Knowledge of Greek adolescents on human papilloma virus (HPV) and vaccination: A national epidemiologic study

Observational Study

Medicine®

OPEN

Knowledge of Greek adolescents on human papilloma virus (HPV) and vaccination

A national epidemiologic study

Dennis Vaidakis, MD, MPH, PhD[a,*], Irini Moustaki, PhD[b], Ioannis Zervas, MD, PhD[c], Anastasia Barbouni, MD[d], Kyriaki Merakou, MPH, PhD[d], Maria S. Chrysi, MSc[e], George Creatsa, MD, PhD[f], Theodoros Panoskaltsis, MD, PhD[f]

Abstract

The aim of the present study was to identify the sexual behavior, attitudes, beliefs, and knowledge on sexually transmitted infections (STIs) focused on human papilloma virus (HPV) in the Greek adolescent population. The participants were 4547 adolescents, a representative sample for Greek territory with a mean age of 17 years. After written permission from Greek ministry of education each student completed a questionnaire with 36 questions. The fields covered were demographic characteristics, sexual life data, and basic knowledge on HPV. In the present study, 43% and 75% of the participants knew about HPV or cervical cancer, while more than 6 out of 10 did not know the association between the 2. More than 60% of the participants could not answer correctly neither about HPV infection and cervical cancer frequency in sexually active women, nor about protection methods against HPV and cervical cancer. This study shows that the low vaccination coverage of the Greek population may be due to lack of information and awareness of the adolescents and their parents. It is our duty to increase our efforts in order to better educate the population and vaccinate the population as early as possible in their reproductive years.

Abbreviations: HPV = human papilloma virus, STI = sexually transmitted infection.

Keywords: epidemiologic study, HPV vaccination, knowledge adolescents

1. Introduction

Human papilloma virus (HPV) is the commonest sexually transmitted infection (STI) in the world.[1] Even though most of the HPV infections are asymptomatic and resolve spontaneously, chronic infections with high risk HPV strains are related to oncogenesis.[2] HPV-related cancers are, mainly, cervical, vulvar, anal, oropharyngeal, and penile cancer.[3]

The commonest HPV-related cancer is cervical cancer, which is the commonest gynecological cancer worldwide.[2] Squamous cell maturation of the cervix is a long-lasting procedure which starts with menarche and it is completed after 6 to 8 years.[4] Mature cervical epithelium is more resistant to HPV infection, while early expose of the uterine cervix to HPV is more likely to cause chronic inflammation and precancerous lesions.[5]

Epidemiological data show that in excess of 95% of cervical cancers, an HPV infection, with an oncogenic subtype, is essential for carcinogenesis.[6] After breast, cervical cancer is the second commonest cancer in women, and it has been classified as a sexually transmitted disease, so that it could be prevented if HPV infection was to be avoided.[7] As in all STIs, there are certain sexual behaviors which promote HPV contact and infection. Early sexual debut and high-risk sexual behavior, such as unsafe sex, multiple sex partners, and parallel sexual relations, can promote HPV infection.[8] Although high-risk behavior has traditionally been related to the age group of 20 to 35 years, in the last decades there is a tendency of younger women to adopt this behavior and the majority of the epidemiological studies in Europe and USA record a gradual reduction in the age of sexual debut among both sexes.[8]

The sexual behavior of a young person can be influenced by the family, the social environment, as well as the knowledge about STIs and contraception.[9] So, these behaviors are modifiable and, with the proper health promotion programs in schools and media, protection could be promoted in order to prevent transmission of STIs, including HPV.[10] Nowadays, it is widely accepted that these health promoting programs should run in conjunction with primary protection, through vaccination programs against HPV, and, at a later stage, secondary protection, through screening of the population for HPV-related

Editor: Susanna Esposito.

The authors have no conflicts of interest to disclose.

[a] 3rd Department of Obstetrics and Gynecology, Attikon Hospital, Medical School, National Kapodistrian University of Athens, Athens, Greece, [b] Department of Statistics, London School of Economics, London, United Kingdom, [c] 1st Department of Psychiatry, Cognitive Psychotherapy Department, Eginition Hospital, Medical School, National Kapodistrian University of Athens, [d] Department of Public and Administrative Health, National School of Public Health, [e] Hellenic Anticancer Institute, "Saint Savvas" Hospital, [f] 2nd Department of Obstetrics and Gynecology, Aretaieion Hospital, Medical School, National Kapodistrian University of Athens, Athens, Greece.

[*] Correspondence: Dennis Vaidakis, 3rd Department of Obstetrics and Gynecology, Attikon Hospital, Medical School, National Kapodistrian University of Athens, 3 Serifou Street, Holargos, 15562 Athens, Greece (e-mail: dennisvaidakis@gmail.com).

Medicine (2017) 96:1(e5287)

Received: 5 December 2015 / Received in final form: 20 June 2016 / Accepted: 29 September 2016

http://dx.doi.org/10.1097/MD.0000000000005287

cancers (Papanicolaou cytology and HPV-DNA identification tests) for identification and treatment of preinvasive changes (CIN—cervical intraepithelial neoplasia in the uterine cervix).

In order to develop such health promotion programs, first we should identify the target group of the population and, then, study its sexual behavior, attitudes, beliefs, and knowledge on STIs, focused mainly on HPV. The aim of the present study was to identify the above parameters in the Greek adolescent population and, to our knowledge, this is the first time that a study of this kind takes place, on a national scale, in Greece.

2. Methods

The study was coordinated by a postgraduate student (VD), under the supervision of a consultant gynecologic oncologist (PT). The study was designed, planned, and executed by the 2nd and 3rd Academic Departments of Obstetrics and Gynecology of the Medical School, National Kapodistrian University of Athens, in cooperation with the National School of Public Health (MK, MA) and 1st Department of Psychiatry of the Medical School, National Kapodistrian University of Athens (ZI). The selection of the population sample and the statistical analysis were performed by the Department of Statistics of the London School of Economics (MI). The distribution and collection of the questionnaires were coordinated by staff of the Hellenic Anticancer Institute (CM). The study was submitted and approved by the Pedagogic Institute of the Greek Ministry of Education (134615/Γ2).

It was decided to target the Greek adolescents in their last year in secondary school and before taking their national university entry exams (approximately 17–18 years of age). The target population was approximately 100,000 students. The survey is designed to yield a representative sample of adolescents. The sampling frame for the survey has been the list of all schools in 2008 (1431 schools in total) provided by the ministry of education. The population covered is all the last year in secondary school students of age 17 and above. A probability sampling design has been used with 2-stages and an explicit stratification at stage 1. The primary sampling units are the schools and the secondary and final sampling unit to be interviewed is all the last year in secondary school students among the selected schools. At the first stage all schools were stratified on the basis of geographical area (13 administrative regions, perifereies) and degree of urbanization. Municipalities and local communities within each region have been divided into 3 groups based on their degree of urbanization. Urban areas are defined with 30,000 inhabitants or more, suburban areas with 5000 to 29,000 inhabitants and agricultural or rural areas with up to 4999 inhabitants. The total number of strata of the survey was 39. Schools from each stratum were selected proportional to the size of each stratum. In total, we selected 84 schools, 48 from urban areas, 16 from semiurban, and 20 from rural areas. At stage 2 we selected all the last year secondary school students from the selected schools since it was not possible to obtain a list of students for each school and perform a sampling of students from the selected schools. Only indicative information was provided with respect to the size of each school depending on the degree of urbanization. From information obtained from the ministry of education we estimated that the average number of students per school will be about 60 students taking into account that schools in rural areas have on average 30 students and schools in urban and semiurban areas between 50 and 90 students. From the 84 selected schools, a total number of 4507 adolescents (2778 girls and 1729 boys) participated in the study. The total sample size is large enough to detect any statistical significant effects in the analysis. The sample was considered as representative for the whole of Greek territory. The statistical analysis was coordinated by IM. The geographic allocation of the sample is presented in Fig. 1.

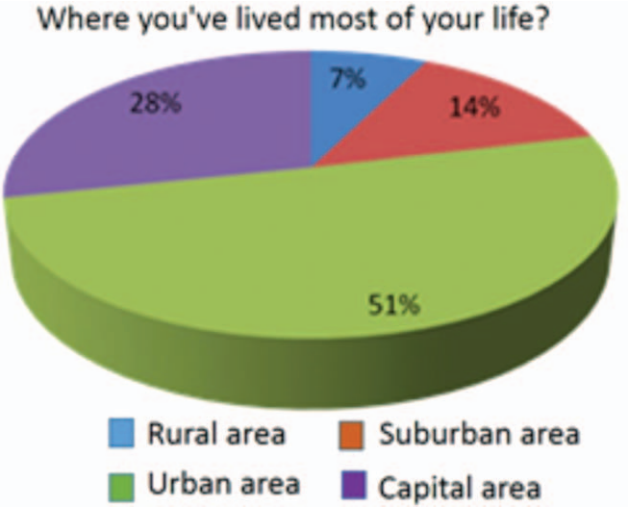

Figure 1. The geographic allocation of the sample is presented.

The mode of data collection was self-administered questionnaires with 36 questions and completion time of, approximately, 15 minutes. All principals of the chosen schools agreed to allow their students to participate in the study. In order to secure the anonymity and the personal data of the participants, the questionnaires were distributed and collected from the allocated health inspectors in each education provincial authority and a member of the research team. The fields covered in the questionnaire were demographic characteristics, sexual life data, knowledge of the participants concerning protection methods from sexually transmitted diseases and contraception methods and the sources from which they collected their knowledge, as well as the level of trust to those sources. A pilot study of 50 students was used to test and evaluate the questionnaire before the final study.

The response rate was very high (87%). Only a small number of students were not interviewed because they were either absent from the school the day of the data collection or refused to participate. In any case, the percentage of nonrespondents is quite small that we believe will have no impact on our results. Furthermore, we expect that students who were absent will not differ from the ones being interviewed. The refusals are more likely to differ but due to the small numbers we expect our results not to be affected by refusals.

2.1. Statistical analysis

The SPSS statistical software (version 18.0) was used for the analysis of the data. Continuous variables were presented with mean and standard deviation, while qualitative variables were presented with absolute and relative frequencies. For the comparison of proportions, Chi-square tests were used. Student *t* tests were computed for the comparison of mean values between 2 groups. In order to find independent factors associated with adolescents knowledge about HPV, cervical cancer and HPV

vaccine, a stepwise multiple logistic regression analyses (P for removal was set at 0.1 and P for entry was set at 0.05) were conducted. Adjusted odds ratios with 95% confidence intervals were computed from the results of the logistic regression analyses. All P values reported are 2-tailed. Statistical significance was set at 0.05.

2.2. Compliance with ethical standards

The printing and postal costs were funded by the participant institutions. This study, involving human participants, was in accordance with the ethical standards of the relevant institutional and national research committees and with the 1964 Helsinki declaration and its later amendments. Further, the study was approved by the Ethics Committee of the National Ministry of Health (134615/Γ2).

3. Results

Data from 4507 participants (1729 boys and 2778 girls) were analyzed. The mean age of the participants was 17.4 years (SD: 0.6 years) and most of them (94.1%) had a Greek nationality. The majority of the adolescents (83.8%) lived with both parents and more than half of the sample (64.5%) had, already, had sexual intercourse. The mean age of onset of full sexual activity was 15.5 years (SD: 1.2 years) and 41.8% of the adolescents had sexual intercourse before the age of 16 years (Table 1).

Table 1

Sample characteristics.

	N (%)
Gender	
Girls	2778 (61.6)
Boys	1729 (38.4)
Age, mean (SD)	17.4 (0.6)
Residence	
Rural/semiurban	944 (20.9)
Urban	3563 (79.1)
Nationality	
Greek	4239 (94.1)
Other	268 (5.9)
Age of the father, mean (SD)	48.9 (5.5)
Age of the mother, mean (SD)	43.8 (5.2)
Educational level of the father, y	
≤6	854 (19.5)
7–14	2225 (50.7)
>14	1306 (29.8)
Educational level of the mother, y	
≤6	649 (14.7)
7–14	2343 (53.1)
>14	1417 (32.1)
What is the role of religion in your life?	
Not important	981 (21.9)
A little important	2033 (45.4)
Very important	1463 (32.7)
Living with both parents	
No	710 (16.2)
Yes	3666 (83.8)
Don't answer	97
Sexually intercourse	
No	1496 (35.5)
Yes	2723 (64.5)
Don't answer	229
Age of onset, y	
12–15	1124 (41.8)
16–18	1565 (58.2)

SD = standard deviation.

Less than half of the sample (42.8%) knew about HPV (47.9% of girls and 35.5% of boys, $P < 0.001$), while 75.5% of the sample knew about cervical cancer (79.1% of girls and 70.2% of boys, $P < 0.001$). The 60.6% of the participants did not know if there is an association between cervical cancer and infection with HPV and the percentage of not knowing the association was greater in boys compared to girls. Only 33.1% of the sample responded that HPV is very common in sexually active women. The proportion of adolescents that did not know that the use of condoms reduces the risk of HPV infection was 21.1%, while 37% did not know that condoms reduce the risk of cervical cancer (32.9% of girls and 42.8% of boys, $P < 0.001$). Less than half of the sample (40.0%) knew about the HPV vaccine and this proportion was lower in boys (34.5%) compared to girls (43.9%). Only 10.2% of the girls had been vaccinated against HPV and, in most cases, this was provided by a gynecologist (51.0%) (Table 2).

Table 3 shows the association of demographics and sexual activity with knowledge about HPV and cervical cancer. Interestingly, more adolescents from rural and semiurban areas knew about cervical cancer compared to those from urban areas. Also, the proportion of participants who knew what is cervical cancer was greater in those with age of onset for sexual intercourse the 16 to 18 years, compared to those with age of onset the 12 to 15 years. Furthermore, a greater proportion of adolescents who knew what is cervical cancer or HPV was found in more religious ones.

The association of demographics and sexual activity with knowledge about HPV vaccine is shown in Table 4. Except from gender, the only other factor that showed a significant association with knowledge about HPV vaccine was the residence of the pupil. Compared with those from urban areas, less adolescents from rural and semiurban areas knew about the HPV vaccine.

When multiple logistic regression analysis was used with stepwise elimination procedure (with the variable presented if they knew about HPV), it was found that female gender and being religious were independently associated with their knowledge about HPV. Specifically, boys were 40% less likely to know about HPV (OR = 0.60, 95% CI: 0.50–0.74, $P < 0.001$). Additionally, participants for whom religion had an important role in their lives were 1.32 times more likely to know about HPV (OR = 1.32, 95% CI: 1.07–1.62, $P = 0.009$). Multiple logistic regression analysis, with the variable presented if they knew about cervical cancer, showed that adolescents whose age of onset was 16 to 18 years had greater odds for the corresponding knowledge compared to those that age of onset for sexual intercourse was 12 to 15 years (OR = 1.33, 95% CI: 1.01–1.75, $P = 0.046$). Also, boys were less likely to know about cervical cancer (OR = 0.68, 95% CI: 0.52–0.91, $P = 0.008$). Specifically for the HPV vaccine, in multiple logistic regression analysis, knowledge about the vaccine indicated a significant association with gender (OR = 0.67, 95% CI: 0.55–0.82, $P < 0.001$) and area of residence (OR = 1.45, 95% CI: 1.16–1.81, $P = 0.001$). Boys and adolescents from rural or semiurban areas were less likely to know about the HPV vaccine.

4. Discussion

Since the 1980s, the sexual education programs focus on HIV.[11] This is recorded in most epidemiological studies in Europe and

Table 2

Adolescent's knowledge about HPV in total sample and by gender.

	Total sample	Girls	Boys	
	N (%)	N (%)	N (%)	*P*
Do you know what HPV is?				
No	945 (57.2)	508 (52.1)	437 (64.5)	<0.001*
Yes	707 (42.8)	467 (47.9)	240 (35.5)	
Do you know what cervical cancer is?				
No	411 (24.5)	206 (20.9)	205 (29.8)	<0.001*
Yes	1264 (75.5)	781 (79.1)	483 (70.2)	
What is the association between cervical cancer and infection with HPV?				
Very strong/strong	527 (31.9)	353 (36.1)	174 (25.7)	<0.001*
Low	55 (3.3)	34 (3.5)	21 (3.1)	
No association	70 (4.2)	34 (3.5)	36 (5.3)	
Don't know	1001 (60.6)	556 (56.9)	445 (65.8)	
Do you know how common is the infection of sexually active women with HPV?				
Very common/common	548 (33.1)	338 (34.5)	210 (31.1)	0.075*
Rarely	111 (6.7)	73 (7.4)	38 (5.6)	
Don't know	998 (60.2)	570 (58.1)	428 (63.3)	
How much condoms reduce the risk of HPV infection?				
Very much	1179 (70.7)	690 (70.5)	489 (71.1)	0.256*
A little	110 (6.6)	67 (6.8)	43 (6.3)	
Not at all	26 (1.6)	20 (2)	6 (0.9)	
Don't know	352 (21.1)	202 (20.6)	150 (21.8)	
How much condoms reduce the risk of cervical cancer?				
Very much	692 (41.3)	422 (42.8)	270 (39.2)	<0.001*
A little	254 (15.2)	169 (17.1)	85 (12.3)	
Not at all	110 (6.6)	71 (7.2)	39 (5.7)	
Don't know	619 (37.0)	324 (32.9)	295 (42.8)	
Are you informed about HPV vaccine?				
No	266 (16.0)	160 (16.4)	106 (15.5)	<0.001*
Yes	665 (40.0)	429 (43.9)	236 (34.5)	
Don't know	730 (43.9)	388 (39.7)	342 (50.0)	
If you are informed for HPV vaccination, what is the recommended age?, mean (SD)	14.4 (3.3)	14.6 (3.1)	14.0 (3.6)	0.090†
Are you vaccinated against HPV?				
No		863 (89.8)		
Yes		98 (10.2)		
If yes, who provided the vaccination				
Pediatrician		30 (30.6)		
Gynecologist		50 (51.0)		
General practitioner		18 (18.4)		

HPV = human papilloma virus, SD = standard deviation.

* Chi-square test.

† Student *t* test.

USA, since the majority of teenagers are aware about AIDS, but they are unaware for other much more common STIs, like HPV.[12]

As our study, all studies based on questionnaires have potential risk bias which may affect data quality. However, in the present study, we tried to overcome such bias, for example to reliably represent the Greek adolescent population, basing our calculation of the statistical sample on the geographical data, provided by all the prefectures in Greece. We decided to sample the, approximately, 100,000 pupils' population of the last year in secondary school, before entering exams for university studies, which means the population of 17 to 18 years of age. This population group was selected, firstly, because we wanted to know the percentage of onset of full sexual activity by the age of 18 years and, secondly, because we wanted to find out what was the percentage of adolescents who had been vaccinated before leaving their homes and went to live on their own, as it usually happens in Greece, when they finish school and follow university studies (85% of Greek students, after school, follow either higher or high education studies). Indeed, in our sample, in more than 30% of the population, the parents acquired higher or high education degrees.

Another potential eliminating factor of bias is the high percentage of participants who, actually, completed the questionnaire. We believe that the unexpectedly high rate (87%) of completing the questionnaire was due to the well organized way of approaching the pupils. They were thoroughly informed by their headmaster and the Public Health Official of their Prefecture about the nature and the purposes of the study. Before being asked to fill the questionnaires, they were given time to ask questions and get answers. Also, we believe that it was of great help the fact that the questionnaires were answered immediately after the informative introduction and in their very well known class environment, where they conducted most of their school activities.

Other source of bias could have been the addressing of a not very homogeneous population sample. We believe that our sample was very homogeneous in the respect that 94.1% of

Table 3

Association of demographics and sexual activity with knowledge about HPV and cervical cancer.

	Do you know what HPV is?			Do you know what cervical cancer is?		
	No	Yes		No	Yes	
	N (%)	N (%)	*P*	N (%)	N (%)	*P*
Gender						
Boys	439 (64.3)	244 (35.7)		207 (29.8)	487 (70.2)	
Girls	513 (51.9)	475 (48.1)	<0.001*	209 (20.9)	791 (79.1)	<0.001*
Residence						
Rural/semiurban	268 (55.3)	217 (44.7)	0.303	104 (20.8)	395 (79.2)	0.022*
Urban	677 (58.0)	490 (42)		307 (26.1)	869 (73.9)	
Nationality						
Greek	898 (57.6)	662 (42.4)	0.222	391 (24.8)	1187 (75.2)	0.355
Other	47 (51.1)	45 (48.9)		20 (20.6)	77 (79.4)	
Age of the father, mean (SD)	48.5 (5.5)	48.5 (5.8)	0.747	48.6 (5.3)	48.5 (5.7)	0.887
Age of the mother, mean (SD)	43.3 (5.1)	43.8 (5.1)	0.084*	43.2 (4.6)	43.7 (5.2)	0.092*
Educational level of the father, y						
≤6	194 (55.7)	154 (44.3)	0.165	96 (27.2)	257 (72.8)	0.301
7–14	494 (59.2)	340 (40.8)		198 (23.3)	650 (76.7)	
>14	234 (53.9)	200 (46.1)		101 (23.0)	338 (77.0)	
Educational level of the mother, y						
≤6	144 (58.5)	102 (41.5)	0.787	68 (27.4)	180 (72.6)	0.358
7–14	494 (56.2)	385 (43.8)		209 (23.4)	686 (76.6)	
>14	286 (57.3)	213 (42.7)		129 (25.5)	376 (74.5)	
What is the role of religion in your life?						
Not important	216 (60)	144 (40)	0.012*	98 (27.1)	263 (72.9)	<0.001*
A little important	434 (59.6)	294 (40.4)		212 (28.6)	530 (71.4)	
Very important	289 (52.1)	266 (47.9)		100 (17.8)	463 (82.2)	
Living with both parents						
No	139 (55.4)	112 (44.6)	0.522	56 (22.1)	197 (77.9)	0.365
Yes	773 (57.6)	570 (42.4)		338 (24.8)	1025 (75.2)	
Sexually intercourse						
No	300 (56.7)	229 (43.3)	0.837	124 (23.3)	409 (76.7)	0.286
Yes	584 (57.3)	436 (42.7)		267 (25.7)	771 (74.3)	
Age of onset, y						
12–15	264 (60.1)	175 (39.9)	0.099*	129 (28.9)	317 (71.1)	0.039*
16–18	316 (55.0)	259 (45.0)		136 (23.2)	449 (76.8)	

Chi-square test, Student *t* test.

HPV = human papilloma virus, SD = standard deviation.

* Chi-square test.

pupils were of Greek nationality. Greece is a small country, with a population of just over 12,000,000 people. The recent humanitarian crisis, with economic immigrants and refugees coming from other countries, is a very new phenomenon and, certainly it did not affect the representation of the sample when the study was conducted. Also, the Greek society is strongly Christian Orthodox and there is a certain family life, based on long-lived traditions, which produces quite similar patterns of social behavior. Indeed, in only 22% of the pupils religion does not play an important role in their life. Also, the vast majority of pupils lived with their parents. However, the extensive use of modern technology, even by adolescents, namely the mobile phones and Internet services, may affect adolescents' behavior, as these activities may be conducted without parental control. We aimed at exploring these factors by, specifically, addressing specific questions in our survey.

We understand that the phrasing of some questions, when asked with a purpose, may have induced biased answers and lead the participants to certain answers even without related knowledge. For example, "What is the association between cervical cancer and infection with HPV?." We decided to do this, instead of posing open questions, in order to focus on the pupils' knowledge on the association of HPV with cervical cancer. However, a few results seem to indicate that the respondents may have been influenced by the nature of the question. For example, when only 33% answers that HPV can cause cervical cancer, at a following question, a higher proportion (41.3%) knows that condoms protect against cervical cancer.

Recently, smaller Greek epidemiological data indicated that the majority of Greek adolescents involve in full sexual activity before leaving school. This is the largest epidemiological study addressing this issue in Greece and it shows that 64.5% of 17 to 18 years of age adolescents have full activities. Also, the mean age of sexual debut, with small differences between genders, is the 15.5 years of age. Along with this fact and the poor knowledge about STI, HPV and the low vaccination rates of adolescents, we believe that there is an urgent need for the Greek authorities to develop a systematic plan of sexual education at school. The, relatively, low numbers of cervical cancer (less than 5/100,000 women/y) could rise sharply in future years, due to lack of information about protection from HPV and the lack of a National screening program for cervical cancer.

Although, most of boys and girls knew, in general, about the protection of using condoms, only 36% of girls and 25.7% of boys knew about the oncogenic association of HPV with cervical cancer. Forty-three percent and 75% of the participants knew

Table 4

Association of demographics and sexual activity with knowledge about HPV vaccine.

	Are you informed about HPV vaccine?		
	No	Yes	
	N (%)	N (%)	*P*
Gender			
Boys	451 (65.4)	239 (34.6)	
Girls	552 (55.8)	438 (44.2)	0.001*
Residence			
Rural/semiurban	327 (66.1)	168 (33.9)	0.001*
Urban	669 (57.4)	497 (42.6)	
Nationality			
Greek	938 (59.9)	627 (40.1)	0.926
Other	58 (60.4)	38 (39.6)	
Age of the father, mean (SD)	48.5 (5.5)	48.6 (5.7)	0.671
Age of the mother, mean (SD)	43.4 (5.1)	43.8 (5.1)	0.213
Educational level of the father, y			
≤6	216 (61.0)	138 (39.0)	0.736
7–14	504 (60.4)	331 (39.6)	
>14	255 (58.5)	181 (41.5)	
Educational level of the mother, y			
≤6	158 (63.2)	92 (36.8)	0.511
7–14	526 (59.6)	357 (40.4)	
>14	295 (59.0)	205 (41.0)	
What is the role of religion in your life?			
Not important	210 (58.3)	150 (41.7)	0.781
A little important	445 (60.5)	290 (39.5)	
Very important	334 (60.0)	223 (40.0)	
Living with both parents			
No	144 (57.8)	105 (42.2)	0.442
Yes	817 (60.4)	535 (39.6)	
Sexually intercourse			
No	312 (59)	217 (41)	0.497
Yes	624 (60.8)	403 (39.2)	
Age of onset, y			
12–15	273 (62.3)	165 (37.7)	0.352
16–18	346 (59.5)	236 (40.5)	

Chi-square test, Student *t* test.

HPV = human papilloma virus, SD = standard deviation.

* Chi-square test.

about HPV or cervical cancer, while more than 6 out of 10 did not know the association between the 2. Also, more than 60% of the participants could not answer correctly neither about HPV infection and cervical cancer risk in sexually active women, nor about protection methods against HPV and cervical cancer. Similar results are observed in relevant studies from Canada,[13] United States,[14] and Europe.[15] Inadequate knowledge about HPV in combination with early sexual debut and high-risk sexual behavior, could lead to long-term increase in the incidence of chronic cervical HPV infection and, consecutively, to cervical cancer.[16]

The female participants of the study and older pupils seemed to know more about HPV and this is a common finding with other similar studies.[17,18] Many adolescents believe that HPV and the repercussions of its infection are a strictly female issue, but since males can be silent carriers of the virus, the more they know about HPV protection methods the better they protect themselves and their partners. Proper education on the potential carcinogenic nature of HPV in men would, also, lead to better protection of both genders.[17] Moreover, the education of the public opinion toward the extension of the vaccine coverage to the whole of the population (boys and girls) will help to reduce greatly all HPV-related cancers, irrespective of gender.

Looking at our data, it seems that a major role on teenagers' attitudes and believes plays the parents' education level, mainly the mothers' education level. Parents of higher education are more likely to inform their children about STIs and encourage them to vaccinate against HPV.[19] Also, the mothers' education and younger age can influence positively their boys' and girls' attitudes, as they are more likely (mainly the daughters) to seek advice from their mothers on sexual issues.[20] Adversely, girls born to mothers with early sexual debut have a higher chance to an early sexual debut and a higher rate of unwanted pregnancies.[20]

Generally, it appears that girls knew more than boys about HPV, although the percentage of vaccinated girls was very small (10.2%). Worldwide, although since 2006 2 vaccines against high-risk HPV genotypes are available, the majority of the teenagers are unaware of them and only a small percentage of them are vaccinated.[21] The HPV vaccine has been incorporated in the Greek national vaccination program since 2008 and it is administered for free by the state insurance providers to girls from the age of 11 up to 26 years of age. From 2017, in Greece the vaccine will be administered for free, only, until the age of 16 years of age. The study was completed in 2013 and there are promising data that the coverage of the population has been steadily increasing to 20% to 25% up to the age of 26 years (personal communication with pharmaceutical companies). We believe that the low coverage is due to lack of systematic information of the public opinion and health professionals and hope that this study will reinforce the efforts that have been done so far, in order to reach acceptable coverage scores. Since in our population most of vaccines were given by gynecologists, we believe that this was achieved by educated mothers who brought their daughters to their gynecologists. It seems that, in order to achieve higher coverage rates, the pediatricians have to be more actively involved in the vaccination program.

In summary, this study shows that the low vaccination coverage of the Greek adolescent population may be due to lack of information of both adolescents and their parents. It is our duty to increase our efforts in order to better educate the population and vaccinate the target groups, as early as possibly in their reproductive years.

References

[1] Onon TS. History of human papillomavirus, warts and cancer: what do we know today? Best Pract Res Clin Obstet Gynaecol 2011;25:565–74.

[2] Jemal A, Simard EP, Dorell C, et al. Annual report to the nation on the status of cancer, 1975–2009, featuring the burden and trends in human papillomavirus (HPV)-associated cancers and HPV vaccination coverage levels. J Natl Cancer Inst 2013;105:175–201.

[3] Tiro JA, Saraiya M, Jain N, et al. Human papillomavirus and cervical cancer behavioral surveillance in the US. Cancer 2008;113(10 suppl): 3013–30.

[4] Berek J. Novak's Gynecology. 14th ed.Lippincott Williams & Wilkins (LWW), Philadelphia:2006.

[5] American College of Obstetricians and GynecologistsHuman papillomavirus vaccination. ACOG committee opinion No. 344. Obstet Gynecol 2006;108:699–705.

[6] DiSaia Ph, Creasman W. Clinical Gynecologic Oncology. Mosby, US:2007.

[7] Franco EL, Cuzick J. Cervical cancer screening following prophylactic human papillomavirus vaccination. Vaccine 2008;26(suppl 1):A16–23.

[8] Fernández-Esquer ME, Ross MW, Torres I. The importance of psychosocial factors in the prevention of HPV infection and cervical cancer. Int J STD AIDS 2000;11:701–13.

[9] Blanc AK, Way AA. Sexual behavior and contraceptive knowledge and use among adolescents in developing countries. Stud Fam Plann 1998;29:106–16.

[10] Vivancos R, Abubakar I, Phillips-Howard P, et al. School-based sex education is associated with reduced risky sexual behaviour and sexually transmitted infections in young adults. Public Health 2013;127:53–7.
[11] Villa-Torres L, Svanemyr J. Ensuring youth's right to participation and promotion of youth leadership in the development of sexual and reproductive health policies and programs. J Adolesc Health 2015;56(1 suppl):S51–7.
[12] Anwar M, Sulaiman SA, Ahmadi K, et al. Awareness of school students on sexually transmitted infections (STIs) and their sexual behavior: a cross-sectional study conducted in Pulau Pinang, Malaysia. BMC Public Health 2010;10:47.
[13] Kiely M, Sauvageau C, Dubé E, et al. Human papilloma virus: knowledge, beliefs and behavior of Quebec women. Can J Public Health 2011;102:303–7.
[14] Healthy Teen NetworkAdvocacy Resource Guide: Comprehensive Sexuality Education. Healthy Teen Network, Washington, DC:2001.
[15] Hilton S, Smith E. I thought cancer was one of those random things. I didn't know cancer could be caught . . . ": adolescent girls' understandings and experiences of the HPV programme in the UK. Vaccine 2011;29:4409–15.
[16] Marrazzo JM, Cates W. Interventions to prevent sexually transmitted infections, including HIV infection. Clin Infect Dis 2011;53(suppl 3): S64–78.
[17] Keenan K, Hipwell A, Stepp S. Race and sexual behavior predict uptake of the human papillomavirus vaccine. Health Psychol 2012;31: 31–4.
[18] Blödt S, Holmberg C, Müller-Nordhorn J, et al. Human papillomavirus awareness, knowledge and vaccine acceptance: a survey among 18–25 year old male and female vocational school students in Berlin, Germany. Eur J Public Health 2012;22:808–13.
[19] Donovan B, Franklin N, Guy R, et al. Quadrivalent human papillomavirus vaccination and trends in genital warts in Australia: analysis of national sentinel surveillance data. Lancet Infect Dis 2011; 11:39–44.
[20] Magnusson BM, Masho SW, Lapane KL. Adolescent and sexual history factors influencing reproductive control among women aged 18–44. Sex Health 2011;8:95–101.
[21] European Cervical Cancer Association. Available at http://www.ecca.info/fileadmin/user upload/HPV Vaccination/ECCA HPV Vaccination April 2009.pdf [accessed 15.10.15].