



# Indications for the HPV vaccine in adolescents: A review of the literature



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## KEYWORDS

Vaccine;  
HPV;  
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## Summary

**Background:** The vaccine against human papillomavirus (HPV) was created to abrogate the risk that the virus presents for the development of cervical cancers. The prevalence of HPV infection among healthy individuals is significant (20%). We performed a review of the literature published in the period from 2008 to 2012 regarding the use of the vaccine against HPV specifically in adolescents.

**Methods:** The articles were selected from a search of the PubMed database with the key words “vaccine”, “HPV” and “adolescent”. This search identified 576 articles; based on readings of the titles and abstracts, the list of included article was reduced to 42.

**Results:** We observed that the majority of authors are in favor of the vaccine for adolescents particularly females.

**Conclusion:** Recommending the use of the HPV vaccine and other vaccines represents an attempt to broaden the reach of these vaccines among both sexes of the adolescent population. Vaccination is a strategy for the prevention of pre-cancerous lesions in the genital and oropharyngeal regions.

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## Introduction

World estimates have indicated that 20% of healthy individuals are contaminated with the human papillomavirus (HPV) and that this virus is primarily transmitted through sexual contact, although direct contact with contaminated objects can also lead to infection. HPV is related to the development of approximately 98% of the cases of cervical cancers; thus, infection with the virus is a public health problem, and the prevention of such infections is mandatory [1–4].

The prophylactic vaccine against the HPV L1 viral particle is an effective method for the prevention of the infection of naïve women and HPV-negative persons; therefore, the Advisory Committee on Immunization Practices (ACIP) of the Centers for Disease Control and Prevention have recommended the universal administration of the three doses of quadrivalent or bivalent HPV vaccine to girls of 11–12 years of age, although the minimum recommended age varies with geographic region [2,5,6].

Based on a cost–benefit analysis, the ACIP recommended the administration of the anti-HPV virus to 11- or 12-year-old girls for the prevention of genital warts, anal cancer and possibly cancers of the head and neck because the vaccine is considered to be highly effective and provides protection against the four types of HPV [7,8].

Parents' interest vaccinating their children and the interest of adults (up to 26 years of age) in getting vaccinated are directly related to the relevant party's knowledge of the efficacy of the vaccine, and studies have demonstrated that the acceptance of the vaccine is greater people are aware of the

associations between some types of cancer and HPV [4,9].

To increase the knowledge of the use of the prophylactic HPV vaccine in adolescents, we performed a review of the published literature that broadly discussed this subject in the period from January 2008 to August 2012.

## Methods

### Search strategy

The PubMed database was searched for relevant articles published in English from 2008 to August 2012. The studies were grouped according to whether they evaluated the indications for administration of the HPV vaccine to adolescents. A broad search strategy was pursued to capture the relevant studies of the HPV vaccine and the indications for the HPV vaccine in adolescents. The keywords 'HPV', 'vaccine' and 'adolescent' were used. Data from longitudinal studies were included, and the references of the retrieved articles were analyzed to identify additional relevant studies.

### Study selection

The studies were selected based on their titles and abstracts, and articles without available abstracts and full-texts were excluded. Agreement between the readers was determined statistically, and any conflicts were resolved by discussion or the analysis of a third reader (GIM). This procedure was applied

at all selection stages. The full-text articles were evaluated by the readers using a pilot-test form.

### Inclusion/exclusion criteria

The inclusion criteria were the following: indications for the administration of the HPV vaccine to children and adolescents regardless of age group and sex, and scientific research projects. Simple and systematic reviews were also included.

Studies with the following main themes were excluded: acceptance, awareness and applicability of the prophylactic HPV vaccine; efficacy of the vaccine; costs and benefits of the vaccine; barriers to the implementation of the vaccine; effect of the vaccine on society; estimates of the immunized population; general concepts of the vaccine; opinions of vaccinated persons; perspectives on the vaccine in prevention; most frequent types of HPV; use of the three doses in clinical routines; simultaneous use of vaccines, including the HPV vaccines; other languages; ethical and legal questions regarding the use of the vaccine; vaccination strategies; sexual behavior after vaccination; perspectives for the control of cancer; intentions of men to have themselves vaccinated; expression of genes and productions of antibodies; and free-of-charge distribution of vaccines by clinics. When necessary, the exclusion criteria were reviewed, and the abstracts were re-assessed until a complete definition of the exclusion criteria was determined.

### Outcomes and variables

The following information was extracted from each included study: year of publication; age-range of those for whom the vaccine was indicated; sex indicated to receive the vaccine; recommendations regarding HPV vaccination of physicians; and the availability of the vaccine to society.

## Results

### Study sample

The search detailed above resulted in the identification of 576 articles. After reading the titles and abstracts, 534 articles were excluded because they focused on other subjects related to the vaccine (Table 1). Thus, our review encompassed a total of only 42 articles.

**Table 1** Exclusion criteria applied to articles obtained from the search of PubMed for articles published in the period from January of 2008 to August of 2012.

Exclusion – subject or language	Number of articles
Acceptance, awareness and applicability	269
Effectiveness	56
Cost × benefit of the vaccine	39
Barriers to implementation of the vaccine	27
Impact of the vaccine	26
Estimate of population immunized	26
General concepts about the vaccine	17
Opinion of persons vaccinated	15
Perspectives of the vaccine in prevention	13
Most frequent types of HPV	11
Use of the 3 doses (clinical routine)	7
Simultaneous use of vaccines	6
Other languages	5
Ethical and legal questions	4
Vaccination strategies	3
Sexual behavior after vaccination	3
Perspectives for the control of cancer	2
Men's intention of getting themselves vaccinated	2
Expression of genes and production of antibodies	2
Free-of-charge vaccine distribution by clinics	1
Total	534

### Recommendations of physicians regarding HPV vaccination

Of the 42 included articles, five addressed recommendations regarding the prophylactic use of the HPV vaccine (bivalent or quadrivalent) by physicians (Table 2). Most of the physicians favored the use of the vaccine. However, many clinical opportunities were lost. Possible reasons for these missed opportunities included the short time of each consultation, forgetfulness on the part of doctor, and the population's absence of interest in the HPV vaccine due to lack of information.

### Recommendation regarding HPV vaccination for females and males

The 42 included articles were in favor of the prophylactic use of the HPV vaccine; these articles particularly emphasized the potential benefits for the prevention of cervical cancers. The percentages of articles that recommended the use of the

**Table 2** Recommendations regarding the prophylactic use of the HPV vaccine of each relevant article.

Author and year of publication	Sex	Indication for	Main comments
Nadal and Nadal (2008) [3]	Female	11–25 years	Vaccination does not dispense with the need for period exams to trace anogenital cancers, and for the present moment it is indicated for women from 11 to 25 years of age, and is not indicated for men.
Somasundaram (2008) [5]	Male	Non-indicated	HPV infections occur within a few years of the beginning of sexual activity, thus it is believed that the prophylactic HPV vaccine should be administered before 9 years of age in India. However, it is necessary for studies to be conducted about the efficacy of the vaccine at this age.
	Female	9–26 years or more young	
Mammas et al. (2009) [6]	Male	–	Understanding the natural history of HPV infection will allow the application of prophylactic HPV vaccines in the most correct age groups for the prevention of Uterine cervix carcinoma (UCC), however, it is agreed that the vaccine is beneficial to the female sex (9–26 years).
	Female	9–26 years	
Wright et al. (2009) [11]	Male	–	In addition to the benefits of the vaccine to girls from 11 to 26 years, vaccination can also benefit females over the age of 26 years who have not been previously exposed to HPV 6, 11, 16, or 18 and those who may have new sexual partners in the future.
	Female	11–26 years and older women	
Garland et al. (2011) [12]	Male	–	Discusses the benefits of the vaccination program in girls (12–13 years) at schools in Australia, showing that within a short time after implementation, a reduction was observed in genital warts diagnosed in STD clinics.
	Female	12–13 years	
Etter et al. (2012) [13]	Male	–	Although the quadrivalent prophylactic HPV vaccine has been approved since 2006, and the bivalent vaccine since 2009, the rates of uptake and completion of the series of doses among young women continue to be low.
	Female	9–26 years	
Kahn et al. (2009) [15]	Male	–	The study informs that doctors are increasingly more inclined to indicate prophylactic HPV vaccine for the male sex as well, but there is still the need for specific information with respect to the vaccine for the male sex.
	Female	9–26 years, Priority: 11–12 years	
Vadaparampil et al. (2011) [16]	Male	Priority: 11–12 years	The study suggests that innumerable clinical opportunities for the application of HPV vaccination are lost, particularly within the first years of adolescence in the female sex (11–12 years).
	Female	11–26 years	
Weiss et al. (2010) [17]	Male	Suggest 9–26 years	Doctors who support the use of prophylactic HPV vaccine for the female sex also believe in the benefits of the use of the vaccine for the male sex. However, they do not agree that adoption of the vaccine for both sexes would favor vaccination coverage, or even change the opinion of adolescents' parents with regard to the importance of the vaccine.
	Female	13–26 years	
Krupp et al. (2010) [18]	Male	13–26 years	The article evaluates the indication of prophylactic HPV vaccine by doctors in India, and observes that the minority indicate this with the justification that there is no time during the consultation to explain the benefits of the vaccine, since they perform 40 attendances per day, which allows less than ten minutes per consultation.
	Female	9–26 years	
	Male	–	

Akinsanya-beysolow and Wolfe (2009) [19]	Female Male	9–26 years Licensure of HPV vaccine has been applied for 9–26 years	Reinforces the need for all gynecologists to explain the benefits and safety of prophylactic HPV vaccine to the women who consult them, because in addition to being benefited by this information, they may take their children (present or future) to receive the vaccine, thus increasing this vaccination coverage.
Moscicki (2008) [20]	Female	9–26 years	Emphasizes the need for creating vaccines for women who have begun sexual activity, since the existent prophylactic vaccines are destined and efficient for women who have not yet engaged in sexual activity.
Frazer (2008) [21]	Male Female	– Until 25 years	Understands that the prophylactic HPV vaccine is a strong weapon for the prevention of uterine cancer and other lesions associated with HPV. It has been used in many countries in women up to 25 years of age, who have not engaged in sexual activity, and in men based on the safety and immunogenicity of the vaccine.
Castle et al. (2009) [22]	Male Female	Suggest until 25 years too Until 26 years	Examining data from 7 clinical centers in the USA, the median age of CIN2/3 is typically between 25 and 30 years of age in 2007; if screen-detected CIN2/3 develops on average 5–10 years after the causal infection is acquired, HPV vaccination will only prevent a significant proportion of CIN2/3 if it is given to women before the age of 26 and more so if given to women 18 and younger.
Westra et al. (2011) [23]	Male Female	– 12–16 years, but can be used until age 25	Based on cost–benefit, it is believed that the preventive vaccination program should consider the target population of the female sex up to 25 years of age. After this age, the preventive program should be of another type, composed of routine exams.
Harper and Paavonen (2008) [24]	Male Female	– Priority: until age 25, but indicate for older women	Inform that the safety and efficacy of prophylactic HPV vaccine are maintained when used in older women (over 55 years) who do not present viral DNA; Therefore they confirm that women over the age of 26 years need to be informed about this opportunity of being immunized.
Kim et al. (2010) [25]	Male Female	9–15 years 10–14 years	Evaluates the safety and efficacy of prophylactic HPV vaccine (Cervarix™, GlaxoSmithKline Biologicals, Rixensart, Belgium) with adjuvant AS04 in Korean girls (10–14 years), which was shown to be highly immunogenic and tolerable.
Bayas et al. (2008) [26]	Male Female	– 8–14 years	The optimal vaccination strategy is vaccination of girls aged 8–14 years. Other strategies should include the uptake of adolescent and women not yet sexually-active, as well as the vaccination of sexually-active women. The long-term HPV eradication strategy will require universal vaccination of females and males.
Reiter et al. (2011) [27]	Male Female Male	Suggest the vaccine, but not for specific age Priority: 11–12 years –	Research conducted in the USA to verify the number of girls (11–12 years) who received prophylactic HPV vaccine, disclosed that few girls were immunized. The immunization strategy proposed is to carry out annual visits for preventive care and administration of vaccines jointly in this age group.

Table 2 (Continued)

Author and year of publication	Sex	Indication for	Main comments
Palefsky (2010) [28]	Female	9–26 years; Priority: 11–12 years	In spite of ACIP recommending the use of the vaccine for the male sex since 2009, this recommendation is permissive only and not routinely implemented. Taking into consideration the few means of anal cancer prevention, prophylactic HPV vaccine for men is the best long term approach to prevention of the disease.
	Male	9–26 years; Priority: 11–12 years	
Borsatto et al. (2011) [29]	Female	9–26 years	In a review of articles, informs that the target population for prophylactic HPV vaccination are girls from 9 to 26 years, preferably before they become sexually active.
	Male	–	
Heideman et al. (2008) [30]	Female	9–18 years	By means of a review of articles, inform that the vaccine could be administered to girls of prepubertal age (9–14 years, beginning of sexual libido), girls from 15–18 years, who lost the previous opportunity of being vaccinated, girls over the age of 18 years, who opted for the vaccine and for adolescents of the male sex (10–15 years).
	Male	10–15 years	
Mayer et al. (2012) [31]	Female	Older age 26	Affirms that prophylactic HPV vaccine could be safely administered in older women, a group that is not chosen by public immunization policies, nevertheless, being a group that may also benefit from the use of the vaccine. Provides a detailed approach to fourteen items about recommendations for the vaccine. The article succinctly recommends the vaccine for both sexes (9–16 years), irrespective of whether or not sexual activity has begun. It also recommends it for men over the age of 26 years, who maintain relationships with other men; and for those with HIV. It does not indicate the vaccine for pregnant women and affirms that use of the vaccine does not dispense with the use of condoms and undergoing preventive exams, such as the Papanicolaou test (Pap smear).
	Male	–	
Committee on Infectious Diseases (2012) [32]	Female	9–26 years	Provides a detailed approach to fourteen items about recommendations for the vaccine. The article succinctly recommends the vaccine for both sexes (9–16 years), irrespective of whether or not sexual activity has begun. It also recommends it for men over the age of 26 years, who maintain relationships with other men; and for those with HIV. It does not indicate the vaccine for pregnant women and affirms that use of the vaccine does not dispense with the use of condoms and undergoing preventive exams, such as the Papanicolaou test (Pap smear).
	Male	9–26 years	
Panatto et al. (2009) [33]	Female	12–14–16 years	They suggest vaccination at three ages (12–14–16 years) as a strategy so that in a short period of time (3–4 years) the group of women from 12 to 20 years could be immunized. The initial cost would be compensated by the savings generated through the reduction in lesions related to HPV.
	Male	–	
Rama et al. (2010) [34]	Female	Young primiparous women	It was observed that young mothers (15–24 years) presented high prevalence of HPV in the cervical region. However, only 13% of this group of women contained the high risk virus, characterizing a group eligible for receiving the vaccine.
	Male	–	
Torné et al. (2008) [35]	Female	Questions the use HPV vaccine for all	The article approaches the topic of vaccination as a means that could be applied to the entire population, irrespective of age, sexual habits, sex and systemic condition. However, it makes it clear that in order to adopt this measure, it would be necessary to await the researches on the efficacy and safety of the vaccine for each population.
	Male	–	

Mogensen (2009) [36]	Female	9–26 years	<p>It emphasizes that prophylactic HPV vaccination is effective when used before sexual activity begins; however, there is no evidence about the efficacy of the vaccine in women over the ages of 25–26 years, which requires clinical studies. Informs that after one year of the national recommendation for the use of prophylactic HPV vaccine for the male sex in the USA, only 2% of men received the vaccine.</p> <p>The National Advisory Committee on Immunization says provincial governments should assess whether a human papillomavirus vaccination program for boys (9–26 years) is preferable to campaigns designed to increase female vaccination rates.</p> <p>Prophylactic HPV vaccination has shown a high degree of immunogenicity in the male sex within the age range of 9–26 years, and is well tolerated and recommended.</p> <p>Emphasizes the benefits of the vaccine for the male sex, for the prevention of genital warts and precursor lesions of penile cancer, in addition to informing that various doctors favor the use of the vaccine for the male sex (9–26 years) believing that the FDA will shortly support this position.</p> <p>Supports the use of the vaccine for men, affirming that in the long term it would be an important factor in the prevention of diseases in women as well.</p> <p>Points out the importance of elucidation as regards the benefits of the vaccine for the male sex, so that there were be greater HPV vaccine adherence by this sex.</p> <p>The use of prophylactic HPV vaccine in the male sex, in addition to being of indirect benefit to women, prevents important lesions related to HPV, irrespective of sexual habits.</p> <p>Reinforces that the vaccination policy is still focused on the female sex, however, it should be offered to and encouraged for both sexes, making it more effective because of immunizing all possible carriers of the virus.</p>
	Male	–	
Reiter et al. (2011) [37]	Female	11–26 years	
	Male	9–26 years	
Eggertson (2012) [38]	Female	–	
	Male	9–26 years	
Garnock-Jones and Giuliano (2011) [39]	Female	–	
	Male	9–26 years	
Printz (2009) [40]	Female	9–26 years	
	Male	9–26 years	
Hibbitts (2010) [41]	Female	9–26 years	
	Male	9–26 years	
Burki (2009) [42]	Female	–	
	Male	Support the vaccine for males.	
O’Connor (2009) [43]	Female	–	
	Male	Until age 26	
Hull and Caplan (2009) [44]	Female	–	
	Male	Suggest the vaccine, but not for specific age	

Table 2 (Continued)

Author and year of publication	Sex	Indication for	Main comments
Paavonen (2010) [45]	Female	Priority: Young adolescents before their sexual debut	In spite of the target population for receiving prophylactic HPV vaccine being girls before they become sexually active, it is believed that the inclusion of the male sex favors immunization of the population in general.
	Male	Suggest the vaccine, but not for specific age	
Campos-Outcalt (2012) [46]	Female	–	Discloses that the ACIP has recommended prophylactic vaccination against HPV to all men from 11 to 21 years and for those men from 22 to 26 years of age, who have sexual life with other men or are HIV positive.
	Male	11–26 years	
Smith et al. (2011) [47]	Female	Suggest the vaccine, but not for specific age	Evaluates the prevalence of HPV in men, showing that the male sex presents high prevalence of both the high and low risk viruses, according to the population analyzed, the need for inclusion of the male sex in the vaccination programs is justified.
	Male	Suggest the vaccine, but not for specific age	
Georgousakis et al. (2012) [48]	Female	9–26 years	Although men present fewer diseases related to HPV when compared with women, the prophylactic HPV vaccine must be considered for the male sex, since it present benefits not only to the men who receive it, but to their partners as well.
Kubba (2008) [49]	Male	9–26 years	Defends the indication of prophylactic HPV vaccine for adolescents of both sexes, because in addition to preventing lesions, it would also function as a strategy to make the immunization program successful, as there would be no exclusion of adolescents.
	Female	Suggest the vaccine, but not for specific age	
Gilkey et al. (2012) [50]	Male	9–15 years	It was observed that the number of adolescents of the male sex who received the vaccine is three times lower than those of the female sex. This suggests that the prophylactic HPV vaccine should be inserted together with the other vaccines in vaccination programs.
	Female	11–17 year	
	Male	11–17 year	

**Table 3** HPV vaccination in a selection of countries.

Countries	Vaccination system	Target group (female)	Vaccine	Period
Australia <sup>a</sup>	Routine	12–13 years	4-Valent	Since 2009
	Catch-up	12–26 years	4-Valent	2007–2009
Denmark <sup>a</sup>	Routine, via GPs	12 years	4-Valent	Since 2009
	Catch-up, via GPs	13–16 years	4-Valent	Since 2009
New Zealand <sup>a</sup>	Routine	13 years	4-Valent	School year: 2009–2010 and 2010–2011
	Catch-up	Girls: 14–20 years	4-Valent	2008–2011
England <sup>a</sup>	Routine	12–13 years	2-valent	Since school years 2008/2009
	Catch-up	13–18 years	2-valent	School years 2009/2010 and 2010/2011
USA <sup>a</sup>	Routine	Priority: 11–12 years	4-Valent	Since 2007
	Catch-up	13–26 years	4-Valent	2008–2011
Netherland <sup>a</sup>	Routine	12 years	2-Valent	Since 2010
	Catch-up	13–17 years	2-Valent	In 2010 only
France <sup>a</sup>	On prescription by physician	Priority: 14 years	4-Valent	Since 2007
Brazil <sup>b</sup>	Routine	11–13 years	4-Valent	Since 2014

<sup>a</sup> Ref. [10].

<sup>b</sup> Ref. [14].

HPV vaccine by females beginning at the lowest ages of 8- to 14-years-old was 11.9%, and 50% of the articles recommended the use of the HPV vaccine by females in the highest age group of 9- to 26-years-old. Other age groups were mentioned by seven articles, but these age groups did not vary from the age range of 8- to 26-years-old. Six articles mentioned indications for the use of the vaccine among males only, two articles did not specify an age range for the use of the vaccine, and only a single article emphasized the indication for older women (>26 years). However, other articles also suggested this possibility (Table 2). A similar pattern was observed regarding the recommendations for males; 9.5% of the articles recommended the HPV vaccine for boys aged 9- to 15-years-old, and 30.9% of the articles recommend the vaccine for boys aged 9–26 years (Table 2). Seventeen articles did not mention the indication for the use of the vaccine by males, six articles indicated the vaccine without specifying an age group, and only a single article indicated another age group (11–17 years). One article adopted a position against the prophylactic use of the HPV vaccine by males (Table 2).

### Availability of the vaccine to society

Many countries in which the authorities are convinced of the safety and efficacy of the prophylactic use of the HPV vaccine are financing the administration of the vaccine to adolescents because these authorities understand that vaccination represents a preventive strategy with a favorable cost–benefit ratio. Table 3 presents important data regarding the vaccination policies of several countries, including the adopted vaccination system, the age of the target population, the type of vaccine applied (i.e., bivalent or quadrivalent) and the year in which the vaccination program began. We observed that 75% (6/8) of the countries adopted programs of routine vaccination of 12-year-old female adolescents, and only two countries opted for the bivalent rather than the quadrivalent vaccination (Table 3).

### Discussion

The main target populations of national immunization programs are adolescent girls regardless of

whether they have initiated sexual activity; however, it is probable that many adult, sexually active women wish to receive the vaccine for their individual benefit. Therefore, Wright et al. [11] considered the use of the vaccines to be acceptable in modern clinical practice because these vaccines are immunogenic and safe for use in sexually active women. In Australia, young adolescents (10–17 years) are vaccinated through a project that is carried out in schools, and Australia is the first country to provide the vaccine via a public health program [12,13]. Many countries, including Brazil, offer prophylactic HPV vaccine to females, primarily those 12- to 13-year-old. In Brazil, a vaccination program for 11- to 13-year-old girls provided through the Sistema Único de Saúde (SUS) national health system was approved, and the campaign was scheduled to begin in March 2014 [10,14].

Studies have evaluated the recommendation that the vaccine be administered by physicians (i.e., general clinicians, pediatricians and gynecologists), and these studies have reported that a minority of these physicians provided their patients with guidance. This finding indicates that innumerable clinical opportunities for vaccinations against HPV have been lost [15,16]. In the USA, despite the existence of national guidelines recommending the vaccine for 11- to 26-year-old women, the proportions of physicians who indicate to their patients that they always recommend the vaccine ranges from 25.8% and 74.5% depending on the age range of the patients and the specialties of the physicians [17]. However, in another study that analyzed the indications for the use of the vaccine in men, variation in the recommendations for the use of the vaccine also occurred with age; the vaccine was indicated for 11- to 12- (63.9%), 13- to 18- (93.4%) and 19- to 26- (92.7%) year-old males. Therefore, this medical recommendation is an important and consistent factor for use of the vaccine [16,17].

In India, it has been observed that doctors do not doubt the efficacy of the vaccine; therefore, the lack of time during consultations has been found to be the main justification for the non-indication of the vaccine. These doctors were required to prioritize other subjects during consultations or to discuss mandatory vaccines [18]. The author of the study explained that it is necessary for gynecologists and obstetricians to explain the importance of the vaccine to women, not only to encourage them to be vaccinated but also so that those women will have their future children vaccinated because women generally care for the health of their families [19]. Doctors believe that investments in campaigns about the importance of the

HPV vaccine would make patients themselves seek vaccination [18].

A large portion of the authors indicated vaccination for women from 11 to 26 years of age who are not yet sexually active; i.e., those without previous exposure to the virus [3,6,20–28]. However, Bor-satto [29] indicated vaccination for all women aged 9–26 years regardless of sexual activity, and others authors, such as Heideman et al. [30], included indications for older women based on the perspective that the vaccine is a safe and effective investment [24,31]. The quadrivalent vaccine (HPV4; Gardasil; Merck & Co, Inc., Whitehouse Station, NJ) is contraindicated for persons with histories of immediate hypersensitivity to yeast and pregnant women [32].

Despite the concern regarding the vaccination of girls who have not initiated sexual activity, i.e., frequently children (9 years), authors believe that the administration of the vaccine at an early age might reduce the immunity offered by the vaccine because it is used well before the phase of high levels of exposure to HPV infection [30], which frequently occurs among 14- to 16-year-old girls; thus, the vaccine is needed for this latter age group [33]. Another target population for vaccination is young primiparous women (15–24 years of age) among whom the prevalence of HPV in the cervical region is high. In one study group, 58.5% (176/301) of such women were HPV-positive, and 13% carried oncogenic types of HPV (i.e., HPV-16 and HPV-18). This group of women is considered to be at high risk for the development of cervical cancer; therefore, vaccination is proposed to these women during the post-natal consultation to prevent infections with the oncogenic types of HPV [34].

The vaccine might prevent approximately 70% of the cases of cancer of the uterus and is thus considered a means of eliminating one of the most worrying female diseases and a disease with a high incidence in India [5,21]. Thus, some authors have been encouraged to develop new research programs regarding the creation of effective vaccines for women who have initiated sexual activity, those who are infected by the virus, and for immunosuppressed patients [20,35]. Others believe that infection prevention programs for older women must be of a different type because vaccination programs are no longer economically feasible for these women because the efficacies of such programs have not been proven in clinical trials, and the virus is not highly prevalent in this age group [23,36].

Regarding males, although Nadal and Nadal [3] does not agree about the benefits of the vaccine for

males, in the USA, a recommendation for the prophylactic use of the HPV vaccine by men between the ages of 9 and 26 years was issued, but one year after this recommendation was issued, the rate of vaccination among males of this age group was minimal (2%). This finding indicates the need for strategies to increase the use of the vaccine by this population; such strategies should include explanations about the disease, how it also affects men, how it can be prevented and how the risk to sexual partners can be minimized [37–45]. Currently, the ACIP states that the HPV vaccine must be administered to men between from 11- to 21-years-old and to men from 22- to 26-years-old who maintain sexual relationships with other men or are HIV-positive [46].

HPV-16 is the most frequent type of infection in men irrespective of age; therefore further studies are needed to determine the best age group for the vaccination of the males, although some have already stated that the appropriate age is the beginning of adolescence (10–15 years of age) [30,47]. In Australia, despite the belief that the vaccination of men would benefit to the population, there is still no program that finances the vaccination of men, and the author of the relevant study believes that it is not possible to vaccinate the majority of the male population without financing from the government [48].

Thus, recommendations in favor of the prophylactic uses of the HPV vaccine and other vaccines have made these vaccines more accessible to both sexes of the adolescent populations, and such recommendations represent a strategy for the prevention of pre-cancerous lesions in the genital and oropharyngeal regions [49,50].

## Conclusion

Despite the small divergences regarding the best indications for the use of the HPV vaccine according to age, sex and sexual habits, all of the reviewed scientific articles maintained that the vaccine is an effective means of prevention even when its use is restricted to a specific section of the population. The continuous study of articles is extremely important for our understanding of the properties of the vaccine and the benefits it provides to certain population groups, particularly those groups that are not targets for this immunization.

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## Competing interests

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## Ethical approval

Not required.

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