Associations between risk-perception, self-efficacy and vaccine response-efficacy and parent/guardian decision-making regarding adolescent HPV vaccination

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ABSTRACT

Objectives: To evaluate associations of risk perception, self-efficacy and response-efficacy with HPV vaccination decisions among parents/guardians of adolescents.

Method: A cross-sectional survey of parents/guardians of adolescents was conducted at the Minnesota State Fair. Risk perception was measured by participant rankings of HPV infection and vaccine risks against diseases/side-effects for which numerical risks were provided. Response efficacy was measured as perceived ability of the vaccine to prevent HPV infection, and self-efficacy was measured as the perceived ability to prevent infection without vaccination (scale 0–100). Chi-squared and Fisher’s exact tests compared risk perception, self-efficacy and response-efficacy of vaccinators to non-vaccinators.

Results: Of 405 eligible participants, 355 completed vaccination questions; 304 (86%) were vaccinators and 51 (14%) were non-vaccinators. Non-vaccinators had lower risk-perception of HPV-related cancers (p < 0.05) and higher risk-perception of vaccine-related side-effects (p < 0.05). Self-efficacy was higher (64 ± 24 vs. 30 ± 29; p < 0.0001) and perceived HPV vaccine response efficacy was lower (52 ± 31 vs. 83 ± 19; p < 0.0001) among non-vaccinators compared to vaccinators.

Conclusions: Lower HPV-related cancer risk perception and higher self-efficacy were associated with the decision not to vaccinate. HPV vaccination decisions were similar to meningococcal vaccination decisions, suggesting reluctance to vaccinate in general rather than resistance to the HPV vaccine specifically drove the results.

1. Introduction

A highly-effective vaccine against human papillomavirus (HPV) has been available since 2006, yet current vaccination coverage is only 68%, and completion rates (2 doses for individuals <15 years of age, 3 doses for individuals 15+ years of age) for eligible individuals is only 51% in the United States. In contrast, meningococcal vaccination coverage is 87% [1]. While a lag between a new vaccine recommendation and uptake is expected, the HPV vaccine is especially controversial. The vaccine against a primarily sexually-transmitted virus is recommended for adolescents 11–12 years of age, with a goal of completing the vaccine series prior to the initiation of sexual activity. Additionally, despite the fact that 79 million Americans are currently infected with HPV [2], many people believe they are not at risk for the virus. Lastly, supported by the larger anti-vaccination movement, there is significant press coverage regarding adverse effects of the HPV vaccine, despite the fact that severe adverse events such as chronic fatigue syndrome, premature ovarian failure and death have not been proven in clinical trials or post-marketing surveillance [3]. Multiple studies assessing the safety of the HPV vaccine have shown adverse effects are short-term and mild, with injection site reactions comprising pain, redness and swelling most commonly reported; serious adverse effects were rare and similar between those receiving the vaccine or placebo [4]. In an effort to counteract the negative sentiment about HPV vaccination, multiple health organizations, including the Centers for Disease Control and Prevention, encourage healthcare providers to strongly recommend the vaccine [5], and have also directly appealed to parents/guardians through traditional (e.g. television, radio, magazine ads) and online media [6,7].

The efficacy of healthcare promotions depends not only on the effectiveness of the advertising, but also an individual’s personal
perceptions and beliefs [8]. Risk perception is the subjective assessment of characteristics and severity of a risk. For example, some would perceive a potentially avoidable 5% risk of an HPV infection causing cervical cancer as high, whereas others perceive this risk level as low enough that intervention is not indicated. Self-efficacy is one’s belief in their ability to succeed in a specific situation or accomplish a task, for example one’s belief that s/he can do something to prevent HPV infection or its sequelae. The parallel to this is response-efficacy which is one’s belief that a particular action will avoid the threat, or in this setting the belief that HPV vaccination will prevent HPV infection and subsequent cancer or genital warts.

The primary objective of this study was to evaluate the association between risk-perception, self-efficacy and response-efficacy with parental/guardian decision-making regarding adolescent HPV vaccination. We hypothesized that low HPV risk-perception and high perceived self-efficacy to prevent HPV infection or its sequelae would be associated with decision not to vaccinate. In contrast, we hypothesized that high vaccine response efficacy and low perceived risk of vaccine-related side-effects would be associated with the decision to vaccinate against HPV. The secondary objective of this study was to compare self-efficacy and response-efficacy for prevention of HPV infection with prevention of meningococcal infection.

2. Methods

2.1. Data

The study was approved by the University of Minnesota’s Institutional Review Board (STUDY00003413). The study was a cross-sectional survey of parents and guardians of HPV vaccine age-eligible adolescents 9–17 years of age who attended the Minnesota State Fair. The Minnesota State Fair attracts over two-million people annually from Minnesota and the surrounding states, with attendee demographics generally representative of the state of Minnesota. Participants were recruited at the University of Minnesota Driven to Discover building, a site dedicated to University of Minnesota Driven to Discover building, a site dedicated to research study recruitment for University of Minnesota faculty and associates. Participants were recruited over three 7-h shifts over 1 week in August 2018. State fair attendees were eligible to participate in the study if they self-identified as the parent or guardian of an adolescent 9–17 years of age, were able to read and write in English, and were able to provide consent. Parents/guardians of more than one adolescent within the target age range were asked to respond to vaccination questions as they pertained to the oldest adolescent within the target age range (e.g. participants with children 8, 11, 15 and 21 years of age answered vaccination questions as they pertained to the 15 year-old). The survey was administered online via electronic tablet, and the data were collected and managed using Research Electronic Data Capture (REDCap) [9]. All data were collected anonymously. Participants received a University of Minnesota drawstring backpack on completion of the survey.

2.2. Measures

The survey included 68 questions covering the following topics: 1) self-efficacy: confidence in one’s ability to prevent HPV or meningitis infection without vaccination; confidence in one’s ability to research the risks/benefits of HPV vaccination; 2) response-efficacy: confidence in the vaccine’s ability to prevent HPV or meningococcal infection; confidence in ability to vaccinate without severe side-effects; 3) risk-perception: perceived risks of HPV-related cancers, genital warts, and vaccine-related side-effects; 4) parent/guardian-reported adolescent information: age, biologic sex, gender, sexual history, health insurance status, HPV vaccination status; 5) participant demographics: age, sex, race. Self-efficacy and response-efficacy were rated on a scale of 0 (not confident) to 100 (very confident) using a slide-rule (Fig. 1A). Risk-perception was measured by ranking the HPV or vaccine-related risk as “higher” or “lower” than the given risk for which a numerical measure (incidence or prevalence) was provided (Fig. 1B). A measure of relative risk perception was used as it reduced the ambiguity inherent to interpersonal variability in interpretation of terms such as “high-risk” or “low-risk,” and allowed comparison of over-estimation or under-estimation of risk by HPV vaccination status.

2.3. Survey development

The study was conducted by the study investigators. The phrasing and structure of the self-efficacy questions were developed based on Albert Bandura’s “Guide for constructing self-efficacy scales” [10]. An initial survey was tested among a panel of undergraduate and medical students for content and clarity. The revised survey was then pilot tested utilizing a convenience sample of adolescent parents/guardians, and the survey was revised a second time prior to conducting the study. No formal validation testing was performed.

2.4. Analyses

Survey responses were summarized using descriptive statistics. Parents/guardians who had vaccinated or planned to vaccinate their adolescent (“vaccinators”) were compared to those who did not plan to vaccinate their adolescent (“non-vaccinators”) by demographic characteristics, self-efficacy, response-efficacy and risk-perception using Chi-squared tests and Fisher’s exact tests as appropriate for categorical variables, and using two-sided two-sample t-tests assuming unequal variance for continuous variables. Means ± standard deviations (SD) and frequencies and percentages are reported unless otherwise noted. Statistical analyses were performed using SAS 9.4 (Cary, NC), and p-values less than 0.05 were considered statistically significant.

3. Results

3.1. Participants

A total of 424 state fair attendees initiated the survey, and 405 (96%) eligible participants completed the survey. Demographics of the parents/guardians and their adolescents are detailed in Table 1. A majority of parents/guardians were 41–50 years (55%), female (71%), and identified as White race (83%). Just over half of participants (58%) answered questions in regard to a female child. Most parents/guardians thought their adolescent was heterosexual (89%) and only 6% thought their adolescent was sexually active. Most adolescents (86%) were covered by private insurance.

3.2. HPV vaccination history

A majority of participants (61%) reported their adolescent had at least initiated the HPV vaccine series, and an additional 15% planned to vaccinate their adolescent (Table 1). Almost half (44%) vaccinated or planned to vaccinate their adolescent at the Advisory Committee on Immunization Practices-recommended age of 11–12 years of age, with 16% vaccinating at the early but acceptable age of 9–10 years, and an additional 28% vaccinating or planning to vaccinate at age 13–14 years. There was no difference in vaccination rates by adolescent sex (57% of vaccinated individuals were female vs. 63% of unvaccinated were female; p = 0.43) or parental/guardian perception of their adolescent’s sexual activity (p = 0.46; Table 2). While most participants reported a healthcare provider had recommended the HPV vaccine, vaccinators were more likely to report a healthcare provider recommendation (83% vs. 69%, p = 0.01).

3.3. Self-efficacy, response efficacy

Among the entire study population, participants were moderately
Fig. 1. Examples of question format for self-efficacy and vaccine response efficacy (Fig. 1A) and risk-perception questions (Fig. 1B).
confident they could prevent HPV infection with vaccination (78 ± 23) and without severe side-effects (67 ± 30); this was similar to meningococcal prevention (78 ± 22). Self-efficacy was low and similar for HPV (37 ± 31) and meningococcal infection (36 ± 31) prevention.

The mean vaccine response-efficacy was higher among vaccinators (83 ± 19 vs. 52 ± 31; p < 0.0001; Table 3), and was similar for both the HPV and meningococcal vaccines. Similarly, the mean confidence score for ability to vaccinate against HPV without severe side-effects was significantly higher among vaccinators (75 ± 26 vs. 29 ± 30; p < 0.0001). In contrast, the mean self-efficacy was higher for non-vaccinators compared to vaccinators (64 ± 24 vs. 30 ± 29; p < 0.0001), and again was similar for both HPV and meningococcal infection prevention.

4. Discussion

4.1. Discussion and review of the literature

The results from this cross-sectional study supported our hypotheses...
and previously published literature showing that parents/guardians who do not vaccinate their adolescents against HPV perceived lower HPV-related cancer risk and higher HPV vaccine side-effects risks than those who vaccinated or planned to vaccinate their adolescent [11]. What is less often studied is the role of self-efficacy in HPV vaccination decision-making. The results of our study show that non-vaccinators have a higher perceived ability to prevent HPV infection without vaccination. Prior to introduction of the HPV vaccine, cervical cancer mortality decreased by 70% with the implementation of routine cervical screening and detection and treatment of precancerous lesions or early-stage cancers which are amenable to cure [12,13]. While secondary prevention for cervical cancer is effective and does improve one’s ability to prevent cervical cancer in the absence of HPV vaccination, the procedures required to excise or treat the precancerous lesions are associated with a higher risk of morbidity than HPV vaccination. Furthermore, there are currently no secondary prevention methods for the other HPV-associated malignancies. Anti-HPV vaccine social media campaigns have exploited the fact that the majority of cervical, oropharyngeal, penile, vulvar and vaginal cancers diagnosed annually.

5. Conclusions

The results of our study show that parental/guardian HPV vaccination decisions for adolescents often parallel decisions regarding other adolescent vaccines, and that a strong recommendation by a healthcare provider is a key motivator for vaccination. Beyond the healthcare provider recommendation, the decision to vaccinate is influenced by disease and vaccine risk perception, but also self-efficacy to prevent HPV infection without vaccination. In addition to combating misinformation about vaccine risks, education efforts need to emphasize the difficulty in preventing HPV infection and its associated malignancies without vaccination, especially malignancies for which secondary prevention options do not exist.

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CRediT authorship contribution statement

Alicia Myhre: Conceptualization, Methodology, Investigation, Data curation, Writing - original draft, Writing - review & editing.
Visualization. **Tiaj Xiong:** Conceptualization, Methodology, Software, Investigation, Writing - review & editing. **Rachel I. Vogel:** Conceptualization, Methodology, Validation, Formal analysis, Data curation, Writing - review & editing. **Deanna Teoh:** Conceptualization, Methodology, Investigation, Data curation, Writing - original draft, Writing - review & editing, Visualization, Supervision, Funding acquisition.

**Declaration of competing interest**

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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**Appendix A. Supplementary data**

Supplementary data to this article can be found online at https://doi.org/10.1016/j.pvr.2020.100204.

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