



Vaccination and knowledge regarding human papilloma virus (HPV) among Greek female adolescents

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ABSTRACT

Purpose: The purpose of this study was to investigate Greek female adolescents' knowledge on human papilloma virus (HPV), vaccine coverage and their attitude towards HPV vaccination, as well as contributing factors such as mother's educational level and last year's grades.

Methods: A cross-sectional survey (n=555 girls; mean age=15.1 years) was conducted during the school years 2018-2019 and 2019-2020, using a structured questionnaire, adapted to the needs of the adolescent, which was distributed to the students of participating schools, following the written consent of their parents.

Results: Almost 8 out of 10 girls (79.4%) knew about HPV and 44.4% were vaccinated against it. Mean age at vaccination was 13.4 years (SD=±1.5) and in most cases vaccination was done by a pediatrician. Also, 79.3% of the girls that had not been vaccinated against HPV were considering doing so in the near future. Multiple logistic regression showed that knowledge of HPV was significantly associated with last year's grades and mother's educational level. Only mother's educational level was positively significantly associated with vaccination against HPV.

Conclusions: In conclusion, although the majority of secondary and high school students had awareness of HPV, vaccination coverage rate was moderate to low despite high occurrence of cervical cancer. Adequate information of adolescents and young adults regarding HPV is a key element in order to take preventive actions or healthy sexual behavior

Key words: HPV; Greek female adolescents; vaccination

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Introduction

Adolescence possesses certain developmental characteristics. Adolescents logic and critical ability are not as developed as emotional capacity (1). In this context, high-risk behaviors often arise both in behavioral matters such as bullying or victimization, as well as in matters of sexuality management and sexualization, body image, eating disorders, and others (1).

Human papilloma virus (HPV) infection is a potential threat for adolescent's health. Many studies support the association between HPV infection and the onset of genital warts, penis cancer and cervical cancer (2-4). Cervical cancer is the most common cancer in young women aged 15 to 44 years, and leads to a significant psychological, social, and financial burden on patients and healthcare systems (5,6). Current estimates indicate that every year 696 women are diagnosed with cervical cancer and 271 die from the disease in Greece (7). Cervical cancer ranks as the 12th most frequent cancer among women in Greece and the 4th most frequent cancer among women between 15 and 44 years of age (7). HPV is high prevalent disease and is easily transmitted through sexual activity (8). Although the majority of girls do not start their sexual activity before the age of 16 years, it is very important to be vaccinated and informed as early as possible (9). The most appropriate time is during early adolescence or early adulthood, when females should be informed about sexually transmitted diseases and be vaccinated in order to protect them in the future (9). The vaccine protects against two types of HPV (HPV-16 and HPV-18) that together cause more than 70% of cases of cervical cancer.10 Moreover, it also protects against the other five carcinogenic types of HPV (31, 33, 45, 52, 58) and the two most common 'low-risk' types, 6 and 11, responsible for 90% of (10). Vaccination against HPV is considered as a revolutionary method of combating HPV, particularly for developing countries, where effective routine gynecological examination is implemented with difficulty. Vaccination is preventive and not therapeutic for HPV infection or diseases associated with HPV (11, 12). Therefore, the HPV vaccine is most useful for girls and women before they become infected with HPV (12).

In Europe, available data from 25 countries showed that HPV vaccination coverage rate in girls was reported $\geq 71\%$ (high) in ten countries, 51-70% in seven, 31-50% in four, and $\leq 30\%$ (very low) (13).

There are not available data from Greece.

The purpose of this cross sectional study was to investigate Greek female adolescents' knowledge on human papilloma virus (HPV), vaccine coverage and their attitude towards HPV vaccination, as well as contributing factors such as mother's educational level and last year's grades.

Material and Methods

Study design, sample and settings

This is a sub-analysis of a cross-sectional survey that was conducted in the context of an educational program entitled: "What happens in adolescence". A self-completed questionnaire was administered in a sample of 1100 secondary and high school students, during the school years 2018-2019 and 2019-2020, in schools of Greek territory. Specifically, schools, whose students were selected to participate in the study, were housed in the following areas: 1) Anavryta, 2) Volos, 3) Elefsina, 4) Ilion, 5) Ioannina, 6) Corfu, 7) Cyclades, 8) Pallini, 9) Piraeus, 10) Tavros, and 11) Chania. The questions of this survey explored habits, experiences and knowledge regarding sex education, body image, adoption of standards in the context of sexualization, behaviors related to use of technology, school bullying and other topics. This questionnaire was used to record data on adolescent behaviors.

Construction of the questionnaire

For the purpose of this survey, a structured questionnaire, adapted to the needs of the adolescent was constructed, which was distributed to the students of schools participating in the study, following the written consent of their parents. In this context, translation and adaptation of various foreign-language questionnaires-research tools were taken place, as shown below. For scales that had not previously been used in Greek populations, a Greek version was constructed employing the back translation method and further modifications were made following a pilot study.

Questionnaire structure

The questionnaire consisted of the following parts:

- 1.Social-demographic characteristics (gender, age, marital status, parents' profession, ancestry, school performance, etc.).
- 2.Eating Attitudes Test (EAT 26) (14).

3. Internet usage and behavior data (frequency, place, applications).

4. Bullying – Cyberbullying. These questions were given to the EU-NETADB Pan-European study

5. Young’s Internet Addiction Test (IAT) (15).

6. Smartphone Addiction Scale – Short Version (16).

7. Sexuality and adolescence (self-designed scale) (17).

8. Sexualization (self-designed scale).

9. Strengths and Difficulties Questionnaire (SDQ – Hel) (18).

The questions concerning HPV were:

1) “Do you know the HPV virus?”

2a) “Have you been vaccinated against HPV?”

2b) “If YES, at what age were you vaccinated?”

2c) “If you answered YES, which of the following doctors vaccinated you?” (followed by a list of specialties), and

3) “If you haven't been vaccinated, are you thinking of getting vaccinated soon?”

Implementation of the study

The implementation of the study included the visit to secondary and high schools that initially expressed their interest in participating in the educational program “What happens in adolescence”. Questionnaires were distributed and completed in one teaching hour. Teachers of participants and collaborators of Adolescent Health Unit (M.H.U.), who were specially trained and approved by the M.H.U. for the implementation of the educational program “What happens in adolescence”, were present during the questionnaire completion.

Statistical analysis

Quantitative variables were expressed as mean values (SD), while categorical variables were expressed as absolute and relative frequencies. Student’s t-tests were computed for the comparison of mean values. For the comparison of proportions chi-square tests were used. Logistic regression was used in order to find factors independently associated with knowing about HPV and with being vaccinated against it. Adjusted odds ratios (OR) with 95% confidence intervals (95% CI) were computed from the results of the logistic regression analyses. All reported p values are two-tailed. Statistical significance was set at p<0.05 and analyses were conducted using SPSS statistical software

Table 1. Sample characteristics

	N (%)
Age, mean (SD)	15.1 (0.7)
BMI, mean (SD)	20.5 (2.6)
BMI	
Underweight	35 (9.0)
Normal	320 (82.1)
Overweight	31 (7.9)
Obese	4 (1.0)
Born in Greece	526 (95.3)
School grades last year	
<15	58 (10.5)
15-17.9	207 (37.4)
18-20	288 (52.1)
Living condition	
With both parents	458 (83.6)
With one parent	82 (15.0)
Other	8 (1.5)
Father born in Greece	467 (84.8)
Mother born in Greece	459 (83.5)
Working father	501 (93.5)
Working mother	432 (79.4)
One or both parents unemployed	41 (7.5)
Father’s educational level	
Primary/ Middle school	94 (17.7)
High school/ 2 year college	194 (36.5)
University	243 (45.8)
Mother’s educational level	
Primary/ Middle school	58 (10.8)
High school/ 2 year college	172 (31.9)
University	309 (57.3)

Table 2. Knowledge and attitude towards HPV

	N (%)
Knows about HPV virus	427 (79.4)
Has been vaccinated against HPV	240 (44.4)
If yes: Age at vaccination, mean (SD)	13.4 (1.5)
Vaccination administered by	
Pediatrician	181 (75.4)
Gynecologist	32 (13.3)
Pathologist / General doctor	16 (6.7)
Do not know	11 (4.6)
If no: Considering being vaccinated in the near future	176 (79.3)

Table 3. Univariate analysis of the association between participants’ knowledge of HPV and their sociodemographic characteristics.

	Knowing about HPV virus		P*
	No N (%)	Yes N (%)	
Age, mean (SD)	14.9 (0.6)	15.1 (0.7)	0.002
BMI, mean (SD)	20.8 (2.6)	20.3 (2.6)	0.19
BMI			
Underweight	4 (11.8)	30 (88.2)	0.27
Normal	60 (19.1)	254 (80.9)	
Overweight/ Obese	9 (27.3)	24 (72.7)	
Born in Greece			
No	6 (24.0)	19 (76.0)	0.68
Yes	105 (20.5)	406 (79.5)	
School grades last year			
<15	18 (34.0)	35 (66.0)	<0.001
15-17.9	52 (26.0)	148 (74.0)	
18-20	39 (13.8)	244 (86.2)	
Living condition			
With both parents	94 (21.0)	353 (79.0)	0.39
With one parent	16 (20.3)	63 (79.7)	
Other	0 (0.0)	7 (100.0)	
Father born in Greece			
No	21 (25.3)	62 (74.7)	0.26
Yes	90 (19.9)	363 (80.1)	
Mother born in Greece			
No	24 (27.0)	65 (73.0)	0.11
Yes	87 (19.5)	359 (80.5)	
Working father			
No	10 (29.4)	24 (70.6)	0.185+
Yes	97 (19.9)	390 (80.1)	
Working mother			
No	23 (20.9)	87 (79.1)	0.96
Yes	87 (20.7)	333 (79.3)	
One or both parents unemployed			
No	102 (20.7)	390 (79.3)	0.85
Yes	8 (19.5)	33 (80.5)	
Father’s educational level			
Primary/ Middle school	27 (29.0)	66 (71.0)	0.017
High school/ 2 year college	42 (21.9)	150 (78.1)	
University	36 (15.4)	198 (84.6)	
Mother’s educational level			
Primary/ Middle school	18 (32.1)	38 (67.9)	0.003
High school/ 2 year college	43 (25.6)	125 (74.4)	
University	47 (15.6)	254 (84.4)	

* p-value from Pearson’s χ^2 test for categorical variables or Student’s t-test for quantitative variables

Sample Characteristics

For the purposes of this study, in this sub-analysis we included 555 female students from the total sample of 1100 secondary and high school students. Their characteristics are presented in Table 1. 82.1% of the girls had normal BMI and 95.3% of them were born in Greece. 288 girls (52.1%) had high grades (18-20) during the last year. Also, 83.6% of the girls were living with both of their parents. In 93.5% of the cases, the father was employed, in 79.4% the mother was employed while in 7.5% at least one of the parents was unemployed.

Results

Almost 8 out of 10 girls (79.4%) knew about HPV (Table 2) and 44.4% had been vaccinated against it. Mean age at vaccination was 13.4 years (SD=1.5) and in most cases vaccination was carried out by a pediatrician. Also, 79.3% of the girls that had not been vaccinated against HPV were considering doing so in the near future.

The percentages of girls who knew about HPV were presented in Table 3 in relation to their sociodemographic data. It was found that girls that knew about HPV were significantly older than girls that did not ($p = .002$). Also, the percentage that knew about HPV increased significantly with higher grades in school and higher parental educational level. Similarly, the percentage of girls that had been vaccinated against HPV increased significantly with higher grades in school and as parental educational level increased (Table 4).

Multiple logistic regression shown that knowledge of HPV was significantly associated with last year's grades and mother's educational level (Table 5). More specifically, girls with high grades last year (18-20) had 3.27 times greater odds of knowing about HPV compared to girls with low grades (<15). Also, as mother's educational level increased, the odds of knowing about HPV increased. Regarding vaccination against HPV, it was found that only mother's educational level was positively significantly associated with it: as mother's educational level increased, the odds of the girl being vaccinated against HPV also increased.

Table 4. Univariate analysis results of the association between having been vaccinated against HPV and participants' sociodemographic characteristics.

	Been vacc. against HPV		P*
	No N (%)	Yes N (%)	
Age, mean (SD)	15.1 (0.8)	15.1 (0.7)	0.62
BMI, mean (SD)	20.6 (2.5)	20.3 (2.6)	0.30
BMI			
Underweight	16 (48.5)	17 (51.5)	0.82
Normal	166 (53.0)	147 (47.0)	
Overweight/ Obese	18 (56.3)	14 (43.8)	
Born in Greece			
No	17 (68.0)	8 (32.0)	0.18
Yes	275 (54.5)	230 (45.5)	
Last year grades			
<15	37 (71.2)	15 (28.8)	0.023
15-17.9	110 (56.1)	86 (43.9)	
18-20	144 (50.9)	139 (49.1)	
Living condition			
With both parents	241 (54.3)	203 (45.7)	0.26
With one parent	46 (59.7)	31 (40.3)	
Other	2 (28.6)	5 (71.4)	
Father born in Greece			
No	49 (60.5)	32 (39.5)	0.28
Yes	243 (54.0)	207 (46.0)	
Mother born in Greece			
No	50 (57.5)	37 (42.5)	0.63
Yes	242 (54.6)	201 (45.4)	
Working father			
No	24 (70.6)	10 (29.4)	0.059
Yes	260 (53.9)	222 (46.1)	
Working mother			
No	66 (60.0)	44 (40.0)	0.22
Yes	222 (53.5)	193 (46.5)	
Unemployment in one or both parents			
No	269 (55.2)	218 (44.8)	0.84
Yes	22 (53.7)	19 (46.3)	
Father's educational level			
Primary/ Middle school	53 (58.2)	38 (41.8)	0.086+
High school/ 2 year college	113 (59.8)	76 (40.2)	
University	116 (49.6)	118 (50.4)	
Mother's educational level			
Primary/ Middle school	43 (76.8)	13 (23.2)	<0.001
High school/ 2 year college	99 (59.6)	67 (40.4)	
University	143 (48.0)	155 (52.0)	

* p-value from Pearson's χ^2 test for categorical variables or Student's t-test for quantitative variables

Table 5. Multiple logistic regression results with knowing about HPV and being vaccinated against it as dependent variables and participants' characteristics as independent variables.

	Know about HPV virus		Being vaccinated against HPV	
	OR (95% CI)*	P	OR (95% CI)*	P
Age	1.41 (0.95 – 2.08)	0.085	0.93 (0.69 – 1.26)	0.637
BMI				
Underweight (reference)	1		1	
Normal	0.51 (0.16 – 1.64)	0.259	0.99 (0.46 – 2.13)	0.975
Overweight/ Obese	0.37 (0.09 – 1.55)	0.173	0.94 (0.32 – 2.73)	0.905
Born in Greece				
No (reference)	1		1	
Yes	0.71 (0.17 – 3.07)	0.648	1.35 (0.39 – 4.61)	0.634
Last year grades				
<15 (reference)	1		1	
15-17.9	1.36 (0.53 – 3.49)	0.520	0.96 (0.39 – 2.35)	0.930
18-20	3.27 (1.25 – 8.55)	0.016	1.13 (0.47 – 2.70)	0.790
Living condition				
With both parents (reference)	1		1	
With one parent	2.22 (0.78 – 6.28)	0.134	1.14 (0.58 – 2.25)	0.703
Other	-	--	4.07 (0.38 – 44.09)	0.249
Father born in Greece				
No (reference)	1		1	
Yes	1.23 (0.38 – 3.91)	0.731	1.22 (0.50 – 2.97)	0.669
Mother born in Greece				
No (reference)	1		1	
Yes	0.82 (0.28 – 2.41)	0.722	0.51 (0.23 – 1.13)	0.097
Working father				
No (reference)	1		1	
Yes	1.17 (0.37 – 3.75)	0.788	0.99 (0.37 – 2.64)	0.983
Working mother				
No (reference)	1		1	
Yes	1.34 (0.65 – 2.76)	0.429	1.47 (0.84 – 2.59)	0.179
Father's educational level	1.13 (0.74 – 1.71)	0.579	0.97 (0.70 – 1.34)	0.834
Mother's educational level	1.67 (1.05 – 2.63)	0.029	1.79 (1.22 – 2.62)	0.003

* Adjusted Odds Ratio (95% Confidence Interval); -- could not be calculated

Discussion

The purpose of this study was to investigate Greek female adolescents' knowledge on human papilloma virus (HPV), vaccine coverage and their attitude towards HPV vaccination, as well as contributing factors such as mother's educational level and last year's grades. In our point of view, the most important findings of our study were 1) almost 80% of participants (427) had been informed about the HPV virus and the vaccine against it, 2) 44% of respondents had been vaccinated against HPV, 3) the percentages of girls that knew about HPV and had been vaccinated against HPV increased significantly as mother's educational level increased and 4) girls that knew about HPV were significantly older than girls that did not.

According to international literature, this was the first study in Greece which included secondary and high school female students from a wide geographical area, while the sample of the present survey was much larger than that of a previous study which included only high school female students from Greek islands (555 versus 260, respectively) (19).

In the present study, almost 80% of participants (427) had been informed about the HPV virus and the vaccine against it, a rate higher than this of a previous study conducted in Greek islands (65,5%) (19).

An interesting finding of our survey was that only 44% of respondents had been vaccinated against HPV, rate higher than this of a previous study conducted in Evritania, Greece (5.3%; 10/189) (20). This finding was expected, because in Greece, when the quadrivalent HPV vaccine was included in the National Vaccination Program for girls only, there were many doubts about the efficacy and possible adverse events (20, 21). In studies of adult women in Greece, moderate levels of acceptance of vaccination had been found and the main causes of refusal to vaccinate their female children were the fear of side effects, the lack of information and skepticism about the etiology of cervical cancer (20, 21).

The lack of knowledge about the HPV vaccine among girls and older women may affect their decision to take preventive actions, thus increasing the risk of becoming infected with the virus and developing cervical cancer. It has been found that education and awareness about HPV infection and cervical cancer are essential to improve the level of knowledge and

attitudes of girls and women towards cervical cancer and the diseases caused by the virus (22).

Two interesting findings of this study were that the percentages of girls that knew about HPV and had been vaccinated against HPV increased significantly as mother's educational level increased. These findings were consistent with previous studies conducted in America, where higher maternal educational level was associated with positive attitudes towards HPV vaccination and with more complete information of their female children regarding HPV (23, 24).

Another important finding of this study, which is also consistent with the study of Lai et al. in America, was that girls that knew about HPV were significantly older than girls that did not (25). This may be because older girls, due to the development of sexual activity, are more informed in general about issues relating to sexually transmitted diseases and how they can be protected against them.

One of the strengths of this study is that it included secondary and high school students from areas spread throughout Greece and not only from a particular prefecture. On other hand, its main limitation is that in this kind of survey, in which self-report questionnaire is used, participants may give the answer that is widely accepted and do not answer what they really believe, a phenomenon called socially desirable responding (SDR), leading to response bias (26). Another limitation is that the study contained only three questions concerning HPV, which means that there was no thorough assessment of the level of knowledge about HPV, nor was there an investigation of the reasons why the schoolgirls have not been vaccinated. Finally, another limitation is that, unlike the previous Greek study (19), Greek male teenagers were not included in the present study, although the issue of HPV prevention concerns them. This limitation supports the need to design and implement studies that will include both Greek male and female teenagers in order to detect possible differences between them regarding level of awareness of HPV and vaccination coverage rates.

In conclusion, although the majority of secondary and high school students had awareness of HPV, vaccination coverage rate was moderate to low despite high occurrence of cervical cancer. Adequate

information of adolescents and young adults regarding HPV is a key element in order to take preventive actions or healthy sexual behavior. Therefore, health education, social policy legislative measures, screening, and vaccinations are particularly important in the prevention of transmission of HPV.

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