

Knowledge Levels and Related Factors Regarding Human Papillomavirus, Human Papillomavirus Diagnostic Testing, and Human Papillomavirus Vaccination Among Adolescents

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What is already known on this topic?

- Adolescents' knowledge about human papillomavirus (HPV) varies, and many obtain information from digital platforms.
- The HPV vaccination is an effective method for preventing HPV-related diseases, but accessibility and awareness remain challenges.

What does this study add on this topic?

- High school students in young adolescence have an intermediate level of HPV knowledge and primarily learn about it through digital platforms.
- Many students are inclined to receive the freely accessible HPV vaccine, highlighting the importance of accessibility.
- The study emphasizes the need for tailored training programs, early comprehensive sexual health education, and improved vaccine accessibility to enhance HPV awareness and uptake.

ABSTRACT

Objective: Human papillomavirus (HPV) is the most common viral infection of the reproductive system. Adolescent awareness about HPV-related infections and preventive vaccinations can help reduce the burden of disease and cancer. This study aimed to assess the knowledge levels of high school students, as part of the adolescent population, regarding HPV, HPV screening tests, and HPV vaccination.

Methods: This descriptive study was conducted between August 30 and October 30, 2024, among high school students in a district of İstanbul. A total of 214 participants were selected using a purposive sampling method. Data were collected through an online electronic survey using the "Participant Information Form" and the "HPV Knowledge Scale."

Results: Among the participants, 67.3% were female (n = 144), 32.7% were male (n = 70), with a mean age of 16.55 ± 1.26 years. The mean score on the HPV Knowledge Scale was 17.56 ± 3.83. The most correctly answered question regarding HPV was "Having multiple sexual partners increases the risk of HPV transmission," while the most incorrectly answered question was "HPV usually does not require any treatment." A significant difference was found in HPV Knowledge Scale scores based on gender, mothers' education level, and prior knowledge about HPV (P < .05).

Conclusion: This study found that high school students had a moderate level of knowledge about HPV. It is recommended to provide educational programs for adolescents, who are potential candidates for sexual activity, to raise awareness of HPV prevention and vaccination.

Keywords: Human papillomavirus, knowledge level, student

Introduction

Human papillomavirus (HPV) is a carcinogenic virus that can cause infections in mucosal areas such as the cervix, vagina, vulva, anus, penis, and oropharynx.¹ There are over 200 known types of HPV, with 30-40 specifically affecting the anogenital region and leading to serious health issues. The HPV is recognized as the primary etiological factor of cervical cancer.^{1,2} In Türkiye, the incidence of cervical cancer has been reported as 4.3 per 100 000, with a mortality rate of 2.71 per 100 000 population, ranking Türkiye 153rd in the world.^{3,4} These data highlight cervical cancer as a significant public health concern, necessitating effective preventive measures. In this context, vaccination and HPV screening tests play a crucial role in preventing and detecting cervical cancer at an early stage. According to national cancer screening guidelines, women aged 20-30 are recommended to undergo a Pap smear test every 3 years, while those aged 30-65 should have both an HPV test and a Pap smear test every 5 years.⁵ The HPV vaccines are emphasized as

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the most effective primary prevention method against cervical cancer. Vaccination has been reported to be highly effective in preventing and reducing mortality related to cervical cancer. For this reason, many European countries, including Germany, Belgium, Denmark, France, the Netherlands, and the United Kingdom, have incorporated HPV vaccination into routine immunization programs.^{1,2}

Worldwide, the estimated number of cervical cancer cases in 2022 is 662 044, almost half of which (348 709) resulted in death, making cervical cancer the fourth leading cause of cancer morbidity and mortality in women worldwide.⁵⁻⁷ The HPV is a member of the sexually transmitted virus family and is an infectious agent that does not necessarily require full sexual intercourse for transmission. The HPV can also spread easily through the contact of infected areas.⁸ This situation poses a significant risk, especially among adolescent groups who are not adequately informed about sexual health. Additionally, risk factors for HPV include early sexual activity, having multiple sexual partners, immune system deficiencies, and smoking.^{8,9} It is crucial to educate sexually active individuals about condom use during intercourse and to increase their awareness about the higher risk of HPV transmission associated with multiple sexual partners, particularly for the adolescent group.¹⁰

The HPV vaccine, an effective method for preventing cervical cancer, has been developed against the most dangerous types, including types 6, 11, 16, and 18.^{11,12} Among the HPV vaccination recommendations, it is particularly suggested for adolescents aged 9-13 who are not sexually active.^{13,14} Although this vaccine can also be administered to sexually active women, it is especially important to vaccinate girls aged 9-14 years.¹⁵ It is an indisputable fact that ensuring adolescents are informed about this issue will help prevent future cervical cancer and reduce the disease burden.

This study is designed as descriptive research to evaluate the knowledge levels of young adolescents regarding HPV, HPV screening tests, and HPV vaccination, identify factors influencing these knowledge levels, highlight potential problems, and lay the groundwork for efforts to address these issues.

Research Questions

1. What is the level of knowledge of high school students in the late adolescent period regarding HPV, HPV tests, and HPV vaccines?
2. Is there a difference in the level of knowledge about HPV, HPV tests, and HPV vaccines among high school students in the late adolescent period based on their sociodemographic characteristics (such as age, gender, parents' educational level, monthly income, and type of high school attended)?
3. Is there a difference in the level of knowledge about HPV, HPV tests, and HPV vaccines among high school students in the late adolescent period based on their knowledge and perceptions of sexuality (such as parental communication about sexuality, awareness of sexually transmitted infections, and engagement in sexual activity) and cervical cancer?

Methods

Study Design

The descriptive study was conducted with young adolescents attending high school in a district of Istanbul between August 30, 2024, and October 30, 2024.

Population and Sample

The population of the research consists of approximately 9000 high school students who continue their education in public schools in a district of Istanbul. Sampling was done according to the calculation

of the known population with a 5% margin of error and 95% CI. It was planned to include at least 200 young adolescents between the ages of 14 and 19 who were continuing their education at high school level, who agreed to participate in the study online (Google forms) and whose parents gave online consent. The study was completed with the participation of 214 young adolescents aged 14-19 years who were continuing their education at high school level.

Data Collection

The data were obtained from the participants who agreed to participate in the study and the parents of the adolescents using a Google forms survey on the online platform after obtaining their written consent online. Data were collected using the participant information form and HPV knowledge scale.

Participant information form: The personal information form developed by the researchers included the personal characteristics of the young adolescents who agreed to participate in the study (such as age, gender, educational level of their parents, monthly income, high school type) and sexual health status (such as family information about sexuality, knowledge about sexually transmitted diseases, and active sexual life).⁸⁻¹³

Human papillomavirus knowledge scale: The HPV knowledge scale, which was developed by Waller et al (2013)¹⁵ and validated and reliably validated in Turkish by Demir Bozkurt and Özdemir (2023),¹⁶ is a 33-item scale that measures knowledge levels about HPV, the HPV vaccine and screening tests. In the scoring of the HPV knowledge scale, each correct answer is evaluated as "1" point, while incorrect and "don't know" answers are accepted as "0" points. The total score that can be obtained from the scale varies between 0 and 33, and higher scores indicate that individuals have a higher level of knowledge. The Cronbach's α score of the scale was 0.96, which was found to be 0.86 in this sample group.

Data Analysis

Research findings were analyzed using SPSS for Windows (IBM SPSS Corp.; Armonk, NY, USA 22.0) package program. Descriptive statistics were calculated as mean and standard deviation for continuous variables and number and percentage for categorical variables. Chi-square test was used to analyze categorical variables and Student's *t*-test was used to compare 2 independent groups according to scale scores. The results were evaluated at 95% CI and $P < .05$ significance level.

Ethical Considerations

Approval was obtained from the Scientific Research Ethics Committee of a University of Health Sciences (Date: 20.09.2024; Approval no: 24/230). Before the data collection phase, online consent was obtained from volunteer adolescents and their parents who met the sample selection criteria through a form prepared in accordance with the Declaration of Helsinki.

Results

The mean age of the high school students who participated in the study was 16.55 ± 1.26 years (range: 14-19), and more than half (58.9%) were over 16 years of age. It was found that most of the participants were female (67.3%), had nuclear families (79.9%), and 61.2% of them had income equal to expenses. It was determined that most of the participants were in the fourth grade of high school (43%) and Anatolian high school students (49.5%). It was found that more than half of the students' mothers (54.2%) had more than 8 years of education and more than half of their fathers (59.8%) had 8 years or less of education (Table 1).

Table 1. Individual Characteristics of the Participants (n = 214)

Characteristics	Number (n)	Percentage (%)
Age		
16 years and younger	88	41.1
Over 16 years old	126	58.9
Gender		
Female	144	67.3
Male	70	32.7
Family type		
Nuclear family	171	79.9
Extended family	43	20.1
Social security		
Yes	152	71.0
No	62	29.0
Economic situation		
Income-less than expense	32	15.0
Equal to income-expenditure	131	61.2
Income-more than expense	51	23.8
High school level		
Second grade and below	66	30.8
Third grade	56	26.2
Fourth grade	92	43.0
Type of high school		
Regular	13	6.1
Anatolian	106	49.5
Religious vocational	27	12.6
Vocational	68	31.8
Mother's educational background		
8 years and under	98	45.8
Over 8 years	116	54.2
Father's educational background		
8 years and under	128	59.8
Over 8 years	86	40.2

In this study, the most accurately known information questions about HPV were “Having more than one sexual partner increases the risk of HPV transmission” with 47.7%, “HPV can be transmitted during sexual intercourse” and “HPV can be transmitted by skin-to-skin contact in the sexual area” with 41.6%. In addition, the statement “Using condoms reduces the risk of HPV transmission” was also among the correctly known statements with 40.7%. On the other hand, the most common misconceptions were “HPV usually does not require any treatment” with 36.9% and “HPV can cause HIV/AIDS” with 28% (Table 2). The HPV knowledge scale scores of the students participating in the study ranged between 11 and 27, with a mean score of 17.56 ± 3.83 .

When the HPV knowledge scale scores of the high school students in the young adolescent group participating in the study were compared according to individual characteristics such as age, gender, income level, family type, high school level and type, and educational level of their mothers and fathers, no difference was found between them in terms of other characteristics except gender and maternal educational level; however, it was found that girls scored significantly higher on the HPV knowledge scale than boys, and those whose mothers' educational level was above 8 years scored significantly higher than those whose mothers' educational level was 8 years or less ($P < .05$). Among the high school students in the young adolescent group, those who had information about the HPV virus scored significantly higher on the HPV knowledge scale than those who did not ($P < .05$, Table 3). It was found that students obtained the most information about HPV virus from the internet (36.4%), then from their lessons at school (32.2%), and the least from physicians/nurses (5.6%) and books/magazines

(1.9%). In addition, 54.7% of high school students in the young adolescent group stated that they “would have been vaccinated if vaccines were free of charge” to protect themselves from HPV, while very few (16.8%) had heard of Pap smear test and 32.2% had heard of cervical cancer.

Discussion

The World Health Organization defines adolescents as individuals between the ages of 10 and 19. Adolescence is also accepted as a stage in which physical, emotional, and social development is rapid and health behaviors are shaped.¹⁷ In this study, the mean age of the participants was 16.55 ± 1.26 and more than half (58.9%) were over 16 years of age. The fact that this age group represents the transition period from adolescence to adulthood indicates that individuals are at a critical stage in the acquisition of health knowledge. However, Fagbule (2020)¹⁸ found that adolescents' knowledge about sexual health and HPV was generally inadequate. This situation emphasizes the importance of sexual health education programs for this age group.

In the study, the fact that the highest participation rate was observed in fourth grade high school and Anatolian high school students indicates that there may be differences in the knowledge levels of students studying in different high school types about HPV. Especially the high participation rate in Anatolian high schools may be associated with the academic structure, curriculum arrangements and educational approach of these schools. In addition, when the education levels of mothers and fathers were analyzed in the study, it was determined that more than half of the mothers were educated above the primary education level, and on the contrary, the majority of the fathers were educated below the primary education level (less than 8 years). Stephens et al (2023)¹⁹ found that a high level of maternal education had positive effects on the health knowledge and behaviors of children and adolescents. However, as in this study, it is thought that the low education level of fathers may limit the transfer of information within the family, especially on sexual health.

In addition, the study found that the participants who were young adolescents had sufficient knowledge about the transmission routes of HPV and the protection of condom use. Similar to the results of the study, Bhatta and Phillips (2015)²⁰ stated that the knowledge that HPV can be transmitted through sexual intercourse is widely and accurately perceived among young people. In the study conducted by Vincent et al (2024),²¹ it was emphasized that awareness among young people that condom use reduces the risk of HPV transmission is high. Although the results of the study show that young adolescents have a basic level of knowledge about HPV, it also reveals that this awareness should be expanded and deepened.

The prevalent misconceptions identified in this study—that HPV typically does not require treatment and that HPV can cause human immunodeficiency virus/acquired immunodeficiency syndrome (HIV/AIDS)—indicate substantial gaps in adolescents' knowledge. Such misunderstandings could lead adolescents to underestimate the importance of medical consultation and treatment for HPV-related conditions or create undue anxiety by linking HPV to unrelated diseases. Addressing these specific misconceptions through targeted educational interventions is crucial to improve adolescent health outcomes and reinforce accurate perceptions of sexually transmitted infections. Indeed, while many types of HPV can be cured spontaneously, some types can cause serious health problems such as cervical cancer.^{21,22} As in this study, the perception of HPV as an infection that does not require treatment may lead to insufficient understanding of the potential health risks of this virus. In addition, misperception of the relationship between HPV and HIV/AIDS is of critical importance

Table 2. Distribution of Participants' Responses to the HPV Information Scale (n = 214)

HPV Information Scale	Yes n (%)	No n (%)	I Don't Know n (%)
1. HPV can cause cervical cancer (T)	62 (29.0)	13 (6.1)	139 (69.0)
2. A person can live for many years, without knowing that he has HPV (T)	58 (27.1)	21 (9.8)	135 (63.1)
3. Having more than one sexual partner increases the risk of HPV transmission (T)	102 (47.7)	7 (3.3)	105 (49.1)
4. HPV is very rare (F)	9 (4.2)	58 (27.1)	147 (68.7)
5. HPV can be transmitted during sexual intercourse (T)	102 (47.7)	6 (2.8)	106 (49.5)
6. HPV always has visible signs and symptoms (F)	23 (10.7)	46 (21.5)	145 (67.8)
7. Using a condom reduces the risk of HPV transmission (T)	87 (40.7)	12 (5.6)	115 (53.7)
8. HPV can cause HIV/AIDS (F)	60 (28.0)	9 (4.2)	145 (67.8)
9. HPV can be transmitted by skin-to-skin, contact in the genital area (T)	89 (41.6)	11 (5.1)	114 (53.3)
10. HPV is not transmitted to men (F)	7 (3.3)	69 (32.2)	138 (64.5)
11. Having sexual intercourse at an early age increases the risk of HPV transmission (T)	38 (17.8)	26 (12.1)	150 (70.1)
12. There are many types of HPV (T)	53 (24.8)	5 (2.3)	156 (72.9)
13. HPV can cause warts in the genital area (T)	65 (30.4)	4 (1.9)	145 (67.8)
14. HPV can be treated with antibiotics (F)	17 (7.9)	37 (17.3)	160 (74.8)
15. Most people who are sexually active will be infected with HPV at some point in their lives (T)	23 (10.7)	39 (18.2)	152 (71.0)
16. HPV usually does not need any treatment (T)	5 (2.3)	79 (36.9)	130 (60.7)
17. If a woman's HPV test is positive, she will definitely get cervical cancer (F)	9 (4.2)	59 (27.6)	146 (68.2)
18. HPV test can be done at the same time as the smear (Pap-smear) test (T)	23 (10.7)	8 (3.7)	183 (85.5)
19. The HPV test tells you how long you have had an HPV infection (F)	13 (10.7)	20 (9.3)	181 (84.6)
20. HPV testing is used to determine if HPV vaccination is necessary (F)	42 (19.6)	19 (8.9)	153 (71.5)
21. When you have an HPV test, you can get your results on the same day (F)	14 (6.5)	22 (10.3)	178 (83.2)
22. If the HPV test shows that a woman does not have HPV, then that woman has a low risk of developing cervical cancer (T)	34 (15.9)	18 (8.4)	162 (75.7)
23. Girls who have been vaccinated against HPV do not need to have a smear test in their old age (F)	8 (3.7)	31 (14.5)	175 (81.8)
24. One of the HPV vaccines protects against genital warts (T)	40 (18.7)	19 (8.9)	155 (72.4)
25. HPV vaccines protect against all sexually transmitted infections (F)	25 (11.7)	31 (14.5)	158 (73.8)
26. A person who has been vaccinated against HPV does not get cervical cancer (F)	14 (6.5)	45 (29.0)	155 (72.4)
27. HPV vaccines protect against many types of cervical cancer (T)	56 (26.2)	10 (4.7)	148 (69.2)
28. HPV vaccine needs to be given in 3 doses (T)	33 (15.4)	10 (4.7)	171 (79.9)
29. The individuals for whom HPV vaccines are most effective are those who have never had sexual intercourse (T)	22 (10.3)	21 (9.8)	171 (79.9)
30. HPV vaccine is recommended for all women between the ages of 11 and 26 (T)	47 (22.0)	8 (3.7)	159 (74.3)
31. HPV vaccine is licensed (licensed permitted) for women aged 30-45 years (F)	16 (7.5)	10 (4.7)	188 (87.9)
32. Both available HPV vaccines (Gardasil and Cervarix) protect against both genital warts and cervical cancer (F)	33 (15.0)	9 (4.2)	173 (80.8)
33. HPV vaccine is allowed to be given to men between the ages of 11 and 26 (T)	18 (8.4)	10 (4.7)	186 (86.8)

AIDS, acquired immunodeficiency syndrome; F, false; HIV, human immunodeficiency virus; HPV, human papillomavirus; T, true.

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in age groups where knowledge deficiencies are common, such as adolescence.²² Sexual health education planned for these age groups should aim to provide comprehensive accurate information instead of such common beliefs.

Eliminating the lack of knowledge about the HPV and providing accurate information is of great importance in terms of HPV vaccination and prevention of transmission.^{22,23} In this study, it was determined that high school students in young adolescence had moderate knowledge about HPV. Similar to the results of the study, López et al (2020)²³ found that the level of knowledge about HPV among adolescents was moderate and emphasized the need for more comprehensive training.

Studies suggest that gender has an effect on general health and sexual health knowledge levels. It has been stated that women tend to learn more about the risks related to reproductive health.^{24,25} Similarly, in this study, it was determined that the HPV knowledge level of young adolescent female students was higher than that of male students. In addition, there was a significant relationship between the increase in the level of maternal education and the increase in the HPV knowledge level of young adolescents. This is in line with the findings of the study, which revealed that educated parents play a more effective role in increasing their awareness by providing more information to their children.²⁴

In the study, it was determined that young adolescent students obtained the most information about HPV from the internet, then from lessons at school, and lastly very few from health professionals such as physicians/nurses. Similarly, Johnson-Mallard et al (2019),²⁶ Freeman et al (2023),²⁷ Rosen et al (2017)²⁸ found that adolescents obtained general and sexual health information mostly through digital platforms and social media. Although health professionals have a critical role as a reliable source of information, it has been observed that students cannot benefit from these sources sufficiently. This finding reveals that health professionals and the education system need to develop informative and awareness-raising programs for young people and should be accessible.²⁹

In this study, more than half (54.7%) of high school students in young adolescence stated that they would be vaccinated if the HPV vaccine was free of charge. This shows that economic factors are an important barrier to accessing preventive health services such as HPV vaccination and the role of public health policies in this context is very important.³⁰ In addition, only 16.8% had heard of the Pap smear test and 32.2% had heard of cervical cancer, demonstrating the need to improve health literacy in schools and basic education.

Limitations and Strengths

In this study, the fact that the data were collected through self-report and the sample was limited to a specific region limits the

Table 3. Comparison of HPV Information Scale Score Averages According to Individual Characteristics of the Participants and HPV-related Variables

Variables $\bar{X} \pm SD$ Test Value/ <i>P</i>			
Age	16 years and under (n: 88)	17.09 \pm 3.90	<i>t</i> = -1.517
	Over 16 years old (n: 120)	17.88 \pm 3.76	<i>P</i> = .131
Gender	Female (n: 144)	17.95 \pm 3.80	<i>t</i> = 2.128
	Male (n: 70)	16.77 \pm 3.30	<i>P</i> = .034
Income level	Income less than expense (n: 32)	16.25 \pm 2.95	<i>F</i> = 2.809
	Income equivalent to expenditure (n: 131)	17.61 \pm 3.92	<i>P</i> = .063
	Income is more than expense (n: 51)	18.27 \pm 3.94	
Family type	Nuclear family (n: 171)	17.57 \pm 3.81	<i>t</i> = 0.058
	Extended family (n: 43)	17.53 \pm 3.95	<i>P</i> = .954
High school level	Second grade and below (n: 66)	17.51 \pm 3.84	<i>F</i> = 0.057
	Third grade (n: 56)	17.71 \pm 3.85	<i>P</i> = .945
	Fourth grade (n: 92)	17.51 \pm 3.85	
Type of high school	Regular (n: 13)	18.00 \pm 2.97	<i>F</i> = 0.678
	Anatolian (n: 106)	17.83 \pm 3.96	<i>P</i> = .566
	Religious vocational (n: 27)	17.62 \pm 3.62	
	Vocational (n: 68)	17.07 \pm 3.86	
Mother's education level	8 years and under (n: 128)	17.07 \pm 3.55	<i>t</i> = -2.222
	Over 8 years (n: 86)	18.29 \pm 4.14	<i>P</i> = .028
Father's level of education	8 years and under (n: 98)	17.58 \pm 3.91	<i>t</i> = 0.057
	Over 8 years (n: 116)	17.55 \pm 3.78	<i>P</i> = .955
Knowledge about the HPV virus	Yes (n: 82)	20.36 \pm 3.07	<i>t</i> = -10.279
	No (n: 132)	15.82 \pm 3.25	<i>P</i> = .000

F, One way Anova; HPV, human papillomavirus; *t*, students' *t*-test; *P* < .05

generalizability of the findings. On the other hand, online administration of questionnaires may have reduced the participation rate, especially considering the sensitivity of the issue. However, the focus of the study on high school students is very important in terms of targeting an important age group where HPV awareness needs to be increased. In addition, the use of a standardized measurement tool such as the HPV Knowledge Scale increases the reliability of the data.

Conclusion

In this study, it was determined that high school students in young adolescence had an intermediate level of knowledge about HPV, obtained information about HPV mostly from digital platforms, and were inclined to receive the HPV vaccine, which is freely accessible. In this context, it is recommended that training programs to increase HPV awareness should be tailored to the needs of different demographic and socioeconomic groups, comprehensive sexual health education should be started at an early age, and HPV vaccines should be made free or more accessible.

Data Availability Statement: The data that supports the findings of this study are available on request from the corresponding author.

Ethics Committee Approval: Ethics committee approval was received for this study from the Ethics Committee of University of Health Sciences (Approval no: 24/230; Date: 20.09.2024)

Informed Consent: Written informed consent was obtained from the parents of the participants who participated in this study.

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