

Effectiveness of an educational intervention to increase human papillomavirus knowledge in high-risk populations: A systematic review

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Abstract

Background: HPV vaccine has been described as a very efficacious and safe vaccine, making it highly acceptable for the prevention of potential cervical cancer. However, rejection of vaccine use is on the rise. This paper aims to showcase the benefit of educational intervention as an avenue to increase the rate of vaccination among the high-risk population.

Hypothesis: Parental education on HPV vaccine will improve the rate of vaccination acceptance.

Methods: Databases including PubMed, Google Scholar, Science-Direct and Web of Science were searched for studies pertaining to the effects of educational intervention on HPV vaccine receipt.

Results: A total of 11 articles were included in this review. Eight studies targeted high-risk minors of recommended ages for the HPV vaccine. The parents of these minors were then assessed pre- and post-intervention to study the effect of educational intervention on intent to vaccinate against HPV. Three studies focused on the effect of educational intervention targeted to adolescents and young adults ages 18–22 on intent to vaccinate against HPV. Results compared the intent to vaccinate in groups exposed to the educational intervention versus groups without intervention. Percentage increase in the intent to vaccinate was reported for all groups exposed to educational intervention versus groups without intervention.

Conclusion: The increase in the percentage of participants with intent to vaccinate reflects the importance of individual knowledge. Future studies should focus on methods that improve dialogue and acceptance with groups of different ethnicity and cultures.

Introduction

Globally, a considerable number of people die each year due to cancer. Of the different types of cancers, cervical cancer is one of the leading causes of death, and is defined as a malignant tumor arising from cells originating in the cervix of the uterus.¹ As the fourth most common cause of cancer-related deaths and the third most common cause of cancer in women, cervical cancer is responsible for 4,000 deaths out of 12,000 diagnosed in the United States annually.²

The risk factors associated with cervical cancer include multiple sexual partners, early onset of sexual activity, smoking, oral contraceptive pills, immunocompromised status, family history of cervical cancer, and Human Papillomavirus (HPV) infection.³ It is safe to say that most cervical cancers occur as a result of genital HPV infection, which is referred to as the most common sexually transmitted disease in the world.⁴

Over time, HPV infection can cause cervical cancer, which first progresses as cervical intraepithelial neoplasia (CIN) for an extended period. An important determinant of progression of CIN to cervical cancer is the body's immune system. A deficiency in the immune system may result in the development of cervical cancer. The progression from HPV infection to cervical cancer begins gradually from growth abnormality within the basal cells of the cervix, followed by extension to intermediate and finally the apex. The extent of the growth abnormality within the different layers of the cervix is categorized as CIN 1, 2, and 3 to signify the basal, intermediate and apical layers, respectively. High-risk viral genotypes include HPV 16 and 18, which are responsible for progression of normal cervical cells to abnormal growth in CIN 1, 2, 3, and cervical cancer.⁵

Much research has been done on cervical cancers and how HPV causes the gradual changes in malignancy of the cervix. HPV is said to affect regulatory genes leading to disruption of the function of tumor suppressor genes, which is mediated through production of oncoproteins E6 and E7 by HPV.⁷ E7 is known to inactivate retinoblastoma tumor suppressor genes (RB) by hypermethylation, which limits the ability of RB to inhibit the progression of malignancy during the cell cycle. E7 also affects E-cadherin, diminishing cell adhesion, and promoting invasion and metastasis from malignant tissues.⁶ E6 is responsible for disrupting cell cycle regulation through p53 tumor suppressor ubiquitination, leading

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to p53 degradation.⁷ Degradation of tumor suppressors leads to an uncontrolled and constitutively functioning cell cycle.

Since cervical cancer is common after HPV infection, effective measures to curb infection are important in reducing the incidence of cervical cancer. The Papanicolaou test (or Pap smear) has proven to be effective in screening for cervical cancer, and prophylactic vaccines have been proven to prevent HPV infection by generating immune recognition of HPV.⁸

Even though HPV vaccines are non-infectious, they are able to generate a humoral immune response because they are derived from protein shells known as virus-like particles (VLP). These vaccines are made as a bivalent vaccine (Cervarix) to protect against the high-risk HPV genotypes 16 and 18, and sometimes as a quadrivalent vaccine (Gardasil), which protects against HPV 16 and 18, as well as lower-risk genotypes 6 and 11. Studies of both vaccines have shown 90% efficacy against HPV 16 and 18.⁸ However, since these vaccines are made to be primary prevention methods, they do not show efficacy in women who have HPV infection that has already progressed to CIN 2 or 3.⁹ Following the efficacy and success of the vaccines in curbing HPV infection, the Food and Drug Administration (FDA) approved the vaccination of females between 9 and 26 years old. A 64% decrease in HPV infection was reported six years after vaccine introduction, indicative of the vaccines' success.¹⁰

Despite the success of the HPV vaccines, increasing numbers of parents are declining the benefits of vaccination for their adolescent children and indirectly exposing them to a greater risk of cervical cancer. Some parents have stated that the vaccine comes with deleterious side effects such as pain, vomiting, dizziness, myalgia, diarrhea, gastroenteritis, headache, hypertension, and bronchospasm.^{8,11} In a survey, 16–55% of parents who declined HPV vaccination for their adolescent child cited vaccine safety and side effects as their reasons.⁸ Studies have also shown that numbers of parents who declined vaccination for the reasons of safety and side effects have quadrupled from 4.4% to 16.4% between the years 2014 and 2017.^{8,11} With these numbers climbing, it is necessary to examine methods that can improve vaccine uptake and accommodate parents and adolescents, which will cause a further decrease in the rate of HPV infection.^{8,11} Another survey conducted on mothers refusing vaccines for their adolescent children showed that 6% to 12% of parents were concerned about increased sexual behavior of their children after receiving the vaccination.¹²

Although HPV vaccines have been proven to reduce the incidence of cervical cancer, the success of the vaccine also depends on parents' approval of the vaccine for their children within the recommended ages.¹³ This paper aims to evaluate and elaborate on the possible effects of an educational intervention containing information about HPV infection and vaccination on parents' decision in allowing vaccination of their children against HPV infection, consequently impacting risk of future cervical cancer.

Parameters used to qualify the population of interest as high-risk included: perceptions, lifestyle choices, low socioeconomic status, lack of information, teenagers who are sexually active, minority status, and geographical locations. These factors predispose these populations to HPV infection and its sequelae. In this review, mention of either parents or adolescent children at high risk refers

to high-risk groups as a whole. These demographic groups are thus treated as one high-risk population for the purposes of this review.

Methods

Search Strategies

Databases including PubMed, Google Scholar, Science Direct, and Web of Science were searched for literature containing both medical and social science information relevant to the study in question. These studies consisted of surveys and case control studies. The following keywords and associated Medical Subject Heading (MeSH) terms were queried in PubMed: human papillomavirus vaccines, adverse effects, intervention studies, behavioral research, parental hesitancy, attitude to health, and health education. The operator “and” was used to help widen the search in cases where articles were few or lacking. The combination examples included such phrases like, “Human papillomavirus vaccines and adverse effects”, “Human papillomavirus vaccine and intervention studies”, “Human papillomavirus vaccine and behavioral research”, “Human papillomavirus vaccine and parental hesitancy”, and “Human papillomavirus vaccine and attitude to health and health education”. The key terms were also used independently (without combinations) to help narrow the search. The same keywords including those with the operator “and” were queried in Science Direct, Google Scholar, and Web of Science. The search was limited to literature published in English. Article abstracts published between January 1st, 2000 and December 31st, 2018 were screened for relevance. Articles were reviewed if they were free to access, provided full text, and had relevance to the evaluation of the role of educational intervention on HPV vaccine uptake. The protocol for this review has been registered with the PROSPERO registries of University of York in Britain.

Inclusion Criteria

Studies were included if they reported on any of the following: adverse reactions deterring further vaccination in a community; adolescent and parental knowledge about vaccines; educational interventions to improve parental knowledge; and receipt, or willingness or intention to receive the HPV vaccine.

Data Extraction

The following data were extracted from included studies: methods detailing educational intervention; study design; outcomes; assessment; participants; and results. The extracted data from all articles were then standardized by EM and KC. Independent data analyses were conducted by AF and OS, and conflicts reconciled through correspondence. EM and KC checked the completed analysis against the extracted data for inconsistencies and inaccuracies. Table 1 contains information extracted from included studies.

Data Analysis

In this study, results are reported in percentages, and comparison made among the different results. This comparison measures the effectiveness of the intervention used in each study. In select cases, relative risk (RR) with a 95% confidence interval (CI) is reported. The analysis includes pre- and post-intervention percentages as reported by the authors in their respective articles

for a quasi-experimental design study. Results from randomized controlled trials comparing vaccination intent between intervention and control groups were reported as percentages.

Although this review examines the effect of an educational intervention on HPV vaccine uptake, most of the studies conducted did not measure the rate of vaccination of participants pre- and post-intervention. Instead, most measured the intent of receiving the vaccine as an alternative. Therefore, the intent to receive HPV vaccines was considered a proxy for acquiring HPV vaccine for the purpose of this review. However, one article measured and reported HPV vaccine uptake (3 dose course), and another article measured the attitude towards accepting HPV vaccine. Research has shown that intention to vaccinate is associated with vaccine uptake.²⁹ This is based on the theory of planned behavior, which states that a person's intent predicts the person's behavior.²⁹ Hence the reports obtained with such information can be used in this review.

Critical Appraisal

The articles chosen for this review were evaluated for bias, suitability, and quality. To review the quality of the articles, a checklist from the Critical Appraisal Skills Programme (CASP) tool was used.²⁶ Apart from following the CASP checklist, it was important that the articles had reported the criteria for participant eligibility (such as excluding participants with prior HPV vaccination), included a no-treatment or standard-treatment control condition, and reported in detail on interventions used and outcomes measured to help answer the primary research question. Each study was checked for bias and was given a quality rating from low to good.

Results

Search Strategy

A database search yielded 410 articles related to the topic of discussion. Duplicate citations (n = 52) were identified and removed during the first step of data collection from the four databases. In the end and after the application of inclusion criteria, only a total of 11 papers were included in this review. Reasons for exclusion included: lack of focus on HPV infection and HPV vaccination, failure to assess the impact of education on HPV vaccines, studies that had no quantifiable outcomes and comparisons, and articles whose full text could not be accessed. Figure 1 below is a flowchart that summarizes the inclusion and exclusion of articles for this review.

Critical Appraisal

The overall risk of bias in the studies chosen for this review was assessed and then the studies were categorized as between moderate and good quality. This was due to the nature of the studies involved. Randomized controlled studies are usually of low risk for bias and that is why some of the studies used in this review were randomized controlled trials.²⁶ However, the studies evaluated here did not report whether participants or researchers were blinded. Many studies also did not include standard-treatment or no-treatment control groups. Although most studies included in this review did not report frequency of HPV vaccination receipt, intention and attitude toward receiving HPV vaccines was measured as a proxy.

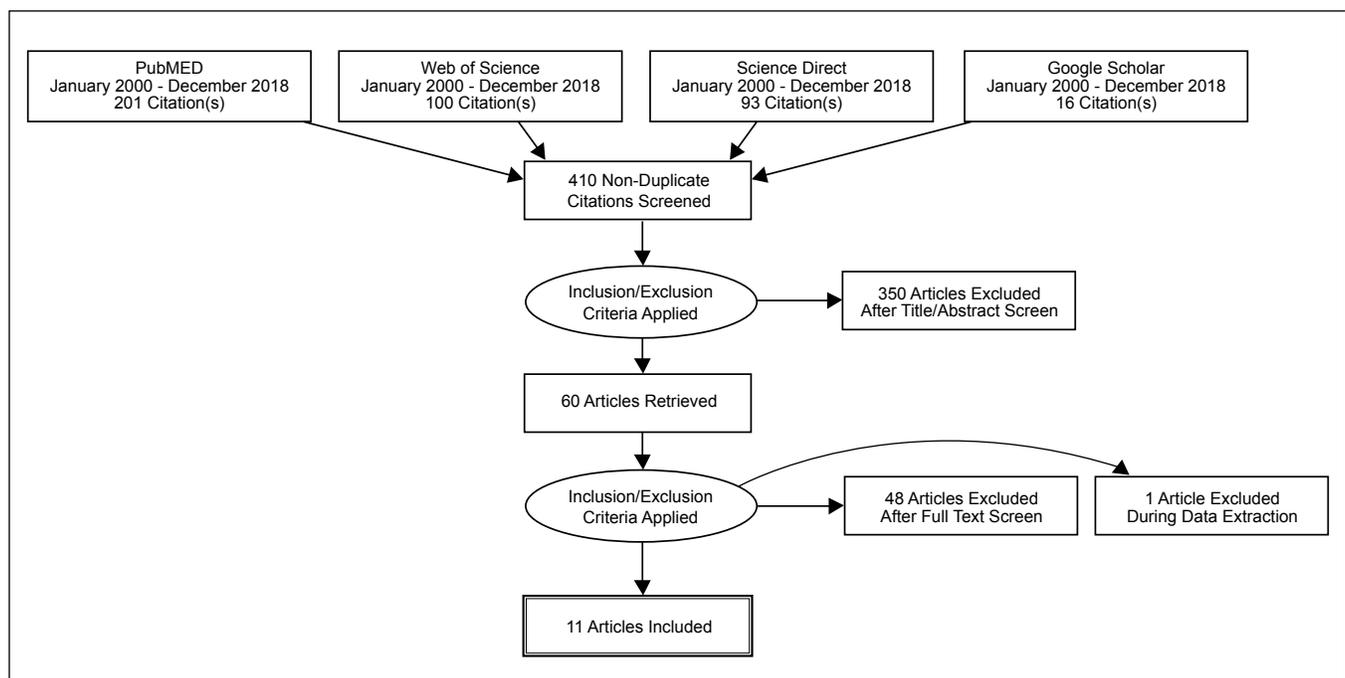


Figure 1. Flow chart of total articles included and excluded for this research

Parental Education

Parental education was important for this study since minors eligible for, and recommended to receive, HPV vaccination require parental consent to receive the vaccine. This review included 8 studies that investigated the effects of educational intervention on parents of minors eligible for the HPV vaccine. The studies included in this review were obtained from different countries, with 5 of them originating from the United States,^{14,16-19} 2 from China,^{20,22} and 1 from India.¹⁵ Of the 8 studies questioning the effectiveness of the educational intervention on parents, 6 were designed as a quasi-experiment in which comparisons were made between pre- and post-intervention parental intent to vaccinate their children.^{14-16,18,20} The remaining studies were designed as randomized controlled studies.^{17,19} Because of the way the studies in this review were designed, comparisons were only made immediately after educational intervention. Therefore, no follow-up assessments were carried beyond post-intervention for most studies.

The modalities of educational interventions for parents in the studies were of importance. Four of the studies introduced HPV educational fact sheets as the method of intervention. These contained information on HPV epidemiology, potential clinical sequelae of HPV infection, the connection between HPV and cervical cancer, and the HPV vaccine as a means of primary prevention, with some fact sheets more detailed than others.^{14,15,17,22} Of the studies employing a fact sheet intervention, 3 out of the 4 showed a 20% increase in the number of parents willing to vaccinate their children.^{14,15,22} One randomized controlled study used a fact sheet intervention, but did not completely report parental intent to vaccinate: only the post-intervention percentage of parents willing to vaccinate their children was reported as 43%, reportedly a statistically significant increase in intention to vaccinate their children compared to pre-intervention.¹⁷ These results indicate that introducing parents to fact sheets containing information about HPV infection and vaccine can affect their intent to vaccinate their children.

Apart from fact sheet interventions, other methods of educational intervention were utilized in other studies. One study involved an educational video about HPV infection and vaccination.¹⁶ Two studies involved a one-hour educational slideshow,^{18,20} while in another study, the researchers conducted their studies using a Spanish-language radio advertisement (radionovela) as an educational intervention.¹⁹ The educational video proved to be effective, with a reported increase in the intention to accept HPV vaccine. 76% of parents after watching the educational video declared their intention to vaccinate their children, compared to 47.1% pre-intervention, while in the control group, 71.2% intended to vaccinate their children post-intervention compared to the 30.8% pre-intervention. The Spanish-language radio advertisement was used as intervention to help inform Hispanic parents about HPV vaccination. It showed an increase in the parents' intention to vaccinate rise from 54% to 61%. Both of the studies that used the one-hour educational slideshow as an intervention showed increases in the parents' intention to vaccinate, with one showing an increase from 32.5% to 44.4%, while the other reported 58.9% post-intervention compared to 41.6% pre-intervention.

Adolescent and Young Adult Education

HPV vaccine is considered a primary preventive method used to reduce the incidence of HPV infection. The vaccine is said to have a maximum benefit at an early age before any sexual activity. This is a result of HPV being the most contracted sexual disease.² Therefore, the majority of individuals recommended for the vaccines require parental consent. However, some studies that evaluate the effect of educational intervention on HPV vaccine uptake were conducted using adolescents and young adults as their participants. Of the articles discovered, 3 that measured uptake were included into this review.^{21,23,24} These articles included participants with ages ranging between 18–26 years old. The participants were either in high school or university. All 3 studies involved were conducted in the United States.^{21,23,24} Two studies included both male and female participants,^{23,24} while the third only included females.²¹

Of the 3 studies, the educational interventions utilized were of different forms. One utilized a 13-minute educational video as the intervention.²¹ Another study utilized a 10-minute educational discussion about HPV epidemiology, potential clinical sequelae of HPV infection, the connection between HPV and cervical cancer, and the HPV vaccine.²³ The last study provided a theory-informed, evidence-guided photographic short story about HPV infection, epidemiology, and vaccination.²⁴

From these 3 studies, 2 were conducted as randomized controlled trials,^{21,23} while the third was a quasi-experimental design in which participant intention to receive the HPV vaccine was compared pre- and post-intervention.²⁴ One of the randomized controlled trials was conducted by Vanderpool et al. to measure actual HPV vaccination by randomizing participants into either a group exposed to a 13-minute video presentation about HPV, or a control group that received only standard care. The study compared the number of participants in the intervention group who completed a 3-dose HPV vaccination schedule compared to the control group. This indicates that the intervention had a positive effect on the number of vaccines administered.²¹ Unlike the other 2 studies, Vanderpool et al. followed up with the participants for 9 months after intervention using the medical record review.

The second randomized controlled trial recruited 131 participants aged 18–26 years. The study randomized participants into 2 groups, assessed and compared the results of participants' level of knowledge about HPV and its vaccine, and then surveyed participants to measure their intent post-intervention. The intervention used in this study was a 10-minute brief educational program comprised of an informative discussion aimed at answering their concerns and correcting any misconceptions about the vaccine. The result of the post-intervention survey indicated that 87% of the participants in the intervention group intended to vaccinate, compared to 67% of the participants in the control group.²³

The third study was designed as a quasi-experiment that used a theory-informed, evidence-guided photographic short story about HPV infection and vaccine. Results obtained from the study showed that 34% of participants had the intention to vaccinate post-intervention compared to 24% pre-intervention.²⁴ All three studies showed a significant difference between vaccination intent when comparing intervention and control groups.

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Table 1

Author/Year	Study design	Intervention (I)	Control (C)	Outcomes (O)	Assessment (A)	Total Participants (n)	Participants willing to allow vaccination pre-intervention (%)	Participants willing to allow vaccination post-intervention (%)	Results
Davis K, et al./2004. ¹⁴	Comparison survey. Survey of attitude and willingness before and after intervention.	Group introduced to HPV educational fact sheet.	Same group prior to intervention.	Parents' acceptance of the HPV vaccine for their adolescent.	Assessment of pre- and post- intervention survey item.	506	9	37	A change in acceptance to vaccination was reported as +20% by the authors.
Basu P, and Mittal S./2007. ¹⁵	Comparison survey. Survey of attitude and willingness before and after intervention.	Group introduced to fact sheet about cervical cancer and HPV vaccine followed by a trained social worker for clarity.	Same group prior to intervention.	Parents' acceptance of the HPV vaccine for their adolescent.	Assessment of pre- and post-intervention survey item.	522	27 (w) and 24 (m).	74 (m and w).	An increase in the acceptance of vaccination was reported by the authors.
Suarez Mora A, et al./2018. ¹⁶	Comparison survey. Survey of attitude and willingness before and after intervention.	Group introduced to educational video about HPV.	Same group prior to intervention.	Parents' acceptance of the HPV vaccine for their adolescent.	Assessment of pre- and post-intervention survey item.	104	47.1 (for participating parents themselves). 30.8 (for children and grandchildren).	76 (for participating parents themselves). 71.2 (for children and grandchildren).	A knowledge score improvement was reported after educational intervention (mean = 14.1, $p < .0001$) and remained elevated in the 44 participants that completed long-term follow-up (mean = 13.5, $p < .0001$).
Kennedy A, et al./2011. ¹⁷	Randomized controlled trial.	Educational flyer adapted from CDC.	No informational flyer.	Parents' intention to vaccinate their adolescent when recommended by physician.	Assessment of survey item mailed to parents.	411	Unavailable.	43	Parents in intervention group showed statistically significant increase in intention to vaccinate their children.
Spleen AM, et al./2012. ¹⁸	Survey of attitude and willingness before and after intervention.	Group introduced to one-hour educational slide presentation and health educators about HPV infection, disease, and vaccine.	Same group prior to intervention.	Intention of HPV vaccine for daughters.	Assessment of survey item before and after intervention.	38	32.5	44.4	Authors reported that within 1 month parents intent to vaccinate daughters increased ($p = 0.002$).
Kepka D, et al./2011. ¹⁹	Randomized controlled trial.	Group introduced to a 5-minute Spanish radionovela a about cervical cancer, HPV infection, HPV vaccine.	Prostate cancer radio announcement.	The likeliness of participant daughter receiving vaccine in the next 12 months.	A post - intervention single survey accessed after intervention.	88	54	61	Authors reported an increase in the likeliness of daughters receiving HPV vaccine after intervention.
Kwan T.T, et al./2011. ²⁰	Survey of attitude and willingness before and after intervention.	Group introduced to one-hour educational slide presentation followed by question and answer session with gynecologist and oncologist.	Same group prior to intervention.	Likelihood of HPV vaccine after intervention.	Assessment of survey item before and after intervention.	943	41.6	58.9	Authors reported 11.3% increase in number of girls who indicated an intention to accept the vaccine post intervention.
Vanderpool RC, et al./2013. ²¹	Randomized controlled trial.	Group introduced to an educational video about HPV and vaccination, coupled with CDC HPV vaccine information sheet and a free t-shirt.	CDC HPV vaccine fact sheet and a free t-shirt.	3 dose series completion of HPV vaccine.	Assessing medical record up to 9 months after first dose of HPV vaccine.	344	35.7	43.3	43.3% of intervention group and 31.9% of control group completed the 3 dose series ($p = 0.03$).
Symphorosa Shing Chee Chan, et al./2007. ²²	Comparison survey. Survey of attitude and willingness before and after intervention.	Group introduced to one-page fact sheet containing the effectiveness of the HPV vaccine on reducing HPV infection.	Same group prior to intervention	Parents' acceptance of the HPV vaccine for their adolescent.	Assessment of pre- and post-intervention survey item.	170	32	52	A change in acceptance of vaccination was reported as +20% by the authors.
Kester L.M, et al./2014. ²³	Randomized controlled trial.	Group introduced to a 10-minute educational information session about HPV and vaccination.	No information presented to group.	Likelihood of HPV vaccine after intervention.	Surveys to assess HPV knowledge, vaccination history, and vaccination intent (for unvaccinated participants).	131	67	86	The authors reported that the intervention group had higher HPV vaccination intent (86%) compared to the control group (67%) (OR = 3.09; 95% CI = 1.02–9.3).
Chan A, et al./2015. ²⁴	Comparison survey. Survey of attitude and willingness before and after intervention.	Group introduced to a theory-informed, evidence-guided photographic short story about HPV infection and vaccine.	No information presented to group	Intention to vaccinate, intention to encourage social networks to vaccinate, and attitude towards vaccination	Fisher's exact test comparing intervention and control groups	41	24	34	Authors reported an intent to vaccinate (+18.4%, $p = 0.06$), intent to encourage others to vaccinate (+10.5%, $p = 0.14$).

w = women; m = men

DISCUSSION

Eleven studies involving different educational interventions and their impact on HPV vaccination were involved in this review. These studies involved the assessment of educational interventions for parents of minors of recommended ages for HPV vaccination. Intent to vaccinate was also measured in adolescent and young adults. Of the 11 studies, 8 reported parental interventions, and measured their intent to vaccinate their children, while 3 studies targeted adolescents and young adults. Of the 11 studies involved in this review, only 1 was designed to actually measure the rate of HPV vaccination in a 3 dose course. While it was difficult to obtain studies that assessed HPV vaccination, other studies were obtained that were designed to measure the intention of HPV vaccination. These reports were accepted due to an understanding that a receptive attitude towards HPV vaccine can be regarded as a precursor to vaccination. Intention to vaccinate is being treated as equivalent to actual vaccination for the purposes of this systematic review.

Two selection groups were considered in this review. One group consisted of parents of minors of recommended age, and the other group of adolescent and young adults. Because both groups were introduced to educational interventions, it was necessary to compare the effectiveness between these groups. For proper comparison, the designs used in the study were required to be similar. Results obtained from randomized controlled trials involving groups of adolescents and young adults were used as a comparison to the randomized controlled trials involving the parents.

Results from the examined studies indicated that the parents in both randomized controlled studies showed similar trends. The parents that were exposed to the educational intervention had a percentage increase in their intent to vaccinate their children compared to parents that were not exposed. These results were also similar to that of the groups of adolescent and young adults. The increase reported in these studies may be linked to the ability of the population of interest to understand and appreciate the importance of HPV vaccination post-intervention. In as much as these studies reported an increase in the intention to vaccinate for groups of parents and of adolescent and young adults, and as stated that intent to vaccinate is associated with vaccine uptake, it is still important to note that confounding factors may be responsible for participants' changes in attitude and a follow-up is required in some instances to ensure that the intention accurately translates to action and that educational intervention alone was responsible for the said phenomenon.

Communication is a major component of an educational intervention. For maximum effect, it is paramount that the message delivered is well understood by the recipients. Therefore, for communication to be more efficient, the comprehension abilities of the intended audience should be determined beforehand. The knowledge of the literacy level of the intended audience will determine the type of intervention to be used and will assist in the creation and delivery of a suitable intervention.¹⁶

Aside from the information delivered by an educational intervention, the intervention modality can affect the outcome. Modalities often used in educational interventions include fact sheets, presentations, and videos. The studies included in this review depict some of the various intervention modalities. Table 1

shows the modality of educational intervention used by each study included in this review.

The importance and effectiveness of intervention modality have been questioned by different studies. One study compared the effectiveness of a video educational intervention to that of a written workbook in a hospital setting.³⁰ Having stated that the strategy used in the delivery of an educational intervention is important, it was necessary to determine any difference intervention modality might have caused in the studies included in this review. For the purpose of the comparison, the modalities of the educational intervention were grouped into two categories: studies with printed materials and studies with video material. The printed material category included any study with fact sheets, slides and presentation, or short stories.^{14,15,17,18,20,22,24} The video material category included any study that showed an educational video to participants.²¹ For simplicity, the 2 studies that used Spanish radio and group discussion were not included in any of the categories as they did not fit the criteria for both categories.^{19,23}

Studies that focused on parental education were the first to be compared. From the 8 studies included in this review, only 1 can be categorized as video material,¹⁶ and 6 categorized as printed material. Only studies designed as a quasi-experiment were used for comparison. Results obtained from the group with video material reported an increase in percentage of parents' intent to vaccinate their children from 30.8% to 71.2%. Groups with printed material also reported an increase in parents' intent to vaccinate their children. With the exception of one study,¹⁵ groups with printed material only showed a 20% increase in parents' intent on average.^{14,18,20,23} The exception in the groups with printed material showed an increase in mothers' intent from 30.8% to 74%. Although this is higher than the report from the group with video material, it can be argued that the difference can be attributed to the presence of a trained social worker at the end of the study. The trained social worker provided clarity to the participants in a question and answer period after the fact sheets were read. This report differs from a similar study that suggested that both video and printed materials are equally effective.³¹

The effectiveness of the modality of educational intervention could not be compared in groups with adolescent and young adults. Only 3 studies were included in this group.^{21,23,24} Of the 3, only 2 could be categorized as either video material or printed material. However, a proper comparison could not be made due to both studies being designed differently. One was a randomized controlled trial, and the other a quasi-experiment.

At present, HPV infection and cervical cancer are associated with lower socioeconomic status. Areas with poorer populations and lower educational backgrounds have an increased rate of HPV infection and higher prevalence of cervical cancer.²⁷ Only 2 of the 11 studies involved in this review focused on socioeconomic status.^{19,23} Although the majority of the studies were not focused on socioeconomic status, results obtained were similar to those obtained in the other studies.

Studies in languages other than English were excluded from this review. However, since it is understood that HPV infection and cervical cancer are prevalent in areas with socioeconomically disadvantaged individuals, this can be a limitation to our review. Ethnic minority groups lack access to many services including education and healthcare.³² Because of this they have been revealed

to be skeptical and less receptive to vaccination.²⁸ This could be due to a difference in belief and culture. More research is needed to better understand and formulate interventions that can improve dialogue and increase acceptance among groups that are different from those of the Western world. In addition, the use of only free articles limits access to a large inventory of information that could have strengthened the argument in favor of the interventions described in this review.

A majority of the parents referred to in this study were those from low socioeconomic standing. “High-risk” in the context of this paper refers to the disadvantaged groups who, by a set of unique circumstances, are predisposed to HPV infection. According to Kahn, Lan & Kahn, economics, cultural beliefs, limited access to healthcare facilities, behavioral health practices, and illiteracy are some of the factors that have influenced the lagging trends of HPV vaccination among high risk populations leading to high prevalence of HPV in these groups.³²

Conclusion

HPV vaccine acceptance has been associated with individual knowledge about HPV infection and HPV vaccines. Exposure to an educational intervention is important, as it will further increase knowledge in society.²⁸ This review provides an important link between various educational interventions and vaccine acceptance. A consensus was seen with roughly every study indicating an increase in intent to accept vaccination. However, to further increase the rate of HPV vaccination, future research should be undertaken to understand better methods that can improve dialogue and acceptance among groups that are different ethnically and culturally from those of the Western world.

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