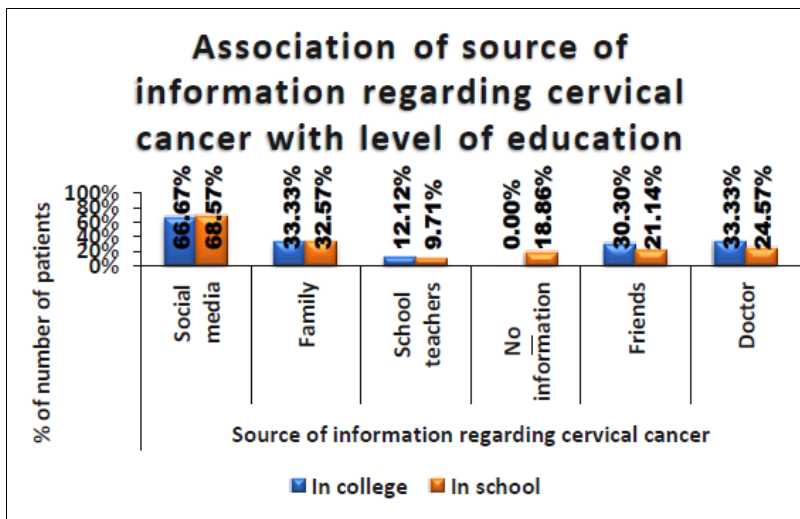


Fig 3: Association of source of information regarding cervical cancer with level of education.

The sources of information regarding cervical cancer were investigated among respondents in college and school. The distribution of these information sources did not show significant differences between the two groups except a notable

difference in the proportion of respondents who indicated having no information about cervical cancer, which was significantly higher among those in school (18.86%) compared to those in college (0%) (p value = 0.003). (Figure 3).

Table 9: Association of awareness about prevention of cervical cancer with level of education.

Awareness about prevention of cervical cancer	In college(n=33)	In school (n=175)	Total	P value
Can cervical cancer be prevented by vaccine?				
No	0 (0%)	8 (4.37%)	8 (185%)	
Not sure	9 (27.27%)	71 (40.57%)	80 (38.46%)	0.139 [†]
Yes	24 (72.73%)	96 (54.86%)	120 (57.69%)	
What is the recommended age group of females for taking the vaccine?				
No	2 (6.06%)	13 (7.43%)	15 (7.21%)	
Adolescence	17 (51.52%)	76 (43.43%)	93 (44.71%)	
Any age group	6 (18.18%)	30 (17.14%)	36 (17.31%)	
Menopause	0 (0%)	3 (1.71%)	3 (1.44%)	0.935 [†]
Reproductive age group	8 (24.24%)	53 (30.29%)	61 (29.33%)	
What is your knowledge about the cervical cancer vaccine?				
Aware and not taken	15 (45.45%)	45 (25.71%)	60 (28.85%)	
Aware and taken	12 (36.36%)	40 (22.86%)	52 (25%)	0.002 [†]
Unaware and not taken	6 (18.18%)	90 (51.43%)	96 (46.15%)	
Is the same vaccine recommended for males as well?				
No	10 (30.30%)	39 (22.29%)	49 (23.56%)	
Not sure	20 (60.61%)	120 (68.57%)	140 (67.31%)	0.37 [*]
Yes	3 (9.09%)	16 (9.14%)	19 (9.13%)	

Fisher's exact test, † Chi square test

The distribution of responses regarding the prevention of cervical cancer through vaccination showed no statistically significant differences based on the level of education. (p value=0.139). However, when considering the respondents' knowledge about the cervical cancer vaccine, significant differences emerged based on their level of education. The proportions of respondents who were aware and not taken and aware and taken were significantly higher in the college group

compared to the school group (Aware and not taken: 45.45% vs 25.71%, Aware and taken: 36.36% vs 22.86%). Conversely, the proportion of respondents who were unaware and not taken was significantly lower in the college group compared to the school group (18.18% vs 51.43%) (p value=0.002). (Table 9). The distribution of awareness about cervical cancer was similar across different streams of education.

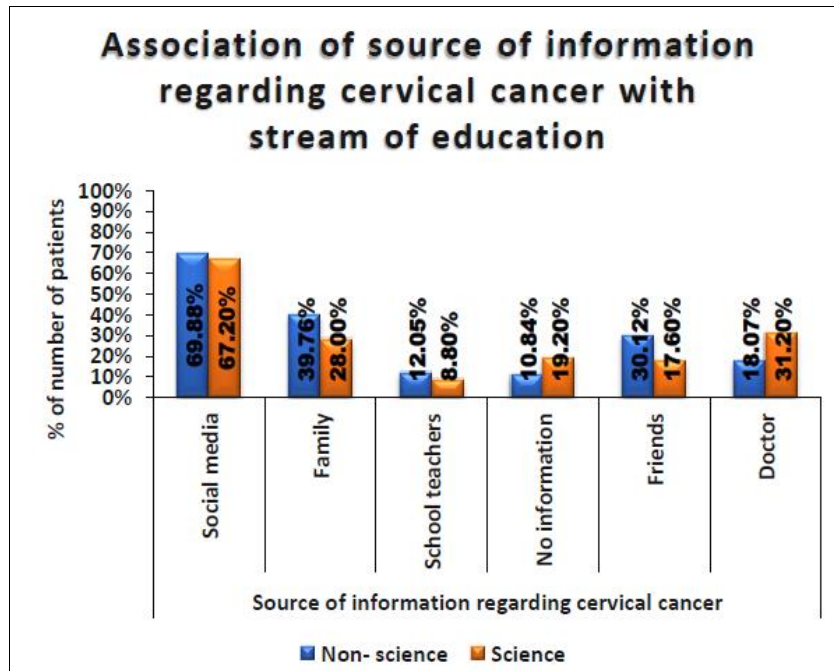


Fig 4: Association of source of information regarding cervical cancer with stream of education.

The distribution of sources of information regarding cervical cancer differed between individuals with non-science backgrounds and those with science backgrounds. Specifically, social media was the most common source for both groups. Friends were cited more often as a source by individuals in the non-science group (30.12%) compared to the science group

(17.60%), a difference that was statistically significant (p value=0.034). Lastly, doctors were more frequently mentioned as a source by individuals in the science group (31.20%) compared to the non-science group (18.07%), also showing statistical significance (p value=0.034). (Figure 4).

Table 10: Association of awareness about prevention of cervical cancer with stream of education.

Awareness about prevention of cervical cancer	Non- science(n=83)	Science(n=125)	Total	P value
Can cervical cancer be prevented by vaccine?				
No	2 (2.41%)	6 (4.80%)	8 (3.85%)	0.318*
Not sure	28 (33.73%)	52 (41.60%)	80 (38.46%)	
Yes	53 (63.86%)	67 (53.60%)	120 (57.69%)	
What is the recommended age group of females for taking the vaccine?				
No	2 (2.41%)	13 (10.40%)	15 (7.21%)	0.171
Adolescence	37 (44.58%)	56 (44.80%)	93 (44.71%)	
Any age group	14 (16.87%)	22 (17.60%)	36 (17.31%)	
Menopause	1 (1.20%)	2 (1.60%)	3 (1.44%)	
Reproductive age group	29 (34.94%)	32 (25.60%)	61 (29.33%)	
What is your knowledge about the cervical cancer vaccine?				
Aware and not taken	30 (36.14%)	30 (24%)	60 (28.85%)	0.028†
Aware and taken	24 (28.92%)	28 (22.40%)	52 (25%)	
Unaware and not taken	29 (34.94%)	67 (53.60%)	96 (46.15%)	
Is the same vaccine recommended for males as well?				
No	20 (24.10%)	29 (23.20%)	49 (23.56%)	0.755†
Not sure (67.31%)	54 (65.06%)	86 (68.80%)	140	
Yes	9 (10.84%)	10 (8%)	19 (9.13%)	

Fisher's exact test, † Chi square test

Significant differences were observed in the knowledge about the cervical cancer vaccine and its uptake between non-science and science streams. Specifically, the proportion of individuals who were aware of the vaccine but had not taken it, as well as those who were aware and had taken it, was significantly higher in the non-science stream compared to the science stream (p value=0.028). Conversely, the proportion of individuals who were unaware of the vaccine and had not taken it was significantly lower in the non-science stream compared to the science stream. (Table 10).

Discussion

Cancer of the uterine cervix is a major cancer in India in women but is largely preventable. The two major high risk oncogenic HPV genotypes, HPV16 and HPV 18, most commonly associated with the development of cervical cancer, are highly prevalent in India [7]. Primary prevention of cervical cancer is largely through vaccination which prevents women being infected with oncogenic HPV types that cause the majority of cervical cancer. Secondary prevention of cervical cancer is through cervical screening to detect and treat abnormalities while they are in the precancerous stage, before possible progression to cervical cancer. This is possible because cervical cancer is one of the few cancers that has a precancerous stage that lasts for many years prior to the development of invasive disease, which provides an opportunity for detection and treatment [8].

The present study was carried out among adolescents of an urban Indian city to explore their understanding regarding the level of awareness and knowledge about cervical cancer, HPV and attitude towards HPV vaccination.

Of the 208 respondents, 83.65% reported having heard of cervical cancer, while 11.54% stated they had not heard of it, and 4.81% were uncertain. However, only 26.92% believed it could be transmitted through sexual contact. Sivasubramaniam *et al.* observed that 71.4% adolescent girls of north Gujarat region had heard about cervical cancer and most of them had received this information from health professional and internet. However, in a study by Aimiosior *et al.*, only about one-in-ten of the female secondary school respondents in Ibadan, Nigeria had good knowledge about cervical cancer [10].

Among the respondents in our study, 68.27% reported obtaining information about cervical cancer from social media, while 68

(32.69%) relied on family members. Only 25.96% respondents received information from healthcare professionals. In contrast, doctors were the source of information for women in a study conducted by Harsha Kumar *et al.* over upper-income group women of Mangalore city. The high literacy levels which is about 90 per cent among women had an enabling role [1]. However, mass media was an important source of information in rural areas as reported by a community-based cross-sectional study by Ahlawat *et al.* [11]. This implies that perhaps doctors were a common source of information when compared to mass media only for individuals who had access to them. Respondents aged 16-17 years and 18-19 years cited an increase in social media as their source of information. Notably, social media was the most common source in females with family and doctor being significantly more common sources of information than for males. Conversely, males were more likely to report no information as their source compared to females.

A close association between increasing age and higher HPV awareness especially among the girls was observed by Rashid S *et al.* Teenage girls from biology-background were more knowledgeable than others about cervical cancer, its causes and HPV being the major causative agent for cervical cancer [7]. Similar observations were made by Poudel K *et al.* who found female students more knowledgeable than male students. This might be because of the interests, motivations and curiosity about diseases that are common among women. However, a Kenyan study showed that male students were interested in learning more about cervical cancer and its association with them. The interest of boys plays an important role in getting vaccinated [12].

Various risk factors associated with cervical cancer were reported by the respondents. The most commonly cited risk factor was not going for regular screening tests, mentioned by 47.60% participants. Significant risk factors included being sexually active at an early age 36.06%, smoking 33.17%, and having multiple sexual partners 30.29%. Multiparity (51.4%) and smoking (50.6%) were considered major risk factors by students in a study conducted by Poudel K *et al.* Similar results were obtained in an Ethiopian study where having early age at sexual intercourse and cigarette smoking were regarded as major risks in contracting cervical cancer [12]. It was interesting to find that only 35.2% of the students considered having multiple sexual partners as a risk factor for cervical cancer. This is an

alarming sign in that most students do not know about the risks of having multiple sexual partners.

Only 57.69% of respondents answered affirmatively that cervical cancer can be treated by vaccine. Only 25.00% of respondents reported being aware and having taken the vaccine and just 9.13% knew that the vaccine was recommended for boys as well. A significantly higher proportion of females believed that cervical cancer can be prevented through vaccination compared to males. Conversely, males were significantly more uncertain about the preventive efficacy of the vaccine. Interestingly, awareness and uptake of the vaccine were significantly higher among females compared to males.

In a review by Taneja N *et al.*, it was observed that 20.14% participants had knowledge of HPV vaccination and 35.68% practiced HPV vaccination [13]. 87.9% of college students in a study in a Chinese study indicated that they had heard of cervical cancer. A plausible reason is improvement of people's living standards, vaccine promotion enabling people to get access to higher-level medical services and more medical knowledge through the media, internet, and community publicity [14]. In a study carried out on a university campus by Landge, Jyoti A. *et al.* only one-fourth (25.7%) of girls were aware of the availability of vaccine for cervical cancer [15].

In India where a majority of population is positive for high-risk oncogenic HPV types and mortality due to cervical cancer is one of the highest in the world, there is a strong need for education intervention among boys and girls to change attitudes toward HPV vaccination. The present study focused on exploring the awareness, and knowledge of cervical cancer, its warning signs and prevention among urban adolescents. Based on the data collected and analyzed, it is evident increasing awareness about cervical cancer is crucial to improve its management and reduce associated health complications.

Conclusion

In conclusion, our study population had fair knowledge about cervical cancer and its prevention but boys lagged behind girls. Since HPV vaccine strategies prioritize girls before sexual debut and now boys as well [16, 17], the present study was carried out to determine the level of knowledge and awareness about cervical cancer and vaccination programs among adolescent girls and boys. This study highlights the critical need for improved cervical cancer awareness and prevention among adolescents including boys in urban settings.

Besides, the contemporary approach has now shifted towards primary prevention emphasizing on adolescents to foster early behavioral modification. Cervical cancer is an important issue in India; hence, appropriate strategies should be developed to provide proper information to this segment of the population. Programs that integrate both male and female students can help address cervical cancer prevention.

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