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**Impact of the information for HPV vaccination given to parents with girls in the
age of 11-14.**

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Abstract

Objectives: Vaccination against human papillomaviruses (HPV) prevents over 70% of precancerous lesions leading to cervical cancer. In 2016 in France, 19.5% of girls aged 16 benefited from a comprehensive immunisation strategy, contrarily to countries like Sweden and Great-Britain where that rate nears 80%. The study aim was to evaluate the impact on HPV vaccination of information given to parents of girls aged 11 to 14.

Study design: A descriptive study used questionnaires to evaluate parents' knowledge and opinion on HPV vaccination before and after reading an information leaflet. It included parents of girls aged 11 to 14 not previously vaccinated against HPV.

Results: There were 106 questionnaires analysed. The initial level of information was poor: 10 of 11 questions assessing knowledge scored below 50% of correct answers. After reading the leaflet, knowledge increased significantly while adherence rose by 74%. Among the 51% initially undecided, 20% intended on vaccinating their daughter after being informed.

Conclusion: The leaflet enhanced knowledge and strengthened intention to vaccinate. However, parents' adherence to vaccination remained moderate. Digital information must be provided alongside communication campaigns by healthcare professionals. This requires identifying levers and barriers and adapting vaccination strategies.

Keywords: Information, Human papillomavirus, HPV vaccination.

Introduction

Human papillomavirus (HPV) belong to the family of *Papillomaviridae*, which are naked DNA viruses with epithelial tropism [1]. Amongst the 200 identified HPV genotypes, around 15 are at high oncogenetic risk and responsible for cervical, vaginal, vulvar and anal cancer as well as cancer cancers of the ENT region [1,2]. Given its almost 530 000 new cases each year, this cancer is the 4th most frequent cancer for women on a global scale, after breast, colorectal and lung cancer [3]. In France, almost 3000 new cases of cervical cancer are diagnosed each year and around 1100 deaths are documented per year. The net survival rate at 5 years of women with cancer averages 63% [4].

Nonetheless, an effective vaccination exists. A study published by the Cochrane Collaboration in May 2018 stated that HPV vaccination can significantly reduce precancerous lesions of the uterine cervix [5]. In Australia, where vaccinal coverage for girls aged 12 to 13 exceeds 80%, the incidence of HPV infection has dropped from 22.7% to 1.5% amongst women aged 18 to 24 between 2005 and 2015, enabling to envisage an eradication of cervical cancer through immunisation [6,7].

Interestingly, in France, less than a quarter of girls at age 15 had received at least one dose of the vaccine in 2017, compared to countries like Denmark, Great-Britain and Canada where the vaccination rates are close to 80% [8,9]. Nonetheless, HPV vaccination is recommended and available free of charge in France for all girls aged 11 to 14, with a possible remedial vaccination between the ages of 15 and 19 [10]. The French context is characterised by a strong mistrust towards vaccination [9]. The HPV vaccination is the one that is viewed least favourably (4.9%), along with the vaccinations against the flu (14.1%) and hepatitis B (11.2%), a mistrust in relation to the controversy raised by groups suggesting the possibility of vaccinations triggering autoimmune diseases [12]. However, in 2017, after the administration of 270 million doses of anti-HPV worldwide, no serious side-effect was reported [13], and the pharmaco-

epidemiological study of 2015 led in France on a cohort of 2.2 million girls aged 13 to 16 enabled to confirm that HPV vaccination did not increase the overall risk of occurrence of autoimmune diseases [14].

Given the essential role of information with regards to adherence to vaccination, it can be questioned to what extent the provision of clear and precise information provided by health professionals and national public health agencies might influence opinion on the topic.

In France, the National Institute for Prevention and Health Education (Institut National de Prévention et d'Education pour la Santé - Inpes) published an information leaflet and made it available online in 2015 [15,16]. Since the law of modernisation of the health system- entered into force on January 26th, 2016- the Inpes has become a part of the National Public Health Agency [16]. This institutional document was made available online, free of charge, and summarised core information about HPV infection and HPV vaccination.

This study's aim was therefore to evaluate the impact of the use of that document on the knowledge and intent of HPV vaccination, on a sample of parents of girls aged 11 to 14, attending school in an area where vaccinal coverage is lower than the national average.

Methods

This was a descriptive, prospective study evaluating 1) parents' knowledge and 2) the expression of their intention to vaccinate their daughter, at two points in time: before and after having read the information leaflet on HPV vaccination provided by the Inpes. The survey was conducted using an online questionnaire accessible via a link to parents of young girls aged 11 to 14 yo between September 2016 and April 2017.

Study population

The population included in the study were parents of girls aged 11 to 14, not vaccinated against HPV and attending school a secondary school in Val d'Oise (an administrative area in the outskirts of Paris). The exclusion criteria were the following: girls whose age was not specified, girls already vaccinated against HPV, insufficient proficiency in French. The geographical area was chosen for epidemiological reasons : the data made available by Santé Publique France (French Public Health Agency) states that this area has a vaccinal coverage rate of 17.3% lower than the national average of 20.6% in France for 2016 for girls of 15 years old [17,18].

Methodological tool: the questionnaire

The first questionnaire (Appendix) included 28 questions: 14 questions regarding the social and epidemiological characteristics of participants (Q1-Q13), 11 questions evaluating knowledge (Q15-Q25) among which three on HPV infection and eight on HPV vaccination. The other questions addressed participants' opinion on vaccination (Q14, Q26-28). The questionnaire went on giving the link to the document available online and published by the Inpes in 2015, « Infections à papillomavirus humains – Les 5 bonnes raisons de se faire vacciner [Infection by human papillomaviruses- Five good reasons to be vaccinated] » [15]. The leaflet contained the answers to the questions asked in questionnaire 1.

The second questionnaire (Appendix) was issued following the reading of the leaflet and repeated the knowledge questions of questionnaire 1 (Q31-41) followed by 10 questions evaluating parents' opinion on HPV vaccination (Q29-30, Q42-49). The knowledge questionnaires were mandatory, thus all participants were to answer them before they were given access to the rest of the questionnaire. The question regarding the reasons for adherence or non-adherence to that vaccine were of a non-mandatory nature. Among the questions were

single-answer questions, multiple-answer questions or open questions. Regarding multiple-questions about knowledge, all items required to be correct in order for the answer to be considered correct. Parents' intention to vaccinate their daughters was evaluated according to the following variables: 'wishes to vaccinate' versus 'does not wish to vaccinate' or 'is unsure'.

The questionnaire was elaborated by three of the co-authors; its clarity and understandability were evaluated by professionals familiar with that methodological tool and/or working in the field of gynaecological prevention and the necessary amendments were made. The computer-tool also required testing and verifications. A testing stage took place in June 2016 with five parents of young girls aged 11 to 14. The questionnaire required no modification following that testing stage.

The study process

The online form was available online from September 2016 to April 2017 using an access link. The Board of the Education Department of the area of Val d'Oise (Direction des Services Départementaux de l'Education Nationale du Val d'Oise) authorised the inclusion of all secondary schools of the area, which resulted in a total of 135 schools that could share the survey. Among these 135 schools, five shared the information with parents via email. These emails included an access link to the various documents of the study: an information sheet detailing the aim of the research, the regulatory procedures and the anonymised questionnaire.

Statistical analysis

Qualitative variables were described using percentages, while quantitative variables were reported using means and standard deviations. A MacNemar test was used for cross-sectional data (before/after) if the conditions for application were met, if not the mid-Mac Nemar test was used. The statistical analysis was conducted using the R software (version 3.3.2.). The significance threshold was set at 5%.

Ethical and regulatory considerations

The project was submitted to the Comité d’Ethique de la Recherche en Obstétrique et Gynécologie (CEROG) [Research in Obstetrics and Gynaecology Ethics Committee] and was registered under the reference number CEROG GYN 2016-0401. A declaration was made to the Commission Nationale de l’Informatique et des Libertés (CNIL) [National Commission on Data Protection and Freedom]. The Board of the Education Department of the area of Val d’Oise (Direction des Services Départementaux de l’Education Nationale du Val d’Oise) played an active part in sharing the survey in the schools and had issued a favourable statement.

Results

Sample characteristics

Among the 120 questionnaires received, 14 did not meet the inclusion criteria and 106 were analysed (Figure 1). Mothers represented 94% of the sample (n=100), three couples completed the questionnaire together (3%) and three fathers completed it alone (3%). The characteristics of these parents of young girls aged 11 to 14 are presented in Table 1. The majority were aged 30 to 50 (n=99, 93%), were in a couple or married (n=96, 91%) and employed (n=75, 71%). All parents (n=106, 100%) had regularly used vaccination to prevent infections other than HPV.

Knowledge about HPV vaccination and intention to vaccinate their daughter

The initial knowledge held by parents was weak, and 10 out of 11 questions (91%) reached a lower than 50% rate of correct responses. The questions regarding knowledge about HPV transmission, procedures for vaccination, benefits, and side-effects of vaccination, as well as the possibility to vaccinate boys and/or girls reached a correct-answer rate of less than 5% before reading the information leaflet (Table 2). The level of knowledge improved after reading the leaflet (Table 2), and for 9 out of 11 questions (82%), a significant rise of correct answers was noticed ($p < 0,001$). After reading the information, the rates of incorrect answers remained higher than 60% for questions about benefits and side-effects, even nearing 80% regarding the procedures of HPV vaccination.

Table 3 presents the opinion of parents regarding HPV vaccination for their daughter, before and after information. Of 106 participants, 29% of parents ($n=31$) wished to vaccinate their daughter versus 51% ($n=54$) after reading the information. Adherence expressed about the vaccine significantly improved after reading the information ($p < 0,001$). Of the 54 initially unsure, 33 remained unsure, 20 wished to vaccinate and one parent did not wish to vaccinate. Of the 21 parents who did not initially want to vaccinate their daughter, 8 confirmed their position, 10 became unsure and 3 wished to vaccinate after information. The two main arguments held in favour of vaccination were 'fear of cancer' and 'protection against this sexually transmitted disease', selected respectively by 43% ($n=34/79$) and 38% ($n=30/79$) of participants. The main arguments held against vaccination were fear of side-effects and the perception that this vaccination was offered too early in age for respectively 47% ($n=37/79$) and 18% ($n=14/79$) of participants. The 'sexual connotation' of the vaccine was not selected by any participant, and the cost of vaccination was selected by only one participant.

Discussion

Main findings

The study showed a significant improvement of parents' knowledge and of their declared intention to vaccinate (29% then 51%, $p < 0,001$) after reading an information leaflet about HPV vaccination for girls between 11 and 14 years-old.

Interpretation of results

The survey highlighted parents' weak knowledge about HPV infection and vaccination before the information leaflet was read (except regarding inherent risks to HPV infection). The lack of knowledge and associated fears could be responsible for under-vaccination [19,20]. Indeed, some studies have demonstrated that knowledge on HPV infection and recommendation by a health professional were positively associated with HPV vaccination [21,22]. After reading the leaflet, the results indicated a significant rise in knowledge that subsequently increased the rate of intention to vaccinate, even if it is only a declared intention. Nonetheless, after reading the leaflet, there still remains a high percentage of incorrect answers regarding the benefits of HPV vaccination (60%), vaccination procedures (80%) and the risks of vaccination (65%). This may explain why the rates of intended vaccination after reading the leaflet remain moderate (51%). Therefore, it appears crucial to strengthen communication tools such as national awareness campaigns, but written information alone seems insufficient, and should be associated to oral information delivered by a health professional.

In the study, parents' knowledge regarding the risks of HPV infection was well known prior to the study and reading the leaflet enabled a rise in intention to vaccinate their daughters. However, one out of two parents persisted in the wish not to vaccinate their child against HPV after reading the leaflet. This progress is insufficient in comparison to countries like Denmark, Great-Britain or Canada where the vaccinations rates near 80% [8]. It is therefore important to understand why people adhere to vaccination and what the potential barriers may be. The main barriers identified by the literature are cost, lack of information and fear of side-effects of the vaccine considered to be too recent [20,22,23]. Regarding cost, after reading the leaflet, nearly all parents knew that the vaccine was free of cost in France. Conversely, the side-effects seem to be a major element of mistrust that is present in France for all vaccines and particularly in the case of anti-HPV vaccine [9,12].

It can also be noted that the vaccination procedures and benefits of HPV vaccination were not well known before reading the information and that this lack of knowledge remained after reading the leaflet. The results in relation to the moderate rates of intention to vaccinate can therefore explain important barriers in France. Thus, the healthcare professional has an important role in providing enlightened information to parents and adolescents but also a role in demystifying the anti-HPV vaccine.

Strengths, limitations, and bias

To our knowledge, this is the first study evaluating knowledge and intention to vaccinate before/after delivering information in the French context, which is resistant to HPV vaccination. We have been able to study a sample of 106 people who were surveyed before and after reading information. Finally, the information was delivered using a leaflet elaborated and used by experts on the topic in France.

Nonetheless, our study presents some bias. The response to the questionnaire was voluntary, in an area which was targeted, which results in a selection bias inherent to the mode of recruitment. The number of intercurrent actions and/or communications during the six months of study could not be evaluated, nor could we assess the sharing of information among parents or between parents and their children.

Moreover, the intention to vaccinate after reading the leaflet does not guarantee that this will be followed by the process and act of vaccination itself. There can therefore be a declaration bias. According to the National Public Health board (Santé Publique France), in 2016 in the area of Val d'Oise, 17% of young girls aged 15 have received one dose of anti-HPV vaccine. It can be noted that the intention to vaccinate in our study was superior to the vaccination coverage in this same area in 2016 (29% versus 17% ; $p=0,0008$) [17,18]. This difference may be linked to selection bias or social desirability bias.

The participation rate was low (only 8.6%), which is also likely to bias the results. The reasons for this low participation rate would have been interesting to identify and discuss, to understand participants' motives for not participating. However, anonymity prevents us from contacting the people who refused to take part in the study, which is why the question cannot be explored further within the scope of this research.

Impact on practice

At a point in time where Gardasil 9® is now available, providing protection against five additional genotypes compared to the previous version of Gardasil® [10], our results highlight the importance of promoting vaccination using educational messages and digital tools, without forgetting the importance of information delivered by health professionals, who play a pivotal role in promoting this major vaccine. Given the lack of information observed in parents but also young girls [22,24], the positioning of doctors/practitioners with regards to this vaccination can

be questioned along with the information they deliver to parents and adolescents [25]. While the leaflet helped modify parents' knowledge and opinion, it could be handed out and explained by a healthcare professional. A lot of information is available but scarcely looked at or read by the population if it is not explained by a third party. Written information delivered simultaneously with oral information on the occasion of an exchange with the practitioner should be encouraged to reduce the barriers to vaccination while increasing knowledge and accompanying parents' intention to vaccinate their daughter.

Conclusion

The communication tool delivered to parents enabled an increase of the knowledge on HPV infection and HPV vaccination. Parents' intention to vaccinate their daughter increased significantly after reading the leaflet, however one out of two parents persisted in their refusal to vaccinate their daughter against HPV. Identifying barriers and levers impacting on actions towards improving vaccinal coverage could provide elements for reflection around the HPV vaccination strategy in France. Interventions must target parents but also young girls, through various communication actions coupled with educational communication led by health professionals.

Conflicts of interest: none

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Contribution

All authors participated in the methodological reflection of this study and to its writing. Mrs ROY and Mrs ROUSSEAU produced the statistical analysis.

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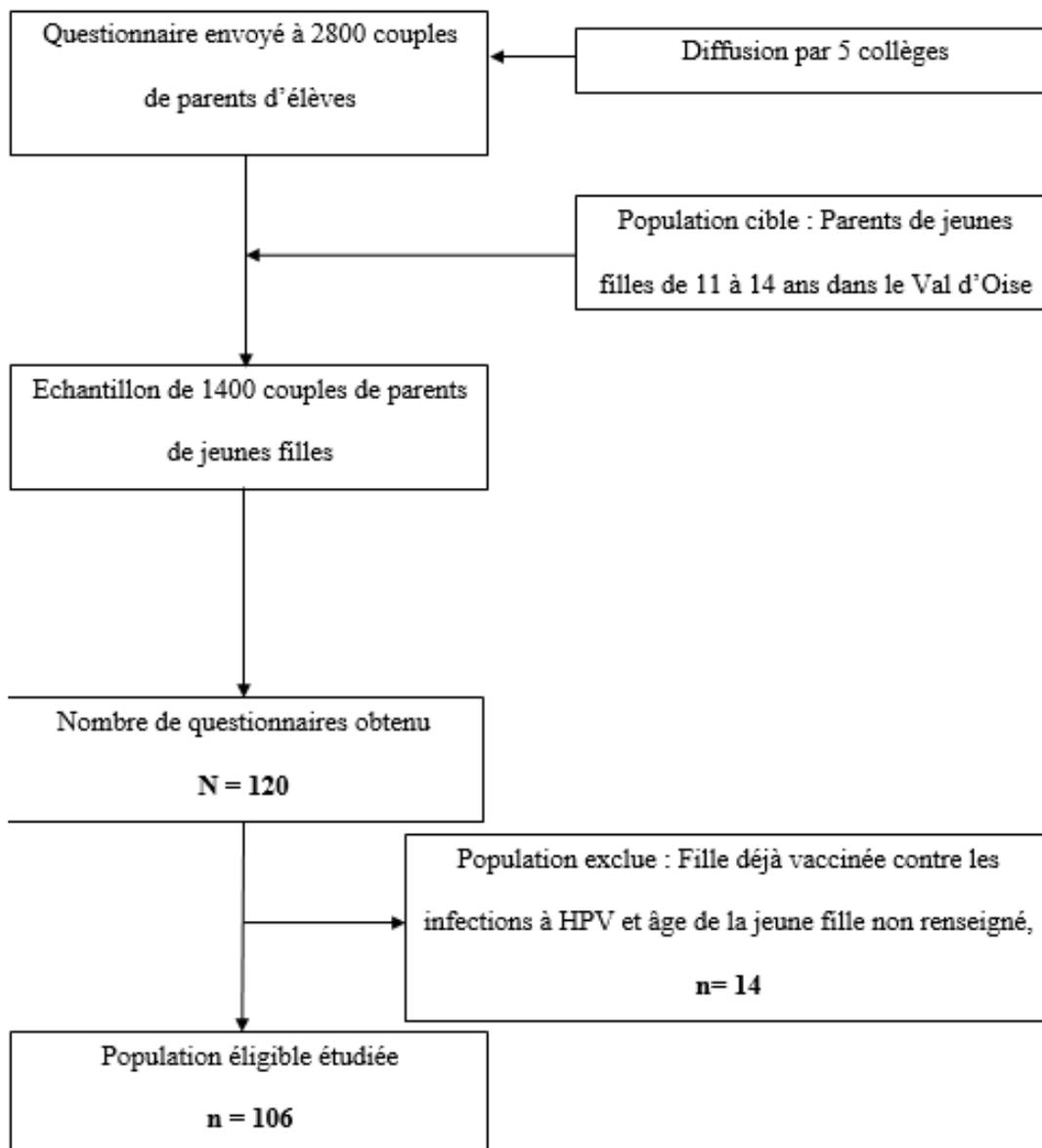


Figure 1 : Diagramme des flux / **Figure 1**: Flow chart

Table 1: Characteristics of the parents

		Data set n=106 n (%)	
Age	Under 30 years old	3 (2,8)	
	30 to 40 years old	30 (28,4)	
	40 to 50 years old	69 (65,1)	
	Over 50 years old	3 (2,8)	
	Missing data	1 (0,9)	
Status	Mother	100 (94,4)	
	Mother and father	3 (2,8)	
	Father	3 (2,8)	
Socio-economic category		Mother	Father
	Farmers	4 (3,8)	1 (1,0)
	Artisans, merchants, business owners	2 (1,9)	19 (18,0)
	Managers and highly qualified professions	15 (14,1)	12 (11,3)
	Intermediate professions	27 (25,5)	15 (14,1)
	Worker	2 (1,9)	19 (18,0)
	Employees	51 (48,1)	24 (22,6)
	Unemployed	5 (4,7)	3 (2,8)
	Missing data	0 (0)	13 (12,2)
Marital status	Single	4 (3,8)	
	Married	65 (61,3)	
	In a couple	31 (29,2)	
	Divorced	5 (4,7)	
	Missing data	1 (1,0)	
Regular vaccination of their daughter	Yes	106 (100)	

Table 2: Comparison of answers before and after the information C

	Rate of correct answers		P
	Before information n (%)	After information n (%)	
Transmission of HPV(Q15)	4 (3,8)	59 (55,7)	<0,001
Risk of infection (Q16)	96 (90,6)	103 (97,2)	0,008
Frequency of infection (Q17)	21 (19,8)	91 (85,8)	<0,001
Vaccination of girls and/or boys (Q18)	2 (1,9)	6 (5,7)	0,06
Targeted age-group (Q19)	41 (38,7)	95 (89,7)	<0,001
Impact of sexual intercourse (Q20)	23 (21,7)	43 (40,6)	0,01
Benefits of vaccination (Q21)	2 (1,9)	41 (38,7)	<0,001
Vaccination strategy (Q22)	0 (0)	20 (18,9)	<0,001
Risks of vaccination (Q23)	1 (0,9)	36 (34)	<0,001
Cost of vaccination (Q24)	48 (45,3)	97 (91,5)	<0,001
Practitioners qualified to perform vaccination (Q25)	5 (4,7)	82 (77,4)	<0,001

Table 3: Comparison of favourable opinions on anti-HPV vaccination before and after information

	Intention to vaccinate after information (n=54; 50.9%)	Unsure and/or refusal to vaccinate after information (n=52; 49.1%)	p
Intention to vaccinate before information (n=31; 29.2%)	31 (29,2)	0 (0)	<0,001
Unsure and/or refusal before information (n=75; 70.8%)	23 (21,7)	52 (49,1)	