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Correlates of HPV knowledge among low-income, minority mothers with a child 9 – 17 years of age

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Abstract

Study Objective—To assess the level of HPV knowledge among low income, minority mothers with a child between the ages of 9 – 17 years.

Design—Women who sought care at a university-based clinic and had at least one child aged 9 to 17 years were approached. A total of 638 mothers were recruited. Only those who had heard of HPV were included in the correlation analyses (n = 468).

Main Outcome Measures—HPV knowledge was assessed utilizing a self-administered questionnaire consisting of 20 questions.

Results—There were differences between those who had heard of HPV and those who had not. More of those who had not heard of HPV were Hispanic (63%), low-income (89%), and did not graduate high school (59%). Of those who had heard of HPV, the majority did not answer 50% of questions correctly. Few knew the vaccine could prevent genital warts (19.7%). Factors independently associated with HPV knowledge included age, personal history of HPV, cervical dysplasia or cervical cancer, acquiring knowledge from ≥2 sources, having known someone with HPV or cervical cancer, having seen a brochure on the vaccine, and having seen an advertisement for the vaccine.

Conclusions—Knowledge regarding HPV is low among low-income women with children in the target age range for HPV vaccination. Increased awareness should focus on genital warts and other cancers, since this population has virtually no knowledge of other health outcomes related to HPV infection. Educational programs tailored to this population need to be developed to increase vaccination.

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Keywords

HPV; human papillomavirus; HPV vaccine; knowledge; cross-sectional; minority

Introduction

Human papillomavirus (HPV) has been recognized as a necessary cause of cervical cancer for well over a decade.[1] Several types of cancers including anal, oropharyngeal, penile, vaginal, and vulvar also have been linked to this virus.[2] In 2006, a quadrivalent vaccine was approved by the Food and Drug Administration to prevent 2 types of HPV associated with malignant changes (16, 18) as well as 2 types associated with genital warts (6, 11) (HPV4; Gardasil; Merck & Co, Inc., Whitehouse Station, NJ).[3] Shortly after its approval, the Advisory Committee on Immunization Practices (ACIP) and the American Academy of Pediatrics (AAP) stated that they recommended routine vaccination of 11–12 year old female children, with "catch up" vaccinations for those up to 26 years of age previously unvaccinated. In 2009, ACIP extended their statement to include the use of the quadrivalent vaccine in males but fell short of recommending it.[4] However, in 2011, the recommendation was expanded to include males.[5]

Since its approval, uptake of the HPV vaccine in the United States has been lower than expected and far less than that of other vaccines recommended during adolescence. For example, only 53% of female children aged 13 to 17 years old had received even 1 dose of the HPV vaccine by 2011 compared to 71% for meningococcal and 78% for the tetanus, diphtheria, acellular pertussis vaccine (Tdap). HPV vaccination rates are especially low among males with only about 8% receiving it by 2011.[6] Among both genders, children who receive the first dose often fail to receive the remainder of the series and thus are not completely protected.[7, 8] National estimates for completion of the series in adolescents who have had ≥ 1 dose range from 21% to 71% in adolescent girls[6, 7, 9] and from 20% to 28% in adolescent boys.[6, 8]

One reason for the low uptake and completion rates in the U.S. is a lack of knowledge about HPV and the HPV vaccine among mothers of children in the eligible age range.[10–13] In fact, parental awareness of the HPV vaccine peaked around the time of FDA approval and has since diminished.[14] Thus, additional educational programs need to be developed. To determine how to best accomplish this, however, data are needed on the current level of understanding about HPV vaccine among different populations residing in the US. A few studies have shown that HPV knowledge is lower among caregivers with lower income levels, less education,[13, 15] and from minority backgrounds.[13, 16, 17] However, studies on this topic have been limited due to a lack of inclusion of an adequate number of low-income minority mothers with HPV vaccine-eligible children. This group is critical as their children have an increased risk of developing HPV-related diseases.[18] Furthermore, studies have seldom included caregivers of boys and have neglected to ask detailed questions regarding specific knowledge on HPV.

The objective of this study was to fill this gap in the literature by more thoroughly addressing the level of HPV knowledge among low income, minority mothers with a male

or female child between the ages of 9 – 17 years. We also examined demographic and behavioral factors associated with higher knowledge of HPV and HPV vaccination.

Materials and Methods

Women who sought care between September 2011 and September 2012 at one of three Regional Maternal Child Health Program clinics at the University of Texas Medical Branch were approached for participation in this study. These clinics serve low-income women, of which 80% have an annual income below US$30,000/y while the low-income limit for the Houston area was ≤ $42,400 based on a 2-person household according to the U.S. Department of Housing and Urban Development[19].

For inclusion into the study, women had to have at least one child between the ages of 9 and 17 years. In total, 650 women met the eligibility criteria and were asked to participate. Of those, only 12 declined to participate (1.8%). The questionnaire was self-administered and available in either English or Spanish. Patients were paid $5.00 for their time and participation. Our initial dataset consisted of 638 mothers with at least one child between the ages of 9 and 17 years old. Of these women, 468 (73.4%) reported that they had heard of HPV or human papillomavirus. While we present demographics for our entire sample, we limited our analysis to only those women who answered, “yes”, to the question, “Have you ever heard of HPV (human papillomavirus)?”

The questionnaire asked about demographic information such as age, race, ethnicity, acculturation, household income, education, and marital status. It also included questions on sexual history, health behaviors (drinking, smoking, exercise, and gynecological exams), contraception, and disease history.

Knowledge of HPV and Gardasil was assessed using a series of 15 true/false questions and 5 Likert-scale questions. Since there was not a high degree of variability in the Likert-scale questions, we dichotomized these questions into true/false with “strongly disagree”, “disagree”, “neutral”, and “don’t know” equal to “false” and “agree” and “strongly agree” equal to “true”. Questions on HPV included how the virus is spread, what conditions result from HPV infection, and how HPV can be prevented. We generated HPV knowledge scores, our outcome of interest, by awarding participants one point for each correct answer. Therefore, the maximum score that could be achieved was 20 points.

All statistical analyses were conducted using Stata 12.1 (College Station, Texas). We tested the internal reliability of questions used to obtain our knowledge score by calculating Kuder-Richardson Formula 20 (KR20), which was found to be 0.85. Descriptive statistics were calculated. We further examined the independent correlation between the continuous outcome variable, HPV knowledge score, and sociodemographic covariates, behavioral covariates, and HPV-related covariates using Pearson Product Moment Correlation coefficients for all continuous covariates and Point-Biserial correlation coefficients for dichotomous covariates. Hierarchical multivariate regression was used to build models. Any covariate that had a significant correlation coefficient at $p \leq 0.05$ was entered into the model in a 3-step process. Model 1 included only significant demographic covariates. Model 2

contained only significant behavioral characteristics and was added to Model 1. Finally, Model 3 contained only significant HPV-related characteristics and was added to Models 1 and 2. The R^2 was reported for each step of the model building process.

Results

The mean number of adults living in the household was 2.0 (SD: + 0.9) for the entire sample (n = 638). The mean age of those who had heard of HPV was 35.7 years (SD: ± 6.8) compared to 36.8 (SD: + 7.8) for those who had never heard of HPV. A large percentage of both groups were low income; however a greater majority of those who had never heard of HPV reported earning < $30,000 (89.4% versus 81.8%), were Hispanic (62.9% versus 51.1%), were not born in the U.S. (52.4% versus 44.2%), did not graduate high school (59.4% versus 42.7%), and had no health insurance (52.9% versus 50.6%).

Results were similar for both groups on current smoking prevalence, attending religious services weekly, and being married or cohabitating. In addition, almost half of all the women reported using no form of birth control at their last sexual intercourse. However, those who had never heard of HPV were less likely to report being current drinkers (25.9% versus 39.7%), use the Internet one or more hours every day (42.9% versus 58.8%), having their first sexual intercourse at age 14 or younger (12.4% versus 18.0%), or report having had 5 or more lifetime sex partners (27.7% versus 36.7%). Only 61.2% of those who had never heard of HPV reported having at least one Pap test in the past 2 years compared to 81.7% of those who had heard of HPV (Table 1).

Among those who had heard of HPV, approximately 35% reported having been diagnosed with HPV, cervical dysplasia, or cervical cancer and 46% knew someone who had been diagnosed with HPV or cervical cancer. Seventy percent reported that they had seen an advertisement for Gardasil on television or in a magazine, and almost 50% had seen a brochure for Gardasil. In addition, 20% of participants had received information about HPV from two or more sources. However, a minority reported that a health care provider had ever recommended the vaccine (28%), and few (20%) had family or friends with a child vaccinated against HPV.

The mean HPV knowledge score among those who had heard of HPV was 9.1 (SD: ± 4.5; range: 0 – 19), indicating that the majority did not answer 50% of the questions correctly. Table 2 lists the 20 knowledge items we assessed with the frequency of correct responses for each item. The items answered correctly by most participants were, “A person can be infected with HPV and not know it” (77.1%), “HPV infection can be prevented” (76.9%), and “Contracting certain types of HPV can increase your chance of developing cervical cancer” (70.2%). Knowledge about the fact that Gardasil can prevent genital warts (19.7%) as well as some types of oral cancer (19.0%) was very poor. In addition, more than 90% did not know that HPV can be transmitted via skin contact, while 86.5% believed that HPV could be cured with the right treatment.

Several factors were independently correlated with HPV knowledge (Table 3). Aside from education, household income, and internet use, HPV-related covariates showed the strongest

correlations with HPV knowledge. Mothers who had seen a brochure for the vaccine, an advertisement on TV or in a magazine, or had known someone with HPV or cervical cancer had the strongest correlations to HPV knowledge, and these findings were highly significant. We did not find a significant correlation between mothers having received ≥1 dose of vaccine and HPV knowledge; however, there were only 15 mothers who had received any doses of the vaccine (data not shown).

Several independent correlations remained significant upon entering them into a hierarchical multivariate regression model. In Model 1, we retained age, college attendance, and income over $30,000. All remained significant in this model and the R^2 was 0.09. Upon the addition of Model 2, we found that all the demographic covariates remained significant, and the covariate on exercise was also found to be significant ($\beta = 0.84$; $p \leq 0.05$). The R^2 increased to 0.11. Finally, adding the HPV-related covariates in Model 3 resulted in only age remaining significant ($\beta = 0.07$; $p \leq 0.01$) from Model 1, while no behavioral covariates remained significant. In addition, those with a personal history of HPV, cervical dysplasia, or cervical cancer had higher knowledge scores ($\beta = 0.86$; $p \leq 0.05$) as did those who acquired HPV knowledge from two or more sources ($\beta = 1.07$; $p \leq 0.01$), and having known someone with HPV or cervical cancer ($\beta = 1.07$; $p \leq 0.05$). Having seen a brochure for the vaccine still had the greatest effect on mean knowledge scores, raising them approximately 2.4 points, and this result was highly significant ($p \leq 0.01$). Having seen an advertisement on TV or in a magazine for the vaccine also had a significant effect on scores, raising them almost 1.5 points, and this result was also highly significant ($p \leq 0.01$). Adding the HPV-related covariates resulted in a 0.17 increase in the R^2 from Model 2. Upon the addition of Model 3, we found that 28% of the variance could be explained by the covariates in our final model. The results of the hierarchical multivariate regression analysis are presented in Table 4.

Discussion

In our population, only 73% of mothers with a child eligible for the vaccine had heard of HPV, which is lower than reported by similar studies conducted in the U.S. For example, Ruffin et al found that 95% of women ≥18 years old from Appalachian Ohio reported having heard of HPV,[20] as did 83% of caregivers of girls 10–18 years old surveyed in North Carolina in 2009.[13] In a national online survey of U.S. parents with girls 9–17 years old, 88% reported they had heard of HPV.[16] Those in our study who had never heard of HPV were more often Hispanic, which is similar to other published studies on HPV knowledge conducted among U.S. Hispanics. For example, Wu et al found that 71% of young Latina women in New Jersey had heard of HPV,[21] while Kobetz et al found that approximately 70% of Hispanic women interviewed in 2007 were aware of HPV.[22] Only 63% of rural Hispanic mothers in Lower Yakima Valley, Washington had heard of HPV.[12] Together, these studies suggest that awareness of HPV is lower among Hispanics residing in the U.S. than other ethnicities.

On average, our participants answered less than 50% of the true/false questions about the vaccine correctly, even fewer than expected due to chance alone. This is after limiting our results to only women who had heard of HPV. Awareness of the vaccine against HPV was

also low in this population with only about half of our original sample having heard of the quadrivalent vaccine. In comparison, a study of rural Hispanic mothers of daughters 9–17 years old found that 71% had heard of the quadrivalent HPV vaccine, but the sample size of this study was small and some participants had been recruited from health fairs.[12] In a similar study by Allen et al, 65% of parents knew about the HPV vaccine but only 61% of Hispanic parents were aware of it.[16] Utilizing data from two national surveys, Kobetz et al found that 65% and 60% of Hispanic females sampled reported that they had heard of the quadrivalent HPV vaccine. However, women of all ages were included in this study, and it was not restricted to caregivers of vaccine eligible children.

Persistent infection or acute infection with high-grade lesion is not curable although low-grade lesions may heal spontaneously. A large majority (87%) of mothers in our study erroneously believed that HPV infection could be cured with the right treatment. In contrast, a similar study in Georgia found that only 60% of parents thought there was a cure for HPV, and those results were collected in 2004.[10]

Differences in findings may be related to population demographics as 51% of participants in the Georgian study were white; however, it could be additional evidence that HPV knowledge has actually decreased over time. Our finding is concerning as an erroneous belief that HPV can be cured may make individuals more complacent about not getting the HPV vaccine.

Receiving information about HPV or the HPV vaccine in the form of a brochure or advertisement had the greatest effect on knowledge scores, even more than physician recommendation. Perhaps, multiple exposures to this type of information (especially TV ads) have played a role in increasing lasting awareness of HPV. Similarly, Hughes et al. found that parents who reported learning about the HPV vaccine from a brochure were 2.6 times more likely to have had their daughter vaccinated.[13] This finding is encouraging as dissemination of information through brochures and advertisements could be easily accomplished on a widespread scale. These materials should emphasize the multiple uses for this vaccination, including protection against genital warts and oropharyngeal cancer, as < 20% of mothers in our study were aware of these benefits.

A personal history of HPV, cervical dysplasia, or cervical cancer and having known someone with HPV or cervical cancer were both significantly associated with HPV knowledge. This further reinforces the idea that social networks play a role in promoting vaccination. In a population-based study of adult women in California, participants were 2.2 times more likely to have adequate knowledge on HPV if they reported receiving information from their social network.[23] This supports a potential role for vaccine promotion through word of mouth and personal experience, either one’s own or that of a family member or friend. Informational material that includes personal stories about cervical cancer and other HPV-related cancers may also have an impact and needs to be explored as an option.

Finally, hearing about HPV in high school or college was associated with a moderate increase in HPV knowledge. Since parents often do not educate their children on sex and

sexually-transmitted infections, public and private institutions should be encouraged to take on some of this responsibility. In fact, non-Hispanic black and Hispanic adolescents are particularly vulnerable to sexually transmitted infections compared to whites,[24] and Latino alternative high school students in Houston, Texas, on average, answered only 1 of 5 questions on HPV correctly.[25] While the role of "sex education" in school is still controversial, based on our finding of very low HPV knowledge, there is a clear need for both adolescents and their parents to receive education from a reliable source. Schools can provide an excellent opportunity for both students and parents.

This study has several limitations. Although we had an adequate sample size, it was primarily limited to low income, minority mothers and thus may not be representative of other groups. Furthermore, information was self-reported by participants. While it is unlikely that this would affect their knowledge of HPV, participants may be less likely to correctly report their income and other sensitive information. They may also over report health behaviors that are considered beneficial such as exercise and annual exams. Finally, since our study utilized a cross-sectional study design, we cannot infer causation.

Conclusions

Knowledge regarding HPV is very low among uneducated, low-income women with children in the target age range for HPV vaccination. Increased awareness should not only focus on cervical cancer but also on genital warts and other types of HPV-associated cancers, since this population has virtually no knowledge of other health outcomes related to HPV infection. Educational programs tailored to this population need to be developed and disseminated to improve vaccination rates.

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Table 1

Characteristics of mothers with a child 9 – 17 years of age by awareness of HPV (n = 638)[a]

	Never heard of HPV (n = 170)	Heard of HPV (n = 468)
	n (%)	n (%)
Demographic characteristics		
Age		
20 – 29	22 (12.9)	65 (13.9)
30 – 39	96 (56.5)	301 (64.3)
40 – 49	39 (22.9)	86 (18.4)
50+	13 (7.7)	16 (3.4)
Born in U.S.	81 (47.7)	260 (56.0)
Race		
White	13 (7.7)	83 (17.7)
Black	50 (29.4)	141 (30.1)
Hispanic	107 (62.9)	239 (51.1)
Other	0 (0.0)	5 (1.1)
Marital status		
Single, never married	29 (17.1)	101 (21.6)
Married or cohabitating	101 (59.4)	251 (53.6)
Separated, divorced, or widowed	40 (23.5)	111 (23.7)
Education		
Did not graduate high school	101 (59.4)	200 (42.7)
High school graduate or GED	49 (28.8)	143 (30.6)
College degree or some college	20 (11.8)	125 (26.7)
Combined annual household income		
Less than $15,000	79 (46.5)	178 (38.0)
$15,000 to $29,999	73 (42.9)	205 (43.8)
$30,000 and above	16 (9.4)	79 (16.9)
No health insurance	90 (52.9)	237 (50.6)
Behavioral characteristics		
Current smoker	37 (21.8)	92 (19.7)
Current drinker	44 (25.9)	183 (39.7)
Exercises at least one day per week	75 (44.1)	248 (53.2)
One or more hours spent on internet daily	73 (42.9)	275 (58.8)
Attends religious services weekly	64 (37.7)	164 (35.4)
Used some form of birth control at last sex	86 (50.6)	247 (52.8)
Age at first sexual intercourse (in years)		
14 and under	21 (12.4)	84 (18.0)
15 – 17	83 (48.8)	210 (45.1)

	Never heard of HPV (n = 170)	Heard of HPV (n = 468)
	n (%)	n (%)
18 and older	66 (38.8)	172 (36.9)
Number of lifetime sex partners		
1	53 (31.2)	136 (29.5)
2 – 4	67 (39.4)	156 (33.8)
5+	47 (27.7)	169 (36.7)
One or more Pap tests in the past 2 years	104 (61.2)	358 (81.7)

[a]Some variables may contain missing values; therefore percentages may not add up to 100.

TABLE 2

HPV knowledge among women who reported having heard of HPV (n = 468)

	Correct Answer	Correct Responses* n (%)
True/False Statement		
A person may be infected with HPV and not know it.	True	361 (77.1)
HPV is the most common sexually transmitted infection in the USA.	True	185 (39.6)
HPV affects only women.	False	248 (53.2)
Certain types of HPV cause cancer.	True	315 (67.6)
Contracting certain types of HPV can increase your chance of developing cervical cancer.	True	327 (70.2)
HPV infection can be prevented.	True	360 (76.9)
HPV can be prevented through vaccination.	True	312 (66.8)
HPV is transmitted or spread via genital contact.	True	288 (61.5)
A person who has HPV may need to have Pap smears more often than others.	True	255 (55.0)
A person's chance of getting HPV increases with the number of sexual partners he or she has.	True	296 (63.5)
HPV can be cured with the right treatment.	False	63 (13.5)
HPV can be transmitted/spread via skin contact.	True	38 (8.2)
HPV can be transmitted/spread through coughing/sneezing.	False	300 (64.4)
Soreness at the site where the shot is given is the main side effect of the Guardasil vaccine.	True	118 (25.3)
Guardasil is effective in preventing an HPV infection.	True	235 (50.2)
Guardasil is effective in preventing genital warts.	True	92 (19.7)
Guardasil is effective in preventing cervical cancer.	True	178 (38.4)
Guardasil is effective in preventing some types of oral cancer.	True	88 (19.0)
Guardasil is effective in preventing the spread of HPV to partners.	True	194 (41.5)

*An answer of, "Don't know" was categorized as incorrect.

Table 3

Correlation coefficients of HPV knowledge score among women with children 9 – 17 years of age[a]

	Correlation coefficient	p-value
Demographic characteristics		
Age	0.12	**0.01**
Born in U.S.	0.08	0.08
Hispanic	−0.06	0.21
Black	−0.02	0.72
Married or cohabitating	0.03	0.54
Separated, divorced, or widowed	0.06	0.18
High school grad or GED	−0.001	0.99
College grad or some college	0.24	**<0.001**
Combined annual household income between $15,000 to $29,999	−0.001	0.99
Combined annual household income $30,000 and above	0.18	**<0.001**
Has health insurance	0.06	0.23
Has daughter(s) only	0.02	0.75
Has both son(s) and daughter(s)	−0.06	0.21
Behavioral characteristics		
One or more hours spent on internet daily	0.18	**<0.001**
Exercise at least one day per week	0.11	**0.02**
Current smoker	0.02	0.73
Current drinker	0.06	0.21
Weekly attendance at religious services	0.03	0.57
Used some form of birth control at last sex	−0.03	0.54
Age at first sexual intercourse 14 years or under	0.000	1.00
Five or more lifetime sex partners	0.11	**0.02**
One or more Pap tests in the past 2 years	0.01	0.86
HPV-related characteristics		
Ever diagnosed with HPV, abnormal Pap, cervical dysplasia, or cervical cancer	0.15	**0.002**
Has family or friends who had child vaccinated against HPV	0.14	**0.002**
Health care provider recommended Guardasil one or more times	0.21	**<0.001**
Two or more sources of information regarding HPV	0.10	**0.04**
Known someone with HPV or cervical cancer	0.25	**<0.001**
Ever heard of HPV in high school or college	0.14	**0.003**
Ever seen an ad about Guardasil on TV or in a magazine	0.36	**<0.001**
Ever seen a brochure about Guardasil	0.40	**<0.001**

[a] All coefficients are Point-Biserial Correlations except age, which is a Pearson Product Moment Correlation.

Table 4

Hierarchical multivariate regression models of HPV knowledge score among women with children 9 – 17 years of age

	Regression Coefficients		
	Model 1	**Model 2**	**Model 3**
Demographic characteristics			
Age	**0.06***	**0.07***	**0.07****
College grad or some college	**2.11****	**1.58****	0.74
Combined annual household income $30,000 and above	**1.61****	**1.32***	0.81
Behavioral characteristics			
One or more hours spent on internet daily		0.81	0.19
Exercises at least one day per week		**0.84***	0.60
Five or more lifetime sex partners		0.71	−0.10
HPV-related characteristics			
Ever diagnosed with HPV, cervical dysplasia, or cervical cancer			**0.86***
Has family or friends who had child vaccinated against HPV			0.16
Health care provider recommended Guardasil one or more times			0.44
Two or more sources of information regarding HPV			0.08
Known someone with HPV or cervical cancer			**1.07****
Ever heard of HPV in high school or college			**1.07***
Ever seen an ad about Guardasil on TV or in a magazine			**1.47****
Ever seen a brochure about Guardasil			**2.35****
R^2	**0.09**	**0.11**	**0.28**

* $p < 0.05$,

** $p < 0.01$