

Correlation of HPV Vaccination Status and Sexual Behavior: A Study of Adolescent and Young Women in Greece

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Abstract

Objective: To evaluate sexual behavior of adolescent and young women and the extent to which these were affected by HPV vaccination.

Methods: Prospective observational study of 287 females 12 to 26 years attending an outpatient PAG Clinic of a University Hospital. Patients were asked to fill an anonymous questionnaire of 84 questions regarding demographic characteristics, HPV awareness and sexual behavior. Attitudes and alterations in sexual behavior in relation to HPV vaccination were compared between the vaccinated and the non-vaccinated group.

Results: Of the population of 287 young women that was studied, 125 (43.6%) were vaccinated and 162 (56.4%) were not. During the study period vaccination increased from 31% to 58% of the cohort. Vaccinated cohort was of younger age, had coital sex in younger age (RR=0.75; 95% CI 0.58-0.98, p=0.040) and their partners were younger too. More of the vaccinated group had higher level of education (p=0.047), were not religiously oriented (p=0.022) and their mothers had higher education (RR=1.57; 95% CI 1.00-2.47, p=0.032) compared to the non-vaccinated. More of the non-vaccinated group had coital sex (RR=0.040; 95% CI 0.58-0.98, p=0.040). No differences were found between the vaccinated and non-vaccinated group on attitude to sex and relationships. More young women on the vaccinated group believed that vaccination should be done early (p<0.001), that is a prerequisite for the initiation of coital sex (RR 1.63; 95% CI 1.07-1.82, p= <0.001) and that it created an opportunity to discuss sexual issues with their mothers (p=0.015).

Conclusion: Young women that are vaccinated start sex earlier but do so after being vaccinated and show a more responsible attitude towards sex and prevention. The vaccinated group was guided by family, discussed sex with their mothers and asked for medical advice on relevant matters.

Keywords: Adolescents; Young women; Human papillomavirus; Vaccination; Sexual behaviour

Introduction

Sexually active women during their adolescence are at a high risk of getting infected by the Human Papilloma Virus (HPV). Behavioural, biological and cultural factors attribute to the high prevalence of the virus in younger women that is gradually reduced at the fourth decade of the life (Smith et al., 2008). HPV disease is the most common sexually transmitted infection worldwide affecting a constantly rising population of adolescents and young adults. The prevalence of high risk HPV types in Northern Greece detected by HC2 (Digene), has been reported to be 5.9% [1] similar to findings of other southern European countries [2]. In another study from Greece the prevalence was 46.6% among adolescents 14-19 years old [3].

HPV is a significant burden in human health, being the sole cause of cervical neoplasia and cancer, genital warts and a cause for a significant proportion of oropharyngeal and anogenital cancers [4]. Two prophylactic HPV vaccines (bivalent and quadrivalent) are available since 2005 and are widely implemented by many countries either by vaccination at school or privately (opportunistic). A third nonavalent vaccine is not yet available in our country. After about 200 million vaccinations worldwide the vaccines have shown to be effective in reducing cancer precursor lesions and genital warts up to 100% in populations naive to HPV infection without significant adverse effects [5,6].

In Greece vaccination for HPV has been opportunistic and is part of the national vaccination program since 2006. It is recommended

for adolescent girls and young women aged 12-26. Despite full reimbursement by the NHS up to the end of 2016 cumulated vaccination coverage for these ages is around 40% comparable to other countries where adolescents are not vaccinated at school.

HPV vaccination has faced a great deal of controversy regarding unanswered questions about the effects it may have on sexual life resulting in increased sexual activity, risky sexual behavior [7] and non-attendance for cervical screening [8]. Sexual norms and values relating to sexual debut have also been addressed. It has been also suggested that parental consent for vaccination may be perceived as authorization for sexual activity [9,10].

The aim of this study is to evaluate various parameters in sexual behavior of adolescent and young women and the extent to which these were related to vaccination.

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Materials and Methods

The participants were females 12 to 26 years of age seeking medical advice in a primary pediatric and adolescent gynecology clinic in a tertiary hospital in Northern Greece. The main criteria for participating were not being vaccinated, age and the knowledge of written Greek language. Initially, 300 females participated in this survey, after receiving their consent; they filled an anonymous questionnaire including 84 questions. The questionnaire consisted of three parts. The first part included questions about age, socio-demographic and family status, education level and occupation. The second part examined the knowledge on STDs, on HPV and HPV-related cancers, awareness of the HPV vaccine and the sources it was obtained. Some questions were related to reasons for refusal or acceptance of the vaccine. The third part included questions regarding sexual behavior and attitude to relationships and contraceptive practices. A brief structured counseling session on STDs and contraception preceded the filling of the questionnaires. The ones refusing to be vaccinated or were sexually inactive filled in the questionnaire at first visit. Sexually active participants were reviewed at the end of vaccination and were asked to fill the questionnaire then. After excluding the girls who did not complete the full vaccination scheme and those who did not return for the review, we collected 300 questionnaires, from which 287 were valid for further study. For the analysis participants were divided into two groups based upon their vaccination status. The study was approved by Committee on Biomedical Research Ethics of the Aristotle University of Thessaloniki Medical School.

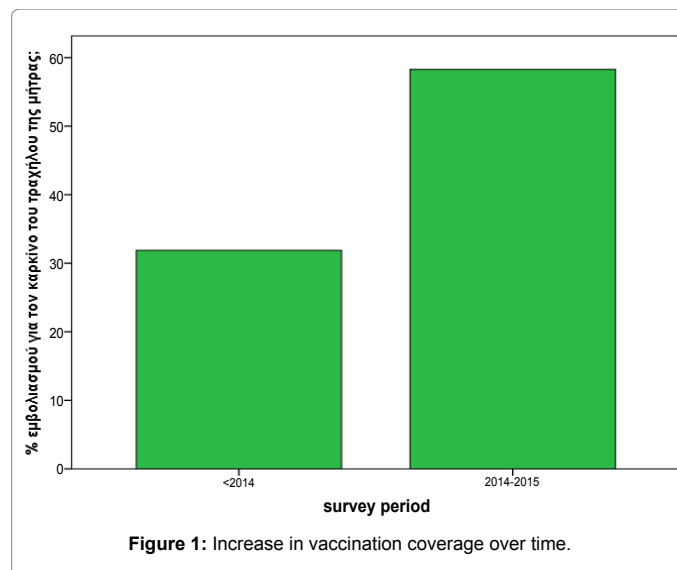
Statistics

Quantitative variables are presented as mean with standard deviation and qualitative variables are presented as frequencies or percentages. In univariate analysis, Independent-samples t-test (for normally distributed data) or Mann-Whitney test (for non-normally distributed data) was conducted to investigate differences between HPV vaccinated and non-vaccinated women on quantitative variables. Chi-square test or Fisher's exact test was conducted to explore any relationship between categorical variables and HPV vaccination. Chi-square test for trend was used to explore any association between ordinal variables and HPV vaccination. In multivariate analysis, logistic regression analysis was performed using the backward conditional method to identify the independent risk factors for the HPV vaccination by calculating the odds ratios (ORs) and the corresponding 95% CI. As dependent variable was used the HPV vaccination and as independent variables were used all the statistically significant risk factors found in the univariate analysis. Normality of quantitative data was checked using Kolmogorov-Smirnov test or Shapiro-Wilk test. A result was considered statistically significant when a p-value was less than 0.05. Data were analyzed using SPSS 21.0 (IBM SPSS Inc., Armonk, NY, USA).

Results

Of the population of 287 young women that was studied, 125 (43.6%) were vaccinated and 162 (56.4 %) were not. Adoption of vaccination (Figure 1) increased over time from 31.9% before the year 2014, to 58.3% after 2014. All subjects have completed the vaccination program as scheduled.

Demographic characteristics of the population studied according to vaccination status are shown at table 1. Variables that were included in the questionnaire were age at first intercourse number of partners, level of education of the responder and of parents and economic status. Vaccinated cohort had younger age, had coital sex in younger age and



their partners were on the average younger too. More of the vaccinated group was not religiously oriented and had higher level of education (university studies) compared to the non-vaccinated. More young women of the non-vaccinated group had coital sex.

In table 2, vaccination was correlated with various indices of sexual behavior. Variables that were looked for were age of first coitus, number of partners, attitudes on relationships, and condom use. More of the non-vaccinated group were sexually active and thought that condom might decrease pleasure and indicate lack of trust from partner. No differences were found between the vaccinated and non-vaccinated group on other aspects of attitude to sex and relationships except that more young women on the vaccinated group believed that vaccination is an absolute prerequisite for the initiation of coital sex.

Because the decision for one to be vaccinated depends on their knowledge of genital HPV infection, its prevention and its consequences, this field was explored by relevant questions (table 3). It appeared that vaccinated young women were younger in age, had less knowledge on the significance of HPV and thought that condom was more effective in its prevention. Nevertheless both groups were well aware of the existence of a vaccine against cervical cancer. Both groups were aware that vaccination is not enough for protection of STDs.

Vaccinated patients seemed to adhere marginally more often to doctor's advice on sexual precautions. Significantly more vaccinated patients had their first visit to a gynecologist with the intention to be vaccinated and found vaccination a motive to discuss sex with their mothers. Although there were not any significant differences between vaccination status and source of information on HPV it is noticeable that for the vaccinated group, doctors were the main source of information followed by family, peers and the internet (Table 4).

Multivariate analysis of the variables revealed that young age, and being not religious were significant for vaccination. Significantly more vaccinated adolescents stated that vaccination is a prerequisite to start sex.

Discussion

This is a descriptive study of female adolescents and young women regarding the relation of vaccination status with various indices of

| | Vaccinated | Non vaccinated | p-value |
|---|------------|----------------|---------|
| N (%) | 125 (43.6) | 162 (56.4) | |
| age (yrs) mean±SD | 18.6 ± 3.4 | 20.5 ± 3.8 | <0.001* |
| age (yrs) of first menstrual period mean±SD | 12.8 ± 1.3 | 12.7 ± 1.3 | 0.472 |
| age (yrs) of first sexual intercourse mean±SD | 17.0 ± 1.5 | 17.5 ± 1.8 | 0.045* |
| age (yrs) of first sexual partner mean±SD | 19.5 ± 3.5 | 20.6 ± 0.020 | 0.020* |
| age (yrs) of current sexual partner mean±SD | 24.2 ± 5.3 | 25.7 ± 5.9 | 0.335 |
| number of sexual partners mean±SD | 3.6 ± 3.1 | 4.4 ± 3.6 | 0.080 |
| age (yrs) of mother mean±SD | 47.6 ± 5.1 | 48.7 ± 5.3 | 0.055 |
| age (yrs) of father mean±SD | 51.9 ± 5.9 | 52.8 ± 5.9 | 0.240 |
| Level of respondent's education N (%) | | | |
| High school | 63 (50.8) | 74 (45.9) | 0.047 |
| Technical school | 4 (3.2) | 17 (10.6) | |
| University | 57 (45.9) | 70 (43.4) | |
| Level of paternal education N (%) | | | |
| Primary school | 8 (6.6) | 15 (9.4) | 0.357 |
| High school | 43 (35.2) | 53 (33.5) | |
| Technical school | 24 (19.7) | 28 (17.6) | |
| University | 47 (42.7) | 63 (39.6) | |
| Level of maternal education N (%) | | | |
| Primary school | 43(3.2) | 14 (8.6) | 0.996 |
| High school | 46 (37.6) | 63 (39.4) | |
| Technical school | 16 (12.8) | 28 (17.4) | |
| University | 58 (46.4) | 55 (34.4) | |
| family status N (%) | | | |
| married | 95 (79.2) | 117 (80.7) | 0.874 |
| divorced | 19 (19.1) | 23 (15.9) | |
| single/widowed | 2 (1.7) | 5 (4.9) | |
| Role of religion N (%) | | | |
| very important | 15 (12.0) | 34 (21.1) | 0.022 |
| important | 45 (36) | 68 (42.2) | |
| not sure | 39 (31.2) | 31 (19.3) | |
| indifferent | 17 (13.6) | 20 (12.4) | |
| none | 9 (7.2) | 8 (5.0) | |
| Financial status of family as judged by respondent N (%) | | | |
| Very good | 17 (13.9) | 10 (6.5) | 0.215 |
| Good | 47 (38.5) | 67 (43.2) | |
| Mediocre | 54 (44.3) | 73 (47.1) | |
| bad | 4 (3.3) | 3 (1.9) | |
| not aware | - | 2 (1.3) | |

Table 1: Characteristics of the population that filled the questionnaire.

sexual behaviour. Our population was young women, attending the services of a paediatric and adolescence gynaecology (PAG) clinic of a university hospital in northern Greece for various reasons and therefore is more motivated and perceptive to medical advice than its peers. After receiving counselling on sexually transmitted infections and the significance of HPV, slightly more than half of them during the study period were vaccinated. This is above the national average of HPV vaccination in Greece which is around 40% despite full reimbursement by the National Health System until the age of 26 years.

There has been considerable controversy regarding HPV vaccination with respects to promoting early initiation of sexual activity and risky sexual behaviour as well as fewer adherences to screening for cervical

cancer [7,11]. The risk compensation hypothesis applies to individuals that will diminish a health protective attitude if they perceive they have less risk after vaccination [12].

Another issue that often arises is the age of initiation of vaccination although it is clear that the antibody response is more rigorous in children and young adolescents [13]. In our study vaccinated population was younger in age than non-vaccinated and this is in accordance with most studies where young age is an important factor for vaccine adoption [14,15].

In the vaccinated group first intercourse was started about six months earlier and partners were of younger age as well, than of non-vaccinated,

| | Vaccinated N (%) | Non vaccinated N (%) | RR | 95% CI | p-value |
|---|-------------------------------------|-------------------------------------|-------------------|------------------------|----------------|
| Coital sex yes no | 75 (39.3) 49 (52.1) | 116 (60.7) 45 (47.9) | 0.75 | 0.58-0.98 | 0.040 |
| Sexual partner in the last 12 months no steady >6 months one/several transient | 37 (46.3) 55 (41.4) 32 (47.1) | 43 (53.7) 78 (58.6) 36 (52.9) | 1.12 1 1.14 | 0.82-1.53 0.82-1.57 | 0.485 0.440 |
| Time length of relationship at first coitus Few days/weeks Few months/ More than a year | 11 (35.5) 64 (40.0) | 20 (64.5) 96 (60.0) | 0.89 1 | 0.53-1.48 1 | 0.637 |
| we should think very well before starting coitus agree not sure/disagree | 115 (43.9) 10 (41.7) | 147 (56.1) 14 (58.3) | 1.05 1 | 0.64-1.72 | 0.833 |
| There should be total trust between each other to have coitus (%) agree not sure/disagree | 92 (44.2) 33 (42.3) | 116 (55.8) 45 (57.7) | 1.05 1 | 0.77-1.41 | 0.770 |
| Should there be true love with your partner to enjoy sex (%) agree not sure/disagree | 82 (42.5) 42 (45.7) | 111 (57.5) 50 (54.3) | 0.93 1 | 0.71-1.23 | 0.614 |
| Monogamy is important in a relationship agree not sure/disagree | 111 (42.9) 13 (50.0) | 148 (57.1) 13 (50.0) | 0.86 1 | 0.57-1.29 | 0.484 |
| it is better to postpone sex until you are ready to undertake the responsibility agree not sure/disagree | 99 (42.3) 25 (50.0) | 135 (57.7) 25 (50.0) | 0.851 | 0.62-1.16 | 0.319 |
| It is boring to have the same sexual partner for a long time agree not sure/disagree | 5 (31.3) 119 (44.2) | 11 (68.8) 150 (55.8) | 0.71 1 | 0.34-1.48 | 0.309 |
| Coitus is a private and unique experience that cannot be shared with anybody agree not sure/disagree | 98 (43.9) 26 (42.6) | 125 (56.1) 35 (57.4) | 1.03 1 | 0.74-1.43 | 0.854 |
| It is important to inform each other about previous sexual experiences agree not sure/disagree | 108 (44.8) 16 (36.4) | 133 (55.2) 28 (63.6) | 1.23 1 | 0.81-1.87 | 0.299 |
| Condom decreases the pleasure in coitus so much that it is better to avoid its use agree not sure/disagree | 6 (30.0) 117 (44.7) | 14 (70.0) 145 (55.3) | 0.67 1 | 0.34-1.33 | 0.203 |
| Coitus is pleasurable with condom agree not sure/disagree | 50 (40.3) 68 (45.9) | 74 (59.7) 80 (54.1) | 0.88 1 | 0.67-1.16 | 0.351 |
| Condoms are not practical for use agree not sure/disagree | 14 (37.8) 103 (43.1) | 23 (62.2) 136 (56.9) | 0.88 1 | 0.57-1.36 | 0.547 |
| Condom use indicates lack of trust on the partner agree not sure/disagree | 2 (11.1) 20 (45.8) | 16 (88.9) 142 (54.2) | 0.24 1 | 0.07-0.90 | 0.004 |
| If the sexual partner does not want to use a condom it is natural to accept his opinion agree not sure/disagree | 5 (41.7) 119 (43.9) | 7 (58.3) 152 (56.1) | 0.95 1 | 0.48-1.88 | 0.878 |
| Condom is not needed if the relationship is steady more than a month agree not sure/disagree | 3 (37.5) 122 (44.0) | 5 (62.5) 155 (56.0) | 0.85 1 | 0.34-2.10 | 1.000 |
| The thought of STDs decreases the pleasure of coitus agree not sure/disagree | 53 (39.8) 68 (46.3) | 80 (60.2) 79 (53.7) | 0.86 1 | 0.66-1.13 | 0.280 |
| Contraception ruins the spontaneity of coitus agree not sure/disagree | 14 (63.6) 106 (41.2) | 8 (36.4) 151 (58.8) | 1.54 1 | 1.09-2.18 | 0.042 |
| The oral contraceptive pill is safe for coitus agree not sure/disagree | 29 (43.3) 89 (42.6) | 38 (56.7) 120 (57.4) | 1.02 1 | 0.74-1.39 | 0.920 |
| Health is more important than transient pleasure agree not sure/disagree | 118 (43.7) 6 (42.9) | 152 (56.3) 8 (57.1) | 1.02 1 | 0.55-1.90 | 0.950 |

| | | | | | |
|--|-------------------------|-------------------------|-----------|-----------|--------|
| Sexual intercourse is a private matter and the purchase of condoms notifies it to others agree not sure/disagree | 6 (26.1) 117 (45.2) | 17 (73.9) 142 (54.8) | 0.58 1 | 0.29-1.16 | 0.077 |
| You should not change sexual habits even if the doctor advises for the contrary agree not sure/disagree | 6 (27.3) 117 (44.6) | 16 (72.7) 144 (55.4) | 0.61 1 | 0.30-1.23 | 0.115 |
| It is impossible to acquire an STD from a steady partner agree not sure/disagree | 13 (31.7) 110 (45.6) | 28 (68.3) 131 (54.4) | 0.69 1 | 0.43-1.11 | 0.096 |
| The risk of cervical cancer or infertility is an important cause to change sexual practice agree not sure/disagree | 88 (43.8) 35 (43.8) | 113 (56.2) 45 (56.3) | 1.00 1 | 0.75-1.34 | 0.996 |
| After vaccination is completed one feels more secure and liberated agree not sure/disagree | 68 (51.5) 56 (36.8) | 64 (48.5) 96 (63.2) | 1.40 1 | 1.07-1.82 | 0.013 |
| Vaccination is a prerequisite for the initiation of coital sex agree not sure/disagree | 63 (56.8) 60(34.9) | 48 (43.2) 112 (65.1) | 1.63 1 | 1.25-2.11 | <0.001 |

Table 2: Correlation of vaccination status with various parameters of sexual behaviour.

| | Vaccinated N(%) | Non vaccinated N(%) | RR | 95% CI | p-value |
|---|--------------------------|-------------------------|-----------|-----------|---------|
| Basic knowledge on HPV Yes No | 47 (35.3) 75 (51.7) | 86 (64.7) 70 (48.3) | 0.68 1 | 0.52-0.90 | 0.006* |
| Basic knowledge on Cervical cancer Yes No | 80 (43.2) 43 (46.2) | 105 (56.8) 50 (53.8) | 0.94 1 | 0.71-1.23 | 0.635 |
| Awareness that cervical cancer is caused exclusively by HPV Yes No/Not sure | 18 (45.0) 104 (42.8) | 22 (55.0) 139 (57.2) | 1.05 1 | 0.72-1.53 | 0.794 |
| Awareness of the incidence of HPV infections in young women very common/common rare/not aware | 37 (39.8) 86.0 (45.0) | 56 (60.2) 105 (55.0) | 0.88 1 | 0.66-1.19 | 0.403 |
| Condom prevents HPV transmission Totally/ very effectively not effectively/ not aware | 52 (48.6) 69 (39.7) | 55 (51.4) 105 (60.3) | 1.23 1 | 0.94-1.60 | 0.142 |
| Condom prevents cervical cancer Yes No/Not aware | 60 (47.6) 61 (39.4) | 66 (52.4) 94 (60.6) | 1.21 1 | 0.93-1.58 | 0.164 |
| Awareness of vaccine for prevention of cervical cancer Yes No | 119 (43.0) 5 (62.5) | 158 (57.0) 3 (37.5) | 0.69 1 | 0.40-1.20 | 0.301 |
| Age to start vaccination ≤ 16 yrs >16 yrs | 89 (54.6) 19 (24.7) | 74 (45.4) 58 (75.3) | 2.21 1 | 1.46-3.35 | <0.001* |
| Informed for HPV vaccine from family Yes No | 64 (64.6) 22 (44.9) | 35 (35.4) 27 (55.1) | 1.44 1 | 1.02-2.03 | 0.022* |
| Informed for HPV vaccine from peers Yes No | 27 (50.9) 59 (62.1) | 28 (49.1) 36 (37.9) | 0.82 1 | 0.60-1.12 | 0.187 |
| Informed for HPV vaccine from sexual partner Yes No | 3 (100.0) 56 (54.4) | 0 (0.0) 47 (45.6) | 1.84 1 | | 0.253 |
| Informed for HPV vaccine from school Yes No | 15 (53.6) 71 (59.2) | 13 (46.4) 49 (40.8) | 0.91 | 0.62-1.32 | 0.589 |
| Informed for HPV vaccine from internet Yes No | 13 (44.8) 73 (61.3) | 18 (55.2) 46 (38.7) | 0.73 | 0.48-1.12 | 0.106 |
| Informed for HPV vaccine from TV Yes No | 12 (50.0) 74 (59.7) | 12 (50.0) 50 (40.3) | 0.84 | 0.55-1.28 | 0.379 |
| Informed for HPV vaccine from doctor Yes No | 57 (57.6) 29 (59.2) | 42 (42.4) 20 (40.8) | 0.97 | 0.73-1.30 | 0.852 |

| | | | | | |
|--|------------|------------|------|-----------|--------|
| Informed for HPV vaccine from books | | | | | |
| Yes | 2 (40.0) | 3 (60.0) | 0.68 | 0.23-2.01 | 0.650 |
| No | 84 (58.7) | 59 (41.3) | | | |
| Informed for HPV vaccine from printed press | | | | | |
| Yes | 4 (50.0) | 4 (50.0) | 0.85 | 0.42-1.73 | 0.720 |
| No | 82 (58.6) | 58 (41.4) | | | |
| Use of condom after vaccination is necessary | | | | | |
| No/not so often | 22 (36.7) | 38 (63.3) | 1.27 | 0.88-1.82 | 0.173 |
| very often/ all the times | 101 (46.5) | 116 (53.5) | | | |
| Vaccination was the reason for the first visit to a gynecologist | | | | | |
| Yes | 44 (35.5) | 23 (14.8) | | | <0.001 |
| No | 80 (64.5) | 132 (85.2) | | | |
| Vaccination was the reason to discuss sexual life with mother | | | | | |
| Yes | 31 (25.2) | 21 (13.7) | | | 0.015 |
| No | 92 (74.8) | 132 (86.3) | | | |

Table 3: Correlation of vaccination status with knowledge on the vaccine and HPV.

| | OR | 95% CI | p-value |
|--|------|-----------|---------|
| Age (yrs) | | | |
| ≤ 17 | 2.38 | 1.27-4.46 | 0.007 |
| >17 | | | |
| Role of religion in life | | | |
| Very important/ important | 0.4 | 0.22-0.72 | 0.002 |
| indifferent /no role | | | |
| Vaccine is a prerequisite to start sex | | | |
| yes | 2.7 | 1.47-4.95 | 0.001 |
| no | | | |

Table 4: Multivariate analysis of parameters associated with vaccination.

probably reflecting the difference in age between groups. As mentioned before, vaccination has been correlated with an earlier sexual debut by some but not all [16,17]. It is not clear if earlier sexual debut is associated with vaccination or vaccination leads to sexual debut [18].

Other factors such as number of sexual partners were not different between the two groups suggesting that vaccination does not affect these sexual issues, a finding that has been consistent in most studies [11,19].

Younger age of vaccination can be explained by the fact that younger adolescents visit the clinic with their mothers and they follow more easily their mother's decision to vaccinate after being counselled by a health provider [20]. Younger age at initiation of the human papillomavirus (HPV) vaccination series is associated with higher rates of on-time completion [21]. The aim of vaccinating at younger age is to be completed before the initiation of sexual activities. The vaccinated group was significantly less committed to religion than the non-vaccinated and this is accordance to another study [7] that found that being Evangelist and conservative reduce the possibility to accept HPV vaccination. As the general message of the church is abstinence and monogamy. The vaccinated group also appeared to have a higher level of education as a bigger proportion of this group has proceeded to university studies. Another Greek study has demonstrated this [22] but other studies have found no relation [23,24].

Demographic parameters such as education, of parents, family status, age of parents and financial status of the family were not different between groups, suggesting that these do not alter significantly the decision to be vaccinated. Studies provide mixed results on that issue [11]. Parental education level has been found to be a significant factor for adopting vaccination in some studies [25], but not all [26]. Usually parents of lower education or higher income have higher acceptability [11]. Another study from Greece showed that level of education of parents did not affect HPV vaccination [27]. It is worth noticing that

our population was ethnically homogenous of middle class status and mainly urban residence.

When other issues of sexual behaviour were examined in table 2, it emerged that more of the non-vaccinated cohort was sexually active, a finding that can be explained by age alone. Opinions and attitudes towards various issues on sex and relationships have been explored and no significant difference between the groups was found. No differences were seen between groups regarding the feelings of security from unprotected sex after being vaccinated a finding that is in accordance with many studies and indicates that vaccination does not induce the adoption of a risky behaviour towards protection in sex [28]. Vaccinated young women believed more often than the non-vaccinated that vaccination is an absolute prerequisite for the initiation of coital sex and less often that the condom decreases pleasure. Both answers reflect a more responsible attitude to sex and indicate that the motive to be vaccinated was not promiscuity but rather an act of caution. Bednarczyk et al [29] have shown that vaccinated girls 11-12 have not any increased risk of pregnancy, STD or contraceptive counselling a finding that is supported by other studies [30]. In our study the vaccinated population started sex earlier after having discussed it with their mothers and doctors significantly more common than non-vaccinated.

Many studies on vaccination state the importance of thorough counselling on HPV and related issues as a factor in acceptance of vaccination. Other factors have been cost and availability, fears of side effects, the attitude of the parents towards vaccination and a history of HPV related disease in family or friends [11]. In our cohort the vaccinated group had less knowledge on HPV infection and believed that condom can largely prevent it. Both facts do not coincide with its increased acceptance but can be explained by the younger age of this group. It appears that both groups of our study as well most of the public in relevant studies is not well informed on HPV infection and its consequences [31].

Despite limited knowledge on STDs and the significance of the HPV infection both groups were aware that after vaccination they should continue using the condom, a fact that shows that vaccination does not promote a careless behaviour [32].

Another relevant issue is the source of information on HPV which in most studies is mainly derived from family, advertisement of the vaccine in television (not applicable to Greece), the internet, school, and peers [28]. A systematic review showed that knowledge of HPV among women is poor [33]. In our study vaccinated respondents site family as the commonest source of information followed by doctor and

peers which is in accordance with other studies [34]. Non vaccinated group was more often informed by doctors and secondly by family but generally there were no statistical significance in source of information in both groups. In a systematic review [35] vaccination was strongly related to a recent visit to a doctor or having a discussion in the family. In our population internet appears not to be a commonly used source of information in contrast to another Greek study of medical and nursing students of older age [36]. It is reported that comprehensive information is not adequately covered in the internet [37] and vaccination risks are exaggerated [38].

In this study adolescents and young women of vaccinated group significantly more often visited a doctor for the first time with the intention to be vaccinated and vaccination was the reason to discuss sexual matters with their mothers. This issue has been raised in the study by Chao et al [39]. The opportunity of mother to daughter communication on sexual matters initiated by vaccination has been stressed elsewhere [40].

Part of the strength of our study is the number of participants and the detailed questions on attitudes on sex and relationships that allow for more information on the groups. On the other hand the population surveyed is not typical of the whole population of young women in our country since the questionnaires were filled in a hospital outpatient clinic. It is well appreciated that adolescents at these ages do not often seek for medical advice or do regular check-ups.

In conclusion, our study shows that young women that are vaccinated start sex earlier but do so after vaccination and show a more responsible attitude towards sex and prevention. More often than the non-vaccinated, they were guided by family, discussed sex with their mothers and asked for medical advice on relevant matters.

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