Knowledge and beliefs about HPV infection and the relevant vaccination in Greek young population

Original manuscript, Observational non-experimental study (cross-sectional study)

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Abstract

Background: Infection by HPV oncogenic subtypes is the causative agent of half a million cancer cases in developed countries every year. The objective of the present study was to assess: a. the knowledge and beliefs of young Greeks about HPV infection and b. potential factors that discourage them from HPV vaccination.

Methods: Our group consisted of 825 individuals, 18-35 years old, who voluntarily completed some questionnaires.

Results: The attitude and consequent decision of women, considering HPV vaccination is associated with general vaccination attitude, mothers' beliefs, parents' educational level, family income, knowledge about HPV, the doctor's attitude and individual's health beliefs.

Conclusion: In Greece, as well as in other countries where HPV vaccination is neither a mandatory nor a school-based program, increased education of physicians and parents would substantially enhance HPV vaccination acceptance. Intervention strategies should focus more on providing adequate and reliable information to eliminate any doubts on HPV vaccine's safety and efficacy.

Introduction

Cervical cancer is a rare complication of a very frequent infection since more than 80% of sexually active women and men will be infected by Human Papilloma Virus (HPV) in their lifetime. The HPV persistent infection by oncogenic subtypes is the starting point of carcinogenesis for cancers of the lower genital tract (especially the cervix of the womb) (1) and "other-than-cervical" cancers (increasing trend of anal and oropharyngeal HPV-related malignancies in younger individuals) (2).

More than 200 million doses of the anti HPV vaccine have been administered since 2006 but despite the cumulative evidence of safety and efficacy (3), the vaccination coverage remains low. Specifically in Europe, coverage is significantly heterogeneous. Northern Europe reports show 69% coverage in the group of 15-19 years old, while in Eastern Europe there is just 8% vaccination coverage in the same age group (4).

In Greece, a publicly funded national HPV vaccination program has been implemented and since 2008 the vaccine has been available for the target population – girls aged 11-15 years old and teens until the age of 18 – while women aged 18-26 had the opportunity of free catch-up-vaccination until 31/12/2016. Despite the cost-free vaccine availability and the unanimous acceptance by the relevant scientific committees, the coverage does not exceed the 44.3% of the target population in any report (5, 6).

Several explanatory models have been designed aiming to understand the factors that shape health habits or factors that contribute to the adoption of preventive or health promotion behaviors and most of them agree that the way in which an individual perceives a situation will determine his/her final behavior (7). One of the

most commonly applied models is the Health Belief Model (HBM), developed by Becker in 1974, according to which the probability for an individual to amend a personal health behavior depends on whether he/she: a) believes that there is a high possibility of being infected by a disease (**perceived susceptibility**), b) believes that a condition can have a serious impact on one's health with serious consequences (**perceived severity**), c) believes that the proposed medical practices, interventions or behaviors can reduce the risk or the impact on one's health (**perceived benefit**), d) believes that there are negative consequences (financial cost, psychological distress, side effects) related to the proposed change of behavior (**perceived barriers**).

Methods

Our cohort consisted of 825 young adults, aged between 18-35 years old, who completed a questionnaire which was distributed in 2016 in an electronic form by social media. Only a single questionnaire could be submitted from each IP address and the process was fully anonymised. Sociodemographic data were collected, as well as data about sexual behavior and lifestyle factors considered as risk factors for cervical cancer (namely: age of first sexual contact, number of sexual partners, Pap smear results, smoking and condom use). For the data collection the following questionnaires were used:

1. *HPV Knowledge Scale*

HPV-Knowledge Scale (HPV-KS) (8) was developed as a valid framework for assessing knowledge regarding HPV (9). The short form was used in the present study which includes 10 items (true or false type) with the total knowledge score ranging from 0 to10 (1 point given to the correct answer and 0 to the false answer).

2. *Health Belief Model Scale for HPV and Vaccination (HBMS-HPVV)*

The HBM questionnaire was translated and adapted in Greek from Kim's scale and a relevant study in Turkish students (8, 9). The final version of the scale includes 14 statements corresponding to: perceived benefits (items 1-3), perceived susceptibility (items 4 and 5), perceived severity (items 6-9) and perceived barriers (items 10-13 and 14). The answers were given by a 4-item Likert- type scale, from 1 ("not at all") to 4 ("very much") to assess the extent to which the participants agree with each statement.

3. *Control Preference Scale (CPS)*:

The Control Preference Scale (CPS) was developed by Degner et al. (1997) aiming to assess the extent to which an individual wishes to take control over decisions and it was integrated in the current study because it is well known that this preference affects the final attitude and behavior towards health issues. The scale has been validated and used in several patient groups in literature (Sung et al. 2010), it consists of a question with five possible answers (range from 1 to 5) and the participants can be assigned into three categories as preferring: a. an active role *("I prefer to make the final decision*" or *"I prefer to make the final decision after seriously considering my doctor's opinion*"), b. a collaborative role (*"I prefer that my doctor and I share responsibility for the decision"* c. a passive role (*I prefer that my doctor makes the decision after he/she seriously considers my opinion"* or " *I prefer my doctor to make the decision*").

The three instruments were translated from English to Greek using the method of forward–backward translation by three independent translators and the draft version was tested by personal interview in 10 participants. The literary editing and the translation of medical terms in an understandable way were made by three bilingual health professionals (2 gynaecologists and 1 psychologist).

Ethical considerations

Permission was granted for the use of the HPV Knowledge Scale (HKS) and Health Belief Model Scale for HPV and Vaccination (HBMS-HPVV) after contacting Professor Kim. Only answers from participants older than 18 were used for analysis, which is the legal age of consent, since HPV is a sexually transmitted virus. The questionnaire was anonymised and participants were informed that they could return the completed questionnaire only in case they were consenting to the use of the provided data for analysis.

Statistical analysis

For the statistical analysis the method of frequency analysis was employed in addition to the Cross Tabs analysis and the x^2 (Chisquare) test which were also used for the one-to-one comparative analysis. The specific analysis can lead to the identification of differences between the frequencies of co-occurrence of the values of two different variables. The level of significance was defined as $p< 0.05$, the independent variables were the attitude towards HPV vaccination and the received vaccination, and the dependent variables were all the questions regarding level of knowledge, beliefs and attitudes regarding HPV infection and vaccination.

For further analysis, the non-parametric Kruskal-Wallis (KW)/ Mann-Whitney (MW) tests were used: 1) for studying whether the attitude towards HPV vaccination was significantly related to the 4 components of the HBM model (susceptibility, severity, benefit and barriers) – KW and 2) for studying whether the total HPV knowledge score of each participant was statistically related to the 4 HBM components - KW.

At last, the Spearman's rank-order correlation test was used for searching whether the total knowledge score of each participant was correlated to the education level (individual level, mother's, father's level). All analyses were performed using the Statistical Package for the Social Sciences (SPSS) version 21.0 (SPSS Inc., Chicago, IL, USA) for Windows.

Results

Sociodemographic characteristics

The participant's ages ranged from 18 to 35 years old (mean, 23.67; SD, 3.97), 669 were females (81.1%) and 156 males (18.9%). Regarding marital status, the vast majority (93.3%) were singles, while with respect to the educational level the majority (94.7%) were students or graduates of higher technological institutes or universities (37.5% studying or having studied at the field of health sciences and 22.8% at human sciences).

Sexual behavior -Lifestyle factors

The age of first sexual contact was between 15-18 years old for 38.2% and 18-23 years old for 48.1% of the participants. Estimating other risk factors, 72% were using condom regularly and 61.7% were nonsmokers. Furthermore, 71.4% of the women had attended at least once a cervical screening examination/smear (table I).

Attitude towards vaccination

For vaccines in general, 47.1% of the participants were positive towards all approved vaccines, 49.6% were ambivalent (their attitude depended on different vaccines) and only 3.3% were negative against all vaccines. However, specifically for the HPV vaccine, 89.8% were aware of its existence, 81.5% had a positive opinion for HPV vaccine, but only 51% had been vaccinated.

Among the vaccinated women, 44.1% had undergone HPV vaccination at the ideal period (before sexual life onset) and the main two reasons for being positive to the HPV vaccine were the declarations that "*vaccination is the best method of prevention*" (68.8%) and the "*fear of disease*" (11.1%). Conversely, the main two reasons for being opposed to the vaccine were the "*fear of possible side effects*" (55.3%) and the *"insufficient scientific justification"* (29.5%).

Knowledge about HPV

The mean score in the HPV Knowledge Scale was 5.38 for women (range 2-9) and 5.43 for men (range 2-8) of a possible 10 (Table II). The sample (both women and men) had good knowledge about the facts that: 1) "*some HPV subtypes causing warts of male and female genitalia*", 2) "*HPV is sexually transmitted*", and 3) "*HPV vaccine can prevent infection from certain HPV types*". On the other hand, participants had poor knowledge about that: 1) "*HPV in not a low risk virus and can cause cancer*", 2) "*sexually active women should not attend an annual HPV examination*".

The analysis did not find any correlation between the Total Knowledge and the participants' educational level (p=0.092) or mothers' (p=0.216) and fathers' (p=0.313) educational level.

Factors related to women's attitude towards vaccination

Due to the fact that in Greece, the free vaccination program covered only girls and women up to 26 years old (until December 2016) and not boys / men, but also due to the small percentage of men (N=156, 18.9%) who participated in the present study the correlation tests included only the women's subgroup.

Table III presents the results of the correlation analyses performed to assess the associations of **Non-HBM factors** with the women's attitude towards vaccination. As shown, the attitude towards vaccination was positively associated with general attitude towards vaccines (p=0.000), mother's education (p=0.026), mother's attitude towards HPV vaccination (p=0.000), doctor's attitude (p=0.000), as well as with the hypothesis (for the Greek population) of having to pay for HPV vaccination (p=0.000).

Furthermore, positive association was noted with two items of the **HPV-Knowledge Scale**: the knowledge that the HPV is being related to cervical cancer (p=0.007) and that it is a sexually transmitted infection (p=0.007).

Regarding the **HBM factors** (table IV), it was found that the positive attitude towards HPV vaccination was positively correlated with *susceptibility* (p=0.000) and *benefits* (p=0.000) and negatively correlated with *barriers* (p=0.000) (*"I have difficulty deciding at an early age for HPV vaccination"*, "*I doubt the safety and efficacy of the vaccine", "Possible side effects of HPV vaccination make me worry"*). However, the analysis revealed no correlation between the attitude towards HPV vaccination and *severity* (p=0.090) ("*HPV infection is a serious disease that can disturb everyday life", "HPV infection would threaten a relationship with my boyfriend, husband or partner", "The thought of HPV infection scares me*").

Factors related to received vaccination

Correlation analyses were performed in women who had been vaccinated (N=358) to assess the associations between the **Non-HBM factors** and the fact of vaccination. Positive associations were found with participants' educational level (p=0.028), general attitude towards vaccines (p=0.000), both parents' educational level (for mothers p=0.004 and for fathers p=0.000), mothers' attitude (p=0.000), family income (p=0.011), doctors' attitude (p=0.000), cervical screening program compliance (p=0.000) and satisfaction from the provided information (p=0.000).

From the 10 items of the **HPV Knowledge Scale,** only 4 correct answers exhibited statistically significant correlation with the participants' vaccination status. Those who self-reported as vaccinated were more likely to answer correctly that "*HPV*

is related to cervical cancer" (p=0.007), "*HPV is a sexually transmitted virus*" (p=0.007) and that "*HPV can infect the oral cavity, respiratory tract, and eyes*" (p=0.012). In addition, the vaccinated participants falsely answered that "*Sexually active women should undergo an HPV examination annually*" (p=0.008).

On the other hand, the received vaccination was negatively associated with the belief from **HBMS-HPVV** that "*HPV vaccination increases sexual curiosity or causes earlier exposure to sexual intercourse"* (perceived barriers, p=0.011).

Control Preference Scale

At last regarding the Control Preference Scale analysis, 74.1% of the participants prefer the active role in decision making, 20.1% take the decision about medical issues together with their doctor (collaborative role) and only 4.7% prefers to have a passive role leaving the decision to the doctor (Table 4).

Specifically for HPV vaccination, for 22.4% of the participants the decision for vaccination was taken in cooperation with the physician, for 20% the decision was taken by the participant's mother alone, for 33.9% it was a common decision of the individuals and their mothers and a smaller proportion of 19.2% took the decision for HPV vaccination by themselves (active role).

Discussion

The vaccination coverage was 51% which is higher than the 11% to 44.3% which has been previously reported in Greece (5, 6). However, this was yet lower than the 63% in the USA (10) and lower than the threshold of 70% that is the lowest acceptable coverage rate at which vaccination policy is cost effective (11). Likewise, 71.4% attended at least once the cervical cancer screening program and this was in accordance with the highest Greek reported estimate of cervical cancer screening compliance – 79% (12). Hence, the sample of the present study can be considered to be of high performance, regarding cervical cancer prevention attitudes.

General vaccination attitude

According to previously documented data, the belief in "*protection of licensed vaccines in general*" was correlated to HPV vaccine acceptability (13) and this was in line with the current study's results in which the "General attitude towards vaccination" was significantly associated with "HPV vaccination acceptance". Apart from that, it has been reported that HPV vaccine, influenza and MMR vaccines appear as the top three vaccines with the lowest acceptance (14) and because of this fact further analysis is required.

Health beliefs about HPV vaccination

Regarding HBMS-HPVV results, it was observed that women who had positive attitude toward vaccination showed higher perceived susceptibility and perceived benefits, in accordance with other studies (9, 17, 18, and 19). These findings show that women who: a) consider themselves at high risk regarding HPV infection and b) appreciate the importance of the HPV vaccine benefits, tend to adopt a positive attitude towards vaccination. However, perceived severity (belief on potential serious impact of HPV infection on one's health with serious consequences) did not appear to be an

influencing factor towards vaccination, in contrast to other studies (17) which reported a correlation between perceived severity and the intention vaccination. In other words it is more a matter of convincing the Greek population on vaccination benefits rather than disseminating fear about HPV infection (perceived severity) and one could expect that the arrival of the 9-valent vaccine might increase uptake, since it is designed to provide wider type-coverage and protection (additional vaccination benefit).

At last the negative attitude towards HPV vaccination was associated with the factor *perceived barriers* of the HBMS-HPVV. This finding confirms that the reluctance to HPV vaccination is due to fear of adverse effects and doubt on efficacy (20).

Knowledge and vaccination

Positive correlations were observed between "having received vaccine" and knowledge facts. Specifically in the Greek population the knowledge facts which could boost vaccination acceptance were: 1) "HPV is sexually transmitted", 2) "HPV vaccine can prevent HPV-related cancers and warts" and 3) "*HPV vaccine can prevent infection from certain HPV types*".

In other relevant studies, high knowledge scores have been correlated with HPV vaccination intention (21, 9) increased vaccination rates at follow up (22) and in a Greek population has been associated with high vaccine uptake (23). All these studies support that there is a direct association between knowledge and intended behavior – vaccination.

Although that knowledge is considered as an important factor favoring vaccination, it has to be noted that in the present study it is not the total knowledge on

HPV that leads to increased vaccination acceptance (Total Knowledge Score did not show any correlation with attitude towards vaccination), but the knowledge of specific facts which could be probably varying between different societies.

The role of parents

In the Greek society as shown on the results, mothers' beliefs are crucial for HPV vaccination decision, whereas studies from other societies report both parents' beliefs to be important and irrelevant to racial group differences (24).

HPV vaccination acceptance was also significantly associated with mothers' educational level and the performed vaccination was significantly associated with fathers' educational level. Similarly, mother's education was positively correlated to vaccination in a USA cohort (25) and in studies from Austria and Sweden (26, 27). However, in societies such as the UK, the parental educational level has not been correlated to HPV vaccine acceptance (28, 29).

Furthermore, the present findings underlined that having to make the decision for vaccination at an early age was an important barrier and this is a fact which probably enhances the role of parents in decision making.

Physicians' role

Likewise, the role of physicians is of paramount importance for HPV vaccination in Greece. Similarly to other studies it was highlighted that doctor's strong recommendation - encouragement were essential components for HPV vaccine acceptance (24, 19, 30, 31).

Hence, it is worrying that 26.5% of the Greek doctors (according to participants' answers) were ambivalent regarding HPV vaccination. It was only 71.1% of doctors

who were strongly recommending vaccination and even worse a small minority tended to discourage patients from vaccination (2.4%). This is in discordance with the results of other studies which have recently reported that 7% of doctors were ambivalent about risk/benefit of the specific vaccine in the USA (14).

For further understanding of the doctors' influence, it is important to emphasize results of the Control Preference Scale, because autonomy in decision making for medical issues varies between different cultures and ethnicities (15). Taking into account the findings from the present study, it is confirmed that the factor "physician's recommendation" is a key in HPV vaccination decision, as shown in other studies (16). Specifically the results show that 69.2% of the participants seriously considered the doctors' opinion, 20.1% made the decision together with their doctor (collaborative model in decision making) and 4.7% left the decision to the doctor thus giving to the doctor a primary role in decision making.

Satisfaction on available information

In addition to the above mentioned, doctors (39%) and internet (27%) appeared to be the main sources of information on HPV vaccination in the current study. Furthermore, a statistically significant correlation was found between the positive attitude towards HPV vaccination and the satisfaction from provided information and as it has been reported by other authors "the participants who felt to be contented after consultation or after receiving HPV-relevant information, appeared to be more likely to retain a positive opinion for HPV vaccination", thus satisfaction from provided information appears to be a strong determinant of vaccination initiation (32, 33) To achieve the goal of information satisfaction doctor's believe that supporting material such as written leaflets for patients/ parent's education would be a useful adjunct to

their consultation (14). As for the role of the internet, more than half of the users consider nearly all information provided on health sites to be credible ("Pandora box of antivaccination misinformation") (34) which means that antivaccination misinformation is an important barrier against HPV vaccination.

Vaccination and sexual curiosity

There is an impression among parents that HPV vaccination would provide a false sense of safety which might encourage early or unsafe sexual activity (34) and likewise in the present study, a statistically significant positive association was observed between non-vaccination and the belief that "*HPV vaccination increases sexual curiosity or causes earlier exposure to sexual intercourse*". On the other hand, there was no difference between vaccinated vs non-vaccinated participants in relation to the number of sexual partners, age of first sexual contact, smoking and frequency of condom's use. In addition, the vaccinated subgroup shows a significantly higher compliance with cervical cancer screening program ($p=0.000$). This means that the vaccinated subgroup, contrary to the misperception of being negligent, were attending cervical screening program at a higher rate than the non-vaccinated and this indicates increased sense of prevention awareness and responsible, planned behavior.

Conclusion

In conclusion, the results of the present study showed that general attitude towards vaccines, knowledge about HPV infection, parents' educational level and their attitude towards HPV vaccination, doctors' attitude and the individual's health beliefs are factors related to vaccination against HPV. Consequently, it is necessary to provide adequate and reliable information not only to young people but also to their parents and health professionals in order to increase the positive attitude and the intention to receive the vaccine.

Also, public health education programs should focus on concerns about safety issues, as it seemed to be one of the major barriers to vaccination. The results of the present study confirm the correlation between health behaviors and beliefs, i.e. the clearly defined perceptions of individuals that are acquired early in life by interacting specially with parents, school and friends.

"Compliance with Ethical Standards"

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Table I. Lifestyle factors, sexual behavior and attitude towards vaccination

Smoking	**Percentage ,% (♀ / ♂)**
Yes	32.0 (30.7 ♀ / 37.6 ♂)
No	68.0 (69.3♀ / 62.4 ♂)
Considering smoking as a risk factor	
Yes	20.8 (21.5 ♀ / 18 ♂)
No	25.0 (25.7 ♀ / 22 ♂)

Unknown	54.2 (52.8 ♀ / 60 ♂)
Age of beginning of sexual life	
No sexual life	7.4 (6.8 ♀ / 9 ♂)
<15	3.9 (3.1 ♀ / 7 ♂)
15-18	38.2 (37.7 ♀ / 41.3 ♂)
18-23	48.1 (50 ♀ / 41.4 ♂)
>23	2.4 (2.4 ♀ / 2 ♂)
Sexual partners	
<3	38.4 (40 ♀ / 30.5 ♂)
3-5	22.6 (24 ♀ / 17.5 ♂)
5-10	19.4 (20 ♀ / 17.5 ♂)
10-15	7.4 (7.5 ♀ / 9 ♂)
>15	4.5 (4,5 ♀ / 19.5 ♂)
Systematic use of condom	
Yes	72 (70 ♀ / 80 ♂)
No	28 (30 ♀ / 20 ♂)
Pap-test screening	
Yes	71.4 ♀
No	28.6 ♀
Attitude towards vaccines	
Positive	47.1 (46 ♀ / 51.5 ♂)
Negative	3.3 (3 ♀ / 4.5 ♂)
Depends on the vaccine	49.6 (51 ♀ / 44 ♂)
Knowledge about HPV vaccine existence	
Yes	89.8 (97 ♀ / 60 ♂)
No	10.2 (3 ♀ / 40 ♂)
Attitude towards HPV vaccine	
Positive	81.5 (81% ♀ / 84% ♂)
Negative	18.5 (19% ♀ / 16% ♂)
HPV received vaccination	
Yes	51% ♀
No	49% ♀
Pre-vaccination Satisfaction from provided information	
Not at all- a little	52.5% ♀
Quite – very much	47.5% ♀
Information Sources	
Internet	27.0 ♀
Media	2.2 ♀
Family	9.2 ♀
Friends	11.7 ♀
School	6.2 ♀
Doctor	39.0 ♀
Conferences	4% ♀

Table II. HPV Knowledge of the sample

HPV Knowledge Items	Correct Answer n (%)	Incorrect Answer n (%)
1. HPV is related to the development of cervical cancer of the uterus (T)	765 (92.6)	61 (7.4)
2. HPV is a low-risk virus which does not cause cancer (T)	81 (9.9)	745 (90.1)
3. HPV is almost asymptomatic (T)	251 (30.5)	575 (69.5)
4. HPV is a sexually transmitted infection (T)	778 (94.2)	48 (5.8)
5. HPV can infect the oral cavity, respiratory tract, and eyes (T)	491 (59.4)	335 (40.6)
6. Condoms prevent HPV infection (F)	190 (23.1)	636 (76.9)
7. If immunity is strong, HPV might gradually disappear (T)	274 (33.3)	552 (66.7)
8. Sexually active women should undergo an HPV examination annually (F)	55 (6.7)	771 (93.3)
9. Vaccination will prevent certain types of HPV (T)	768 (92.9)	58 (7.1)
10. Some HPV subtypes can cause the development of warts of the labia, the vagina and the penis (T)	799 (96.7)	27 (3.3)

Table III. Correlation analyses of Non-HBM variables with the attitude towards vaccination (Women, N= 669)

Non –HBM Variables	OR (95% CI)	P value
General vaccination attitude	.426	.000
Mother's educational level	.118	.026
Mother's attitude towards vaccination	.566	.000
Doctor's attitude towards vaccination	.515	.000
Cost free vaccination	.755	.000
Paid vaccination	.541	.000

Table IV. Control Preference Scale

Control Preference Scale	N (%)
I prefer to make a decision regarding a health issue:	
Alone without any help	40 (4.9%)
By myself after taking into serious consideration my doctors opinion	572 (69.2%)
Together with my doctor	166 (20.1%)
I wish my doctor to make a decision after taking into consideration my opinion	39 (4.7%)
I wish my doctor to make a decision	6 (0.7%)

Table IV. Univariate Logistic Regression Analysis for HBM dimensions related to attitude towards vaccination

	Univariate Analysis (attitude towards HPV Vaccination)		
HBM Variables	**OR (95% CI for Mean)**		**P value**
Susceptibility	For	6,49-7,30	.00
	Against	4,77-5,60	
Severity	For	5,54-6,39	NS
	Against	5,69-6,54	
Benefits	For	7,60-8,47	.00
	Against	4,76-5,50	
Barriers	For	3,99-4,99	.00
	Against	7,76-8,77	