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# Human Papillomavirus: A Gender-Based Report on the Knowledge of College Students in Northern Greece

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## Abstract

**Title:** This study was performed to evaluate the level of basic knowledge of students in Northern Greece regarding human papillomavirus matters, considering each gender's aspect.

**Background:** In every society it is fundamental that young adults should receive proper education for all Sexual Transmitted Diseases. This study aims on highlighting the necessity of aggressive campaigns, for informing students on HPV. Via a short survey, we performed a key evaluation of the knowledge of students to conclude on whether campaigns for informing students on HPV should be organized by the state.

**Methods and Findings:** A questionnaire type of survey was undertaken to evaluate the level of basic knowledge of the sample regarding HPV. The questionnaire comprised of 11 questions. The first two questions were to determine specific characteristics of the sample; the third was about the participant's belief of being well educated on HPV, while the rest of them were to evaluate their actual knowledge of the activity, pathogenesis and the national vaccination program against HPV. Five hundred sixty-one students of Northern Greece participated in the study (398 females and 161 males). Regarding their knowledge on HPV, most of the participants declared to be well informed with a rate of 76.1%. Indicatively, it appeared to be an independence regarding gender ( $p=0.44$ ) about whether HPV can cause cancer to both sexes. As to vaccination, 50.7% of the participants, regardless gender, believed that HPV vaccine is effective on men ( $p=0.34$ ).

**Conclusion:** Students in Northern Greece seemed to be insufficiently informed about the general activity of HPV, pathogenicity, and vaccine's effectiveness ( $p=0.00001$ ). Similar surveys should be launched in the whole country for a proper evaluation to be obtained. The outcome of

these studies could be rather beneficial in organizing educational campaigns for students of Greece and, if it is needed, to other countries as well.

**Keywords:** HPV; Gender; Greece; Knowledge; Epidemiology; Vaccination; Cervical cancer

## Introduction

Human papillomavirus (HPV) family is composed of many strains with mutual characteristics, such as the lack of envelope and the small diameter (up to 55 nm) [1]. Moreover, all HPVs include a double stranded circular DNA molecule and intraepithelial pathogenic agents. Contamination depends solely on the completion of the keratinocyte's differentiation cycle. The expression of viral genome is limited in keratinocytes, since there has been no evidence that viral genes are expressed to any other cell's types [2]. The non-structural proteins E1 to E8 and the L1 protein participate not only to the installation of the virus in host cells, but also in the infectivity of the various strains [3,4].

The Center for Disease Control and Prevention (CDC) underlines that 90% of HPV infections are going to be eradicated in the next two years. However, given environmental factors, there is always a possibility of benign or malignant neoplasm appearance [4,5]. HPV 16 and 18 strains are high-risk types, as they are responsible to 75% of cervical cancer's appearances. They are also held accountable for 50-75% of vaginal and vulvar cancer cases [6-8]. Across the globe, HPV-related cancerous rates fluctuate to 100% of cervical, 88% of anal, and less than 50% of lower genital tract and oropharyngeal [9].

Regarding female gender, over the past three decades, the cervical cancer remains the second leading cause of cancerous-related deaths in women. Every year, about 500,000 women develop the disease, while approximately 240,000 die [10]. In 1997, an epidemiological study carried out in Greece detected the HPV types 16, 18, and 31 in patients with cervical

cancer at levels of 56%, 23% and 6% respectively [11]. During the years 2003-2006, another study was conducted by St. Savvas oncology hospital in Athens, which detected HPV infection in patients with cervical cancer, aged 18-48 years, at a rate of 47.3%. The most common HPV types on the study sample was the low risk HPV-11 (13.4%) and the high-risk HPV-18 (10.3%) [12].

On the other hand, HPV associated cancer is rare for men (approximately 1.6/100,000 in general population). More specifically, HPV can cause rectum, penile and oropharyngeal cancer, with the last one being observed, in several countries, at higher rates on men compared to women [9]. Also, 45% of men present an indication of HPV infection, over a rate of 40% for women (age ranges: 18-59). Additionally, a 25% of males from the above rates are infected by high risk HPV types, while the equivalent of females is estimated at 20% [13].

Nowadays, HPV vaccine has been proven to be the most effective shield against HPV infections. Specifically, the new 9-valent vaccine protects from the high-risk types 16, 18, 31, 33, 45, 52, 58, and the low-risk types 6 and 11. The vaccination can be applied on both boys and girls from the age of 9 to the age of 45 and 26, for women and men respectively [14,15]. From 2017, the vaccination program for HPV is recommended by the National Immunization Programs in 71 countries, while vaccine is administered for free to both girls and boys by 11 of those countries [16]. In April 2019, the European Centre for Disease Prevention and Control (ECDC) reinforced the efforts to include the vaccination on males [17]. Therefore, more and more countries tend to incorporate the masculine gender in their official vaccination program, with United Kingdom to be the most recent example [18]. It must be pointed out that being sexually active does not cancel the effectiveness of vaccine. On the contrary, shielding from the remaining types is essential [14,15].

In Greece, the National Immunization Program has been including HPV vaccination since September 2006. Nowadays, the program joins girls aged of 11 to 18 years and special groups between the age of 18 to 26 who are categorized as "special occasions" [14,19]. In these specific groups are being included women with chronic diseases, medical and nursing personnel and men who have sex with other men. The vaccine is being administered to feminine gender, excluding male population from the National Program [20].

The above analysis is an evidence that general population, especially students, must possess adequate knowledge on HPV facts. Several countries have attempted to measure the awareness of general population on HPV pathogenesis, vaccination programs and gender aspects. It seems that this kind of evaluation is quite useful when it comes to organizing and launching educational campaigns, especially to young adults [21-28].

The present study was designed as a survey to provide the statistics and vital information regarding HPV awareness

among students of northern Greece. The rationale is to focus on each gender's point of view on HPV and the association that presents to both males and females.

## Material and Methods

The questionnaire was distributed to universities and college students of Northern Greece. Medical and hygiene students were excluded from the survey. There was no age limitation. The survey was launched via social media to Northern Greece University forums and academic blogs, of which the aggregate of members was known. As a result, due to the average assemblage of each group's members, the total population of our study rises approximately to 100,000. In order to extract a randomized sample out of all students of Northern Greece, we made sure that our survey was launched to many different institutional forums and blogs (e.g. Aristotle University of Thessaloniki, University of Macedonia, International Hellenic University of Thessaloniki etc.). The amount of the responders building up our randomized sample is 561. The needed sample size was calculated, with a confidence level of 99% and a 5.43% margin of error, at 561 participants that could safely represent a population of 100,000 which is rather representative for Northern Greece student population.

The survey was launched on September 2019 and remained available for responding until 31 December 2019. A primary study was conducted with 96 participants, in which the internal consistency of our questionnaire was checked by using the  $\alpha$ -Cronbach Test ( $\alpha$ -factor=0.8). Responders were able to open the survey through a link provided by the authors. All the questions were mandatory. The responders were informed that they were participating in the survey voluntarily and anonymously and that their response was deposited for research purposes only. Prior the main questions the responders were asked to sign that they consent for using and depositing their responses for future research. Additionally, respondents were asked to confirm that they were students (Under-graduate, Post-graduate or PhD), that they were not studying in any school of health sciences and finally, that they had not already submitted an answer to this survey. Every time a respondent fulfilled the survey, date and time signatures were added.

The questionnaire consisted of 11 questions (**Table 1**). The first question evaluated the rates of male and female participants. The second, estimated the average age rates of the responders. The third was of high importance to evaluate whether our participants believe to be informed on HPV. The next 8 questions determined the actual knowledge of the responders about the clinical manifestation, prevalence of HPV, vaccination, and gender's dependence. More specifically, No.5 evaluated their believes regarding gender's aspect. Questions No.4 and No.9 demanded a strict positive or negative answer. The rest of them (No. 6,7,8,10,11) were more

debatable of the respondents' knowledge, giving them the opportunity to declare their unawareness.

**Table 1** Questions 1 to 11 of the questionnaire are used to evaluate the level of the basic knowledge of the participants regarding HPV; these questions are to determine their biological gender (No. 1), age (No. 2), whether or not the participants believe to be informed (No. 3), and their actual knowledge on HPV (No. 4-11), The bolded counts/rates represent the right responds that evaluate participants' true knowledge on HPV.

Question	Answer	N	%
1. What is your biological gender?	Female	398	70.9
	Male	163	29.1
2. In which category is your age included?	<22	169	30.2
	22-30	252	44.8
	>30	140	25
3. Do you believe that you are well informed about Human Papillomavirus (HPV)?	Yes	427	76.1
	No	134	23.9
4. In your opinion, is Human Papillomavirus responsible for genital warts?	Yes	417	74.3
	No	144	25.7
5. Regarding gender 's aspect, to whom is epidemiologically HPV more related?	Exclusively to women	23	4.1
	Mostly about women	387	68.9
	Mostly about men	35	6.3
	Exclusively to men	0	0
	I am not sure	116	20.7
6. Could an "HPV Infection" and "Smoking" similarly result to developing cervical cancer?	Yes	221	39.5
	No	98	17.3
	I am not sure	242	43.2
7. Are there more HPV-related types of cancer than the cervical one?	Yes	286	50.9
	No	33	5.9
	I am not sure	242	43.2
8. Does HPV cause cancer to both sexes?	Yes	277	49.5
	No	86	15.3
	I am not sure	198	35.2
9. In your opinion, is HPV vaccine effective to be administered to the male gender?	Yes	285	50.7
	No	276	49.3
10. Should the HPV vaccine be administered to sexually active women?	Yes	393	70.2
	No	71	12.7
	I am not sure	97	17.1
11. Is the vaccination that prevents cervical cancer the same that shields people from several HPV-valent types?	Yes	277	49.5
	No	64	11.2
	I am not sure	220	39.3
N: number of answers, %: percentage of each answer			

Chi-square test was used on 2×2, 3×3, and 2×3 contingency tables. Additionally, a good-fitness test was applied on the sample to determine whether the survey was equally fulfilled from both sexes. Every chi-square statistic has been also

calculated with the popular Yates correction, maximizing the credibility. Finally, a Z-test was conducted to analyze the significance between the number of participants who declare to be informed and their mean scores of right answers (**Table 2**). Statistical analyses were performed using SPSS (free software for statistical computing-via Auth, <http://www.spss.com>), and p-value of significance was regarded as  $<0.05$ .

**Table 2** The participants mean scores of right answers (Questions No. 4 to 11) and their own affirmative answers of being well informed on HPV (Question No. 3), in comparison.

	N	Mean Score	SE	P-value
1. Males and Females	427	284.6	22.94	0.00001
2. Males	94	62.14	5.13	0.00001
3. Females	333	222.43	18.3	0.00001

N: number of affirmative answers on Question No.3, SE: standard error, P-value: statistical significance to all three studies

## Results

As shown on **Table 1**, 70.9% (398) of the participants were women and 29.1% (163) were men. Additionally, knowing that our target population was equally divided, a good-fitness test was performed regarding the gender and a significant difference was found ( $p=0.0001$ ), with female participants to outbalance the males. Regarding participants' age, the majority fluctuated among the ages of 22-30 (44.8% of rate). About their knowledge on HPV, most of the participants declared to be informed, with a rate of 76.1%. A percentage of 74% responded affirmative that HPV was the cause of genital warts, while only 39.5% declared an affirmative that HPV infection and smoking could both be responsible for developing cervical cancer. Regarding gender's aspect, a rate of 68.9% believed that, epidemiologically, HPV is related to both genders with women to had more weighted outcomes. On the questions about developing other cancer types than the cervical one, and whether HPV causes cancer to both sexes, a 50.9% and 49.5% respectively answered positively. About vaccination, it is reported by 50.7% of the participants that HPV vaccine was efficient for males, while a 70% agreed that it should be administered to sexually active women as well. Finally, a 49.5% believed that HPV vaccine is the same that prevents cervical cancer (**Table 1**).

As shown on **Table 2**, the mean score of 427 participants who declared to be informed on HPV and answered right the questions was 284.6 (66,7%). A significant difference was detected to each gender's knowledge analysis as well ( $p=0.00001$ ).

## Discussion and Conclusion

To begin with, the minority of male participants is rather provocative, pointing out a bias regarding HPV and its' relation to gender. Apart from questions No3 and No10, the present

study shows that almost half of the students in northern Greece do not have sufficient knowledge regarding HPV matters. Even a large proportion of those who believe to be informed on HPV is proven to be unaware or misinformed (**Table 2**). This phenomenon appears to other ethnicities, too. For example, Vongtmann et al. at their study of HPV awareness on Mexican college students, declared that the knowledge on HPV matters is rather limited, although most of them are familiar with the name of the virus [21].

Additionally, it was observed that sufficient information about HPV depends on gender ( $p=0.00001$ ). More specifically, it was found that women are more aware than men regarding genital warts' cause ( $p=0.00005$ ). The same fact was concluded for Swedish adults from Dahlström et al. [22].

On the contrary, in regards with the effectiveness of vaccination to masculine gender, there was no significant difference to the answers of each gender ( $p=0.34$ ), with both sexes to appear poorly informed. Although, studies on United States have pointed out a negativity about males' opinion on HPV immunization [23].

More particularly, trying to compare each gender actual knowledge on the effectiveness of the vaccine on males, we separated the two genders. The comparison that took place was among their response "do you believe you are well informed" and "whether or not the vaccine is effective to be administered to the male gender". It was observed that men were confused on the matter, with the two variables to appear independent ( $p=0.06$ ). On the contrary, a significant dependence on the same variables appeared to female's sample ( $p=0.026$ ). Patel et al. has also come to this deduction after a review analysis on European adolescents about HPV and HPV vaccine knowledge [24].

Consequently, even though both sexes appeared to have insufficient knowledge on HPV vaccination, women appeared to be lesser uninformed, as was expected. This might be a result of women's annual pap-test and discussion with their gynecologists, as it has been reported on a study conducted by McBride et al. [25]. The outcome is similar to the comparison of gender and whether or not HPV can cause cancer to both sexes; it appeared to be an independence regarding gender ( $p=0.44$ ) with the majority of men answering wrong and approximately 50% of women giving the right answer. When it comes to whether the vaccine prevents only the cervical cancer, a significant gender dependence appeared, with more men declaring unaware or answering wrong in comparison to women ( $p=0.001$ ). This finding showed that approximately 50% of the whole sample was unaware about vaccine's efficiency against other types of cancer. It is not unprecedented the fact that the immunization against HPV has been underestimated by male gender. Peters et al., on a proportional study, concluded that American males were less likely to be aware of the vaccine. However, the same study has also pointed out an insignificant gender differentiation of the awareness on HPV-associated cancers [26].

Furthermore, it was found that 82% of participants above the age of 22 believed to be informed about HPV, while only a

62% under the age of 22 declared the same ( $p=0.00001$ ). Similar age dependence existed between the age and whether the vaccine prevents only the cervical cancer ( $p=0.0004$ ). About the effectiveness of the vaccine to the masculine gender the variables appeared to be independent ( $p=0.16$ ), since all responders, despite their age, were confused about whether or not the vaccine should be administered to males (45%-55%: Affirmative answers).

Making our final analysis, despite the undeniable fact that many countries have studied the impact of HPV to both genders [4-10] and have put vaccination to males under seriously consideration [18], in Greece, the progress of the studies is limited to merely several cases [11,12]. The sample studied in this research indicates the general lack of knowledge and proper education on HPV. This unawareness is endorsed by the attitude of Greece's National Hygiene System which is still excluding male gender from the National Immunization Program, reproducing a gender bias to the matter. As many scientists have pointed out in their studies [25,27,28], it would be rather beneficial that educational campaigns for students of Greece (and especially male students) were to be organized in order to extinguish these biased ideas that have accreted through the years.

## Conflict of Interest Statement

The authors declare no conflict of interest.

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