Factors associated to anti-HPV vaccine refusal among young adult women after ten year of vaccine implementation

Vincenzo Restivo [1], Claudio Costantino [1], Tiziana Francesca Fazio [1], Nicolò Casuccio [2], Claudio D'Angelo [2], Francesco Vitale [1], Alessandra Casuccio [1*].

[1]*Department of Science for Health Promotion and Mother Child Care "G. D'Alessandro", University of Palermo, Italy*

[2]*Department of Medical Prevention, Local Health Unit of Palermo, Italy*

[*]**Corresponding author:** Alessandra Casuccio, Department of Science for Health Promotion and Mother to Child Care "G. D'Alessandro", University of Palermo, Via del Vespro 133, Palermo 90127, Italy. e-mail: alessandra.casuccio@unipa.it

Abstract

In Italy HPV vaccination was implemented for girls since 2007 but its coverage was lower than recommended level. Sicily is one of the Italian administrative regions with lower vaccination coverage, ranging in the birth cohorts 1996-1999 from 59% to 62%. Aim of the study was to investigate factors associated with refusal of anti-HPV vaccination among young adult women of Palermo, Italy. A cross-sectional study was conducted through the administration of a telephone questionnaire, consisting of 23 items on HPV infection and vaccination knowledge based on Health Belief Model framework. The eligible population were young women with at least a previous vaccination among all included in Sicilian Vaccination schedule, without starting or completing anti-HPV vaccination schedule. Overall, 141 young women were enrolled, of them 84.4% were unvaccinated and 15.6% had at least one dose of HPV vaccine. In multivariate analysis, factors associated with the failure to perform the HPV vaccination were degree as school level (OR = 10.2, p = 0.041), lower participation at school seminar on HPV (OR = 0.2, p = 0.047) and lower perception of anti-HPV vaccine benefits (OR = 0.4, p = 0.048). Public health educational program focusing and tailored on benefits perception of anti-HPV vaccine and HPV disease severity, especially if carried out at school, can improve HPV vaccination uptake.

Keywords

Human Papillomavirus, vaccine refusal, hesitancy, women, school based, Health Belief Model, gynaecologist, general practitioner, survey, catch up

Introduction

Human Papillomavirus (HPV) vaccination represents the best strategy for primary prevention of cervical cancer. HPV vaccines have high efficacy against cervical pre-cancerous lesions, if given to females before they are exposed to the virus, therefore the World Health Organization (WHO) recommends to offer HPV vaccination to pre-adolescent girls [1].

As of January 2018, 30 of 31 European (EU) countries had implemented HPV vaccination. Target age, financing and vaccine delivery differ among countries [2]. In 2014, mean EU coverage accounted for 53% in the primary target, and organised catch-up. Even if a lower number of primary cohorts were invited, African countries reported a mean 88% HPV vaccination coverage [3].

In Italy, HPV vaccination was free and actively offered to all girls during their 12th year of life since 2007, and the National Health Department established a target vaccination coverage of 95% within 5 years of the start of the campaign [4, 5]. However, despite several promotional activities, vaccination coverage is largely unsatisfactory, ranging from 27% to 83% among administrative regions [6]. Sicily is one of the Italian administrative regions with lowest immunization coverage against HPV, with a value of 59.5%, 58.7% and 62.1% for full HPV vaccination in the 1997, 1998, and 1999 birth cohort, respectively [6]. Consistent differences were reported between subjects who received at least 1 dose of anti-HPV vaccine and who complete the full vaccination schedule. In Sicily anti-HPV vaccine coverage for at least 1 dose were 70.3%, 63.4% and 69.2% in 1997, 1998, and 1999 birth cohort, respectively [6].

Previous studies have indicated that common reasons for not receiving the HPV vaccine were the perception of low risk or not needing the vaccine, lack of vaccine awareness, doubt about the safety and efficacy of the vaccine, fear of side effects, inadequate testing of novel vaccines that may be harmful and weaken the immune system, lack of physician recommendation and cost of the vaccine [7-9].

The Health Belief Model (HBM) attempts to explain and predict health behaviours, and is used in assessing health-behaviour interventions by focussing on the attitudes and beliefs of individuals. The HBM has been used extensively to study vaccination beliefs and behaviours, and has also been used in vaccination research to identify people's perceptions of disease and vaccination [7, 10, 11].

The objective of the study was to investigate factors associated with refusal of anti-HPV vaccination among young adult women of the City of Palermo, Italy, after ten year of vaccine implementation.

Materials and Methods

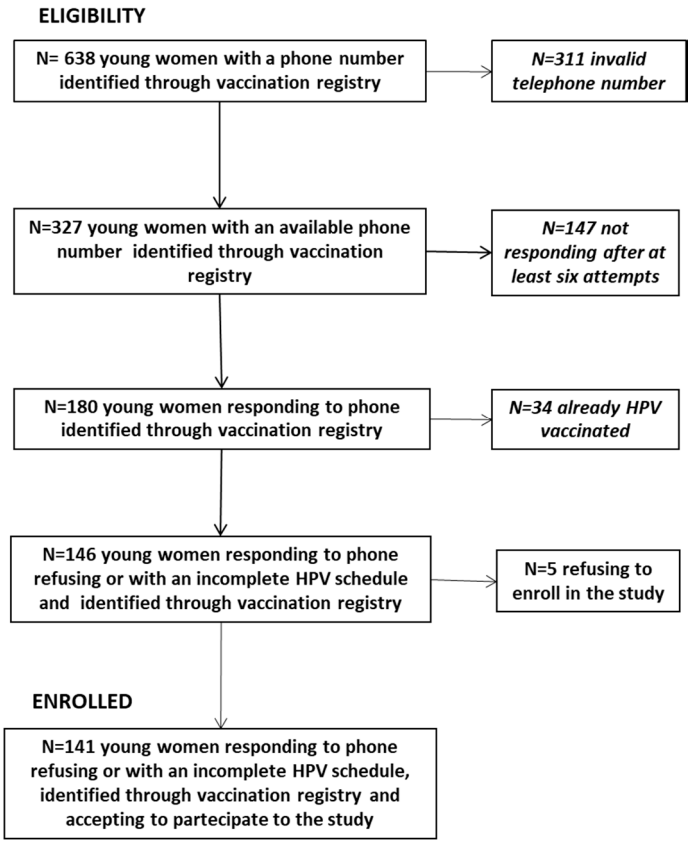
An observational study was conducted among young adult women of the local health unit (LHU) of Palermo (Italy), including girls born from 1996 to 1999 (overall 1996-1999 Palermo birth cohorts n=26,153). The sample was recruited through the vaccination registries of two public vaccination services of Palermo LHU. These services were selected to be as representative as possible of the Palermo geographical area, relatively to knowledge, attitudes and behaviours toward HPV vaccination and reliable source of information. The vaccination registry was filled in for each girl residing in the area of public vaccination services, and who had performed at least one immunization recommended by the Sicilian vaccination schedule. A structured questionnaire was administered through telephone by a trained healthcare professional from May to September 2017.

Preprints (www.preprints.org) | NOT PEER-REVIEWED | Posted: 27 February 2018 doi:10.20944/preprints201802.0178.v1

Peer-reviewed version available at Int. J. Environ. Res. Public Health 2018, 15, 770; doi:10.3390/ijerph15040770

The eligible population was represented by young adult women who refused or didn't complete HPV vaccination schedule. The exclusion criteria from the study were: erroneous telephone number, not responding after at least six attempts, already vaccinated, and refusal to participate to the study. Overall 638 young women were eligible, although 72% of them did not have a useful phone number (erroneous phone number or not responding). Figure 1 describes reason for exclusion from the study. Main reasons for exclusion from the study were: to have an invalid telephone number (49%, n=311) or not available after at least six attempts (23%, n=147). Only 5% (n=34) of women had already performed anti-HPV vaccination outside Sicily.

Figure 1 Flow chart for exclusion from the study



The questionnaire consists of 23 items, divided into two sections. The first concerned demographic characteristic, HPV infection knowledge and use of gynaecologist services. The second section consist of HPV vaccination knowledge and health belief investigating: perceived susceptibility of risk of developing cervical cancer (one item), perceived severity of the disease and its consequences (one item), perceived benefits related to vaccination (four items), perceived benefits related to HPV vaccination (three items), perceived vaccination barriers (two items) and perceived HPV vaccination barriers (three items) using HBM as the theoretical framework. Young women responded using a five point Likert scale (1 = absolutely disagree, 2 = disagree, 3 = neither disagree nor agree, 4 = agree, 5 = absolutely agree). In order to make the results easier to understand, all questions were scored toward beliefs that would result in adherence to vaccination. Therefore, lower scores reflect stronger beliefs about vaccination refusal. This questionnaire was validated in a convenience sample representing approximately 10% of the young women.

Peer-reviewed version available at Int. J. Environ. Res. Public Health 2018, 15, 770; doi:10.3390/ijerph15040770

At the beginning of the interview, informed consent was obtained and survey aims were explained as well as methods used to ensure confidentiality of data. The study was approved by Ethics Committee of the Policlinico "Paolo Giaccone" Hospital (Palermo 1).

Statistical analyses were performed using STATA v14.2 software. For all analyses, P-value ≤ 0.05 was assumed to indicate significance (two-tailed). Normal distribution and homogeneity of variables were tested with Kolmogorov-Smirnov and Levene's test, respectively. Mean (with standard deviation) or median values (with interquartile range) were calculated for quantitative variables, while frequencies for qualitative variables. Mean data were compared by a one-way analysis of variance (ANOVA) with Scheffe's post hoc test, while comparisons of differences in the medians were analysed with the Mann-Whitney test. An univariate logistic regression analysis was performed in order to evaluate factor associated to refuse HPV vaccination. Study covariates, which were found to be significantly associated with the study outcome after the univariate analysis ($p<0.1$), were evaluated into the multiple logistic regression models. Multivariate analysis was performed to investigate the independent effect of a risk or protective factor after adjustment for one or several other factors or to adjust for confounding variables. Only age was considered *a priori* confounder.

Results

A total of 141 young women were enrolled in the study. Of these, 84.4% (n= 119) were unvaccinated and 15.6% (n= 22) received at least one dose of HPV vaccine. Demographic characteristics, HPV infection knowledge and use of gynaecologist services of young adult women were described in Table 1. The median age was 19 years (IQR= 18-20). Enrolled women had more frequently a high school diploma (66.7%) followed by graduate ones (26.2%). HPV virus was know by 93.6% of women (n= 132), 90.8% (n=128) of them were aware of HPV can cause cervical cancer and 8.5% (n=12) didn't know diseases caused by HPV. Furthermore 31.2% (n=44) of young women participated in school informative meeting about HPV. Moreover 58.2% (n=82) had a complete sexual intercourse, 11.3% (n=16) a sexually transmitted disease (STD) and 50.3% (n=71) a gynaecologist visit. Young women refusing vaccination had more frequently, than women with incomplete HPV vaccine schedule, a school diploma (OR= 4.56, p=0.034). On the other hand, young women refusing vaccination, had less commonly taken part in a school informative meeting about HPV (OR=0.38, p=0.043), and they had lower gynaecologist visit (OR=0.24, p=0.009).

Peer-reviewed version available at Int. J. Environ. Res. Public Health 2018, 15, 770; doi:10.3390/ijerph15040770

Table 1 Demographic characteristics, HPV infection knowledge, and use of gynaecologist services of young adult women.

	Total (N=141)	Refusal vaccination (N=119)	Crude OR	95% CI	p
Age, mean (SD)	19 (18-20)	19 (18-20)	0.80	0.55-1.15	0.266
Education, n (%)					
Secondary school	10 (7.1)	6 (5.0)	1		
High school	94 (66.7)	82 (68.9)	4.56	1.12-18.52	**0.034**
University	37 (26.2)	31 (26.1)	3.44	0.74-16.03	0.155
Family members, median (IQR)	4 (3-5)	4 (3-5)	0.85	0.47-1.52	0.582
Smoking habit, n(%)					
No	119 (84.4)	103 (86.6)	1		
Yes	22 (15.6)	16 (13.4)	0.41	0.14-1.21	0.108
Drinking habit, n(%)					
No	117 (83.0)	99 (83.2)	1		
Yes	24 (17.0)	20 (16.8)	0.91	0.28-2.97	0.875
Papillomavirus knowledge, n(%)					
No	9 (6.4)	8 (6.7)	1		
Yes	132 (93.6)	111 (93.3)	0.66	0.08-5.56	0.703
HPV can cause genital warts, n(%)					
No	114 (80.9)	97 (81.5)	1		
Yes	27 (19.1)	22 (18.5)	0.77	0.262.31	0.643
HPV can cause cervical cancer, n(%)					
No	13 (9.2)	12 (10.1)	1		
Yes	128 (90.8)	107 (89.9)	0.42	0.05-3.44	0.422
I don't know disease caused by HPV, n(%)					
No	129 (91.5)	108 (91.8)	1		
Yes	12 (8.5)	11 (9.2)	2.14	0.26-17.46	0.478
Taking part in a school informative meeting about HPV, n(%)					
No	97 (68.8)	86 (72.3)	1		
Yes	44 (31.2)	33 (27.7)	0.38	0.16-0.97	**0.043**
Current relationship status, n(%)					
Stable relationship	80 (56.7)	66 (46.8)	1		
Non-stable relationship	4 (2.8)	2 (1.7)	0.21	0.03-1.63	0.137
Single	57 (40.5)	51 (51.5)	1.80	0.65-5.02	0.259
To have had a complete sexual intercourse, n(%)					
No	59 (41.8)	53 (44.5)	1		
Yes	82 (58.2)	66 (55.5)	0.47	0.17-1.28	0.138
To have had STDs, n(%)					
No	125 (88.7)	108 (91.8)	1		
Yes	16 (11.3)	11 (9.2)	0.35	0.11-1.12	0.077
To have had a gynaecologist visit, n(%)					
No	70 (49.7)	65 (54.6)	1		
Yes	71 (50.3)	54 (45.4)	0.24	0.08-0.70	**0.009**
PAP test knowledge, n(%)					

Preprints (www.preprints.org) | NOT PEER-REVIEWED | Posted: 27 February 2018 doi:10.20944/preprints201802.0178.v1

Peer-reviewed version available at Int. J. Environ. Res. Public Health 2018, 15, 770; doi:10.3390/ijerph15040770

No	18 (12.8)	16 (13.4)	1		
Yes	123 (87.2)	103 (86.6)	0.64	0.14-3.02	0.577
To have a PAP test, n(%)					
No	112 (79.4)	97 (81.5)	1		
Yes	29 (20.6)	22 (18.5)	0.49	0.18-1.33	0.161

As showed in Table 2, main sources of information about anti-HPV vaccination was paediatrician/general practitioner (42.5%, n=60), followed by gynaecologist (33.3%, n=47) and parents (24.8%, n=35). The HBM answers on benefits of all vaccines had a mean score of 2.5 (SD=0.1), benefits of anti-HPV vaccine 2.5 (SD = 0.1), barriers of all vaccines 2.6 (SD=0.1), barriers of anti-HPV vaccine 2.0 (SD = 0.1), susceptibility of disease 4.3 (SD = 0.1) and disease severity 3.2 (SD = 0.1). Young women refusing vaccination had lower score on HBM question of perceived HPV vaccination benefit (OR=0.42, p=0.002), perceived HPV vaccination barrier (OR=0.46, p=0.008) and perceived severity (OR=0.50, p=0.022), compared to women with at least one vaccination dose received.

Table 2 HPV vaccination knowledge and HBM questions of young adult women

	Total (N=141)	**Refusal vaccination (N=119)**	**Crude OR**	**95% CI**	**p**
Informative source about anti-HPV vaccination					
Gynaecologist, n(%)					
No	94 (66.7)	81 (68.1)	1		
Yes	47 (33.3)	38 (31.9)	0.68	0.26-1.72	0.414
Public vaccination services, n(%)					
No	137 (97.2)	116 (77.5)	1		
Yes	4 (2.8)	3 (2.5)	0.54	0.05-5.47	0.605
Parents, n(%)					
No	106 (75.2)	87 (73.1)	1		
Yes	35 (24.8)	32 (26.9)	2.33	0.64-8.41	0.197
Paediatrician/General Pratictioner, n(%)					
No	81 (57.5)	68 (48.5)	1		
Yes	60 (42.5)	51 (51.5)	1.08	0.43-2.73	0.865
Social network, n(%)					
No	135 (95.8)	114 (95.8)	1		
Yes	6 (4.2)	5 (4.2)	0.92	0.10-8.29	0.942
Perceived vaccination benefit D1-4, mean (SD)	2.5 (0.1)	2.5 (0.1)	0.76	0.34-1.68	0.494
Perceived HPV vaccination benefit D5-7, mean (SD)	2.5 (0.1)	2.4 (0.1)	0.42	0.23-0.75	**0.002**
Perceived vaccination barrier D8-10, mean (SD)	2.6 (0.1)	2.6 (0.1)	0.49	0.23-1.04	0.063
Perceived HPV vaccination barrier D11-12, mean (SD)	2.0 (0.1)	1.9 (0.1)	0.46	0.26-0.81	**0.008**
Perceived susceptibility D13, mean (SD)	4.3 (0.1)	4.2 (0.1)	0.73	0.42-1.26	0.262
Perceived severity D14, mean (SD)	3.2 (0.1)	3.1 (0.1)	0.50	0.28-0.91	**0.022**

Peer-reviewed version available at Int. J. Environ. Res. Public Health 2018, 15, 770; doi:10.3390/ijerph15040770

In multivariate analysis, factors associated with the failure to perform HPV vaccination compared to perform at least one dose were degree as secondary school level (OR = 10.62, p = 0.028), the lower participation at school seminar on HPV (OR = 0.25, p = 0.028) and the lower perception of anti-HPV vaccine benefits (OR = 0.41, p = 0.044).

Table 3 Multivariate logistic regression of factor associated with refusal of HPV vaccine

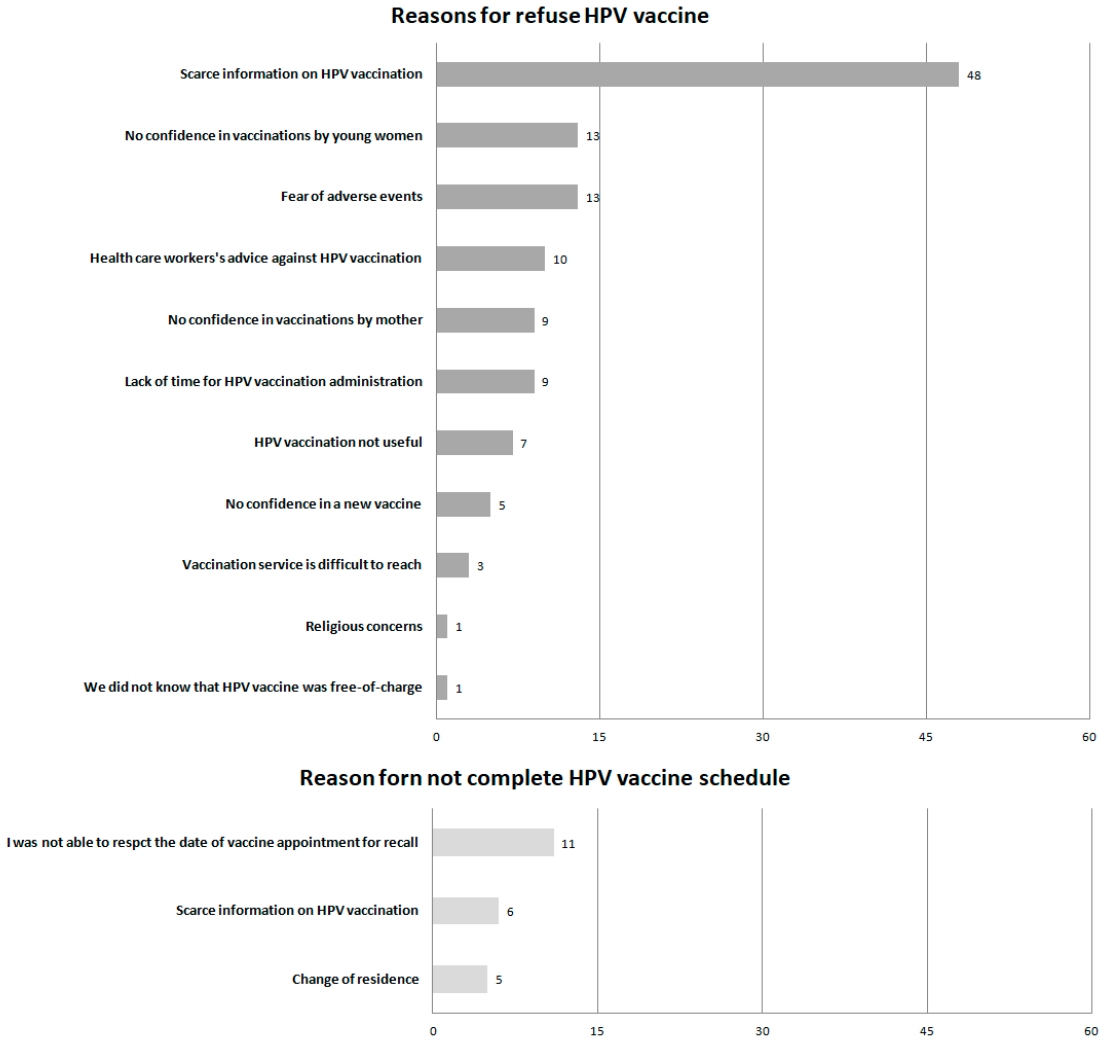
	Adjusted OR	95% CI	p
Age	0.69	0.43-1.12	0.139
Education			
Secondary school	1		
High school	5.33	0.83-34.35	0.078
University	10.62	1.29-87.52	**0.028**
Taking part in a school informative meeting about HPV			
No	1		
Yes	0.25	0.07-0.93	**0.028**
To have had a gynaecologist visit			
No			
Yes	0.59	0.17-2.09	0.414
To have had STDs, n(%)			
No	1		
Yes	0.59	0.17-2.09	0.414
Perceived HPV vaccination benefit D5-7, mean (SD)	0.41	0.17-0.98	**0.044**
Perceived vaccination barrier D8-10, mean (SD)	0.83	0.29-2.35	0.731
Perceived HPV vaccination barrier D11-12, mean (SD)	0.69	0.31-1.56	0.375
Perceived severity D14, mean (SD)	0.80	0.31-2.00	0.635

Main reasons for vaccination refusal (Figure 2) were lack of information (40.3% n = 48), followed by no confidence in vaccination and fear of adverse events (each 10.9%, n = 13). Among young women who did not complete the anti-HPV vaccine schedule, the most frequent reason was the lack of time for subsequent vaccine administration (50.0%, n = 11).

Preprints (www.preprints.org) | NOT PEER-REVIEWED | Posted: 27 February 2018 doi:10.20944/preprints201802.0178.v1

Peer-reviewed version available at Int. J. Environ. Res. Public Health 2018, 15, 770; doi:10.3390/ijerph15040770

Figure 2 Reason for vaccine refusal and to have an incomplete anti-HPV vaccination schedule



Discussion

Sicily offered universal anti-HPV vaccination to all girls aged 12-years from ten years. However, there were notable variations in vaccination coverage among Sicilian LHUs and, in detail, lower vaccination coverage was reported in the LHU of Palermo. The present study investigated reasons for refusal of the HPV vaccine among young adult women of the City of Palermo, and explored their perceptions and attitudes using the HBM.

One of the main factor associated to HPV vaccine refusal was an higher education level. This finding was already showed in several studies but it has a discordant trend. In England Jan S, *et al* showed that LHU with more educational deprivation had higher rates of vaccination for all doses. In this study educational deprivation includes individuals with no qualification or the lowest levels of qualification [12]. On the other hand, in Greece Michail G *et al* observed that female students who studied at University were more likely to be vaccinated than female students who attended a Technological Institute [13]. In our setting, it was possible that young women with a higher educational level has greater access to misleading health information, for instance throughout mass media and/or social media. It is also possible that women with the lowest educational level had higher levels of health literacy, as observed by Lee C et al. In this study, young adults with lower

educational level had better HPV literacy and higher rates of both HPV vaccination initiation and completion, signalling the importance of increasing education and knowledge about HPV in the public [14].

Another predictor associated to HPV vaccine refusal was didn't take part in school informative meeting about HPV. In Italy, the HPV vaccination offer was carried out outside the school setting and therefore the organization of meetings on the HPV was carried out sporadically. Unlike Italy, the UK provides the HPV vaccine in school (offered to all girls aged 12). The UK HPV vaccination programme had several variations: some schools hold assembles to promote and discuss the programme in advance of vaccination days, other schools offer science lessons associated with HPV vaccination [11]. In Sweden according to National law, all first year upper secondary school students (aged 16 years) are offered a health interview with the school nurse, who provides a dialogue regarding several preventive topics as sexual health and relationships [15]. In Italy, school health service was introduced in 1968 and concerned preventive and emergency medicine [16]. In 2004 this law was abrogated because it referred to an epidemiological, social, scholastic context extremely modified in its features [17]. Furthermore school health service was also superseded by the same legislation about the organization of the Italian health service by paediatrician [17]. On the other side, the 'Valore project' showed that Italian pre-adolescents were interested in acquiring additional information about HPV vaccination, and identified school as a setting where they are free to express themselves without fear of being judged, especially if the dialogue takes place with trusted teachers [18]. These results suggested the possible key role of schools in the promotion of correct information about HPV vaccination. Additionally, to achieve a higher uptake of the vaccine, it could be offered in the context of school-based voluntary vaccination and information campaigns, as already implemented in other countries [15, 19]. It has been showed that acceptance rate of the HPV vaccine is considerably lower (19–71%) in the lack of school-based programs than in the presence of the programs (65–86%) [20].

In addition, participants with a lower score for perceptions about HPV vaccinations benefits were more likely to be unvaccinated. This finding is in agreement with Marlow *et al.* where participants with a low score for HPV vaccination benefits (safety and efficacy of HPV vaccination) were more likely to be unvaccinated [7]. A possible explanation would be that a threatened individual didn't expect to accept the recommended health action unless it was perceived as feasible and efficacious. While acceptance of personal susceptibility to a condition also believed to be serious was held to produce a force leading to behaviour, the particular course of action to be taken depends upon beliefs regarding the effectiveness of the various actions available in reducing the disease threat [11]. Evaluation of the perceptions about benefits, barriers, severity and susceptibility of HPV vaccine could play a key role in the development of targeted educational campaigns that would increase the intention to uptake the HPV vaccine [12, 21]. Public Health professionals should provide tailored information to reinforce strength of recommendation regarding HPV vaccination, especially with parents of young women [21, 22].

The reasons reported among young women who reused HPV vaccination and those who did not complete the vaccination schedule differ each other. A consistent lack of information is mainly reported among young women who never performed vaccination. This data was similar to what was reported in a study conducted in the USA and other survey conducted in Italy [23]. The provisions of unambiguous information about benefits of vaccination and risks of the disease, clarifying also doubts, fears, and risk of severe side-effects, were fundamental communicative strategies in influencing awareness of young women of HPV vaccination [4]. On the other hand, women who

Peer-reviewed version available at Int. J. Environ. Res. Public Health 2018, 15, 770; doi:10.3390/ijerph15040770

did not complete the schedule were more likely to not have time to perform it. In order to take on these barriers, it would be necessary to guarantee higher access to vaccination services.

The main limitations of the study are two. Firstly, the study was based on self-reported information, so personal perceptions may have been overestimated, although self-reporting was recognized as a cost-effective and feasible method for gathering data from large population samples. Secondly, the study had low participation rate therefore, the possibility of non-response bias should be taken into consideration. The low participation rate was mainly due to invalid phone number in vaccination registry, suggesting a reorganization of telephone catch-up procedure of vaccination services of Palermo.

Conclusions

These findings suggest that educational interventions conducted in a school setting may be necessary to enhance HPV vaccination rates among Sicilian girls. Therefore, supply correct and unambiguous information to young women about vaccine efficacy and safety, and the value of vaccination in preventing cervical cancer may be needed, to increase in future HPV vaccination coverage.

Reference

1. World Health Organization. *WHO position paper: Human papillomavirus vaccines. Weekly epidemiological record. 2009, 15(84):117–132. http://www.who.int/wer/2009/wer8415.pdf Accessed on 20 February 2018.*

2. European Centre for Disease Prevention and Control. *Vaccine schedule. http://vaccine-schedule.ecdc.europa.eu/Pages/Scheduler.aspx Accessed on 20 February 2018.*

3. Bruni, L., Diaz, M., Barrionuevo-Rosas, L., Herrero, R., Bray, F., Bosch, F.X., de Sanjosé, S., Castellsagué, X. *Global estimates of human papillomavirus vaccination coverage by region and income level: a pooled analysis. Lancet Glob Health. 2016;4(7):e453-63. doi: 10.1016/S2214-109X(16)30099-7.*

4. Giambi, C., D'Ancona, F., Del Manso, M., De Mei, B., Giovannelli, I., Cattaneo, C., Possenti, V., Declich, S., Local Representatives for VALORE. *Exploring reasons for non-vaccination against human papillomavirus in Italy. BMC Infect Dis 2014;14:545 doi: 10.1186/s12879-014-0545-9.*

5. Italian Health Minister. *Piano Nazionale Prevenzione Vaccinale PNPV 2017-2019. http://www.salute.gov.it/imgs/C_17_pubblicazioni_2571_allegato.pdf Accessed on 18 February 2018.*

6. Italian Health Minister. *Papillomavirus (Hpv), i dati sulle coperture vaccinali aggiornati al 2015. http://www.salute.gov.it/portale/news/p3_2_1_1_1.jsp?lingua=italiano&menu=notizie&p=dalministero&id=2828 Accessed 18 February 2018.*

7. Marlow, L.A.V., Waller, J., Evans, R.E.C., Wardle, J. *Predictors of interest in HPV vaccination: a study of British adolescents. Vaccine 2009;27:2483-8 doi: 10.1016/j.vaccine.2009.02.057.*

8. Firenze, A., Marsala, M.G., Bonanno, V., Maranto, M., Ferrara, C., Giovannelli, L., Restivo, V. *Facilitators and barriers HPV unvaccinated girls after 5 years of program implementation. Hum Vaccin Immunother. 2015;11(1):240-4. doi: 10.4161/hv.36158. .*

9. Restivo, V., Marsala, M., Costantino, C., Maringhini, G., Asciutto, R., Mirabile, E., Mazzara, V., Parisi, S., Calamusa, G., Firenze, A., Vitale, F. *Sexual habits and risk factors for sexually transmitted diseases among medical students of Palermo's university in 2010-2011. Eur J Public Health 2012;22(2):179.*

10. Montgomery, K., Smith-Glasgow, M.E. *Human papillomavirus and cervical cancer knowledge, health beliefs, and preventive practices in 2 age cohorts: a comparison study. Gend Med 2012;9:55-66 doi: 10.1016/j.genm.2011.11.002.*

11. Janz, N.K., Becker, M.H. *The Health Belief Model: a decade later. Health Educ Q. 1984 Spring;11(1):1-47.*

12. Jean, S., Elshafei, M., Buttenheim, A. *Social determinants of community-level human papillomavirus vaccination coverage in a school-based vaccination programme. Sex Transm Infect. 2018;12. doi: 10.1136/sextrans-2017-053357.*

13. Michail, G., Smaili, M., Vozikis, A., Jelastopulu, E., Adonakis, G., Poulas, K. *Female students receiving post-secondary education in Greece: the results of a collaborative human papillomavirus knowledge survey. Public Health. 2014;128(12):1099-105. doi: 10.1016/j.puhe.2014.09.005.*

14. Lee, H.Y., Lee, J., Henning-Smith, C., Choi, J. *HPV literacy and its link to initiation and completion of HPV vaccine among young adults in Minnesota. Public Health. 2017;152:172-178. doi: 10.1016/j.puhe.2017.08.002.*

15. Grandahl, M., Rosenblad, A., Stenhammar, C., Tydén, T., Westerling, R., Larsson, M., Oscarsson, M., Andrae, B., Dalianis, T., Nevéus, T. *School-based intervention for the prevention of HPV among adolescents: a cluster randomised controlled study. BMJ Open. 2016;6(1):e009875. doi: 10.1136/bmjopen-2015-009875.*

16. Presidential Decree of Italian Republic. *22 dicembre 1967, n. 1518 Regolamento per l'applicazione del titolo III del decreto del Presidente della Repubblica 11 febbraio 1961, n. 264, relativo ai servizi di medicina scolastica. http://www.gazzettaufficiale.it/eli/id/1968/06/06/067U1518/sg;jsessi.*

17. Italian Health Minister. *Documento finale del gruppo di lavoro per la semplificazione delle procedure relativamente alle autorizzazioni, certificazioni ed idoneita' sanitarie. http://www.epicentro.iss.it/discussioni/obsolete/pdf/Documento%20EBP%20finale.pdf Accesssed 18 February .*

18. Giambi, C., Del Manso, M., De Mei, B., D'Ancona, F., Giovannelli, I., Cattaneo, C., et al. VALORE working group. *VALORE Project: local and regional assessment of vaccination campaigns against HPV: promote conscious adherence to vaccination. Rapporti ISTISAN 13/47. Rome: National Center for Epidemiology Surveillance and Health Promotion (CNESPS); 2013. http://www.iss.*

19. Skinner, S.R., Cooper Robbins, S.C. *Voluntary schoolbased human papillomavirus vaccination: an efficient and acceptable model for achieving high vaccine coverage in adolescents. J Adolesc Health 2010; 47:215-8; doi: 10.1016/j.jadohealth.2010.07.002.*

20. Kessels, S.J., Marshall, H.S., Watson, M., Braunack-Mayer, A.J., Reuzel, R., Tooher, R.L. *Factors associated with HPV vaccine uptake in teenage girls: a systematic review. Vaccine 2012; 30:3546-56; doi: 10.1016/j.vaccine.2012.03.063.*

21. Palmeri, S., Costantino, C., D'Angelo, C., Casuccio, N., Ventura, G., Vitale, F., Pojero, F., Casuccio, A. *HPV vaccine hesitancy among parents of female adolescents: a pre-post interventional study. Public Health. 2017;150:84-86. doi: doi: 10.1016/j.puhe.2017.05.009.*

22. Liddon NC, Hood JE, Leichliter JS. *Intent to receive HPV vaccine and reasons for not vaccinating among unvaccinated adolescent and young women: findings from the 2006-2008 National Survey of Family Growth.Vaccine 2012;30:2676-82 doi: 10.1016/j.vaccine.2012.02.007.*

23. Zimet, G.D., Weiss, T.W., Rosenthal, S.L., Good, M.B., Vichnin, M.D. *Reasons for non-vaccination against HPV and future vaccination intentions among 19-26 year-old women. BMC Womens Health. 2010;10:27. doi: 10.1186/1472-6874-10-27.*

Author Contributions

Restivo V, Costantino C, Casuccio A and Vitale F conceived and designed the study; Fazio TF, D'Angelo C and Casuccio N performed the study; Restivo V analyzed the data; Casuccio A and Vitale F wrote the paper.

Conflicts of Interest

The authors declare no conflict of interest.