

RESEARCH ARTICLE

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Human Papillomavirus (HPV) and HPV Vaccine Awareness among Korean American Immigrants in Alabama: Would Internet Use Improve Health Awareness?

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Abstract

Introduction: Although the HPV vaccine is known to prevent associated cancers, studies found a low awareness among Korean Americans (KA). This study aimed to examine the HPV and HPV vaccine awareness among KA in Alabama. **Methods:** A cross-sectional survey was conducted with a convenience sample of 278 KA residing in Alabama to understand the levels of HPV and HPV vaccine awareness and associated factors. **Results:** Those who heard of HPV were 31.7% and 29.5% for HPV vaccine. Those who were older than 50 years old and married were less likely to hear of HPV and HPV vaccine. Those who were female and had annual health check-ups were more likely to hear of both. Using the Internet for health information was positively associated with HPV vaccine awareness. **Discussion:** HPV education tailored to sociodemographic and using the Internet might be an effective strategy in improving the HPV and HPV vaccine awareness levels.

Keywords: Human Papillomavirus (HPV)- HPV vaccine- Korean Americans (KA)- health check-ups

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Introduction

The Centers for Disease Control and Prevention (CDC) reports that nearly 80 million Americans are infected with at least one strain of Human papillomavirus (HPV) (CDC, 2019). Annually, about 14 million new cases of HPV infection are diagnosed (CDC, 2019). HPV is the most common sexually transmitted infection (STI) in the United States (U.S.), and persistent HPV infection can cause cancer in the cervix, vulva, vagina, penis, anus, or oropharynx (CDC, 2020). Among the cancers, nearly 100% of cervical cancer cases are caused by HPV infection, and Alabama reports higher cervical cancer incidence and mortality rates than the national rates (9.4/100,000 vs. 8/100,000 for incidence, and 3.5/100,000 vs. 2/100,000 for mortality, respectively) (U.S. Cancer Statistics Working Group, 2020). In addition, the overall HPV-associated cancer incidence is higher in Alabama at 13.5/100,000, than the national rate at 12.3/100,000 (U.S. Cancer Statistics Working Group, 2020). Also, Korean Americans (KA) were found to have the highest incidence rate (11.9 cases) among the six Asian American groups (e.g., Chinese, Filipino) (Wang, et al., 2010). Although the HPV vaccine is the most effective preventive method for HPV-associated cancers (CDC, 2020), awareness of HPV and the HPV vaccine is limited among KA (Becerra et al., 2017).

In the last two decades, Alabama experienced

an increase of KA population with 17,719 in 2017 compared to 4,116 in 2000 due to the opening of Korean automotive industries (e.g., Hyundai) (Blalock, 2017; Kim, 2017; National Association of Korean Americans, n.d.). Compared to cities that are highly populated with KA, such as Atlanta, Georgia, Alabama lacks healthcare resources and facilities that provide language service or culturally tailored services, which literature have found to influence immigrants' health disparities (Bernstein et al., 2020; Han et al., 2019). Despite the increasing KA population in Alabama, no study has examined HPV and HPV vaccine awareness among this population.

Previous studies report several factors associated with HPV and HPV vaccine awareness among KA. Those include sociodemographic characteristics (e.g., gender, income), health-related factors (e.g., health status) and cultural factors (e.g., English proficiency) (Becerra et al., 2020; Lee et al., 2018). Younger age and higher health literacy and cultural factors, including higher English proficiency, were relevant factors predicting better awareness among KA residing in California and Georgia (Becerra et al., 2020; Lee et al., 2018). Among the general U.S. population, sociodemographic factors, such as female, younger age, and higher-income along with health-related factors, including better health status, and having a primary care provider were associated with better HPV and HPV vaccine awareness (Blake et al., 2015; Boakye et al., 2017; Gollu and Gore, 2021; Kepka

et al., 2018; Lee et al., 2018; McBride and Singh, 2018; Osazuwa-Peters et al., 2018).

Furthermore, obtainment of health information via Internet was a predictor for HPV and HPV vaccine awareness in a study using a nationally representative sample (Osazuwa-Peters et al., 2018). One focus groups study with KA parents also reported that KA parents' sources of HPV and HPV vaccine information were from health care providers or media, such as the Internet (Lee et al., 2019). Among those who heard from providers, some reported that they searched the Internet for additional information because they did not receive enough information from the providers (Lee et al., 2019). Hence, the Internet as a source of health information could predict HPV and HPV vaccine awareness.

The current study is the first study from the authors' knowledge to examine the HPV and HPV vaccine awareness among Southern KA. As an exploratory study, this study aims to understand the HPV and HPV vaccine awareness levels among KA residing in Alabama. Also, this study examines factors associated with HPV and HPV vaccine focusing on the Internet use, and health literacy. Findings will inform educational interventions that consider the associated factors of HPV and HPV vaccine awareness among KA.

Materials and Methods

Study design and Sampling

This study is an exploratory study to understand HPV and HPV vaccine awareness among KA in Alabama. A convenience sample of 278 KA in Alabama was collected. Eligibility criteria for the survey were (1) 21 years or older; (2) resident of Alabama; and (3) participants who identified themselves as Korean American.

Data Collection Procedure

A survey on cancer screening and health behavior was administered in Tuscaloosa and Montgomery counties in Alabama between September 2019 and February 2020. One of the research team members served as a community liaison and connected members from KA community organizations (e.g., Korean American Association and Korean ethnic churches). Then, the organizations identified and linked the research team to two Korean churches in Tuscaloosa and one Korean church in Montgomery. The research team provided study informational sessions at those churches. Then, the group leaders from each church distributed the surveys to the members of their group. Most participants were long-term church members, and several were friends or significant others of the members.

The survey was developed in English first and then translated to Korean using the back-translation method (Bracken and Barona, 1991). All participants completed the Korean version despite the option to choose an English survey. The survey completion time was approximately 40 minutes. The purpose and procedures for the self-administered survey were explained to the participants by the research team members, and written informed consent from each participant was obtained before the survey administration. A total of 290 surveys

were distributed to church leaders. Participants received a \$20 gift card once the completed surveys were returned to the leaders. With a return rate of 96%, a total number of 278 KA completed the survey. The research team returned to the two sites after two weeks to collect the surveys. The responses were later entered through Qualtrics by research assistants. This study was approved by the University name blinded Institutional Review Board (IRB).

Measures

Dependent variables. HPV and HPV vaccine awareness were included as dependent variables in this study. Two yes-or-no questions were asked in the survey: "Have you heard of HPV?" and "Have you heard of HPV vaccine (0=no, yes=1)?"

Independent variables. Socio-demographics, healthcare resources, English proficiency, Internet use for health information, and health-related factors were included in independent variables.

Socio-demographics. Age (0=18-49 years old, 1=50 years old and over), gender (0=male, 1=female), marital status (0=single, separated, widowed, or divorced, 1=married or partnered) were analyzed dichotomously. Participants reported their annual household income range through selecting from the following options: 1=\$10,000-\$24,999, 2=\$25,000-\$49,999, 3=\$50,000-\$74,999, 4=\$75,000-\$99,999, and 5=more than \$100,000. Participants' annual household income was analyzed as a continuous variable, ranging from 1 to 5.

Access to healthcare. Having annual health check-ups and having a primary physician were also analyzed dichotomously (0=no, 1=yes). English proficiency. Participants were asked, "How well do you speak English? Would you say..." with responses ranging from do not speak at all, not too well, somewhat well, to very well (1=do not speak at all, 4=very well).

Internet use for health. Eleven yes-or-no questions regarding using the Internet use for health-related purpose were asked to participants (0=no, 1=yes, Cronbach's alpha=0.739): In the last 12 months, have you used the Internet for any of the following reasons: (1) looked for health or medical information for yourself; (2) looked for information about quitting smoking; (3) bought medicine or vitamins online; (4) participated in an online support group for people with a similar health or medical issue; (5) used email or the Internet to communicate with a doctor or doctor's office; (6) used a website to help you with your diet, weight, or physical activity; (7) looked for a health care provider; (8) downloaded health-related information to a mobile device, such as an MP3 player, cell phone, tablet computer or electronic book device (ex. Download mobile apps); (9) visited a "social networking" site, such as "Facebook" or "LinkedIn" to read and share about medical topics; (10) wrote in an online diary or "blog" (i.e., Web log) about any type of health topic; (11) kept track of personal health information such as care received, test results, or upcoming medical appointments; and (12) looked for health or medical information for someone else. The final variable of Internet use for health was obtained by summing up responses from the twelve items ranging from 0 to 12. Internet use for health purposes was analyzed

as a continuous variable.

Health literacy. To measure health literacy among participants, three five-point-scale questions developed by Chew (2004) were asked (Cronbach's $\alpha=0.735$): (1) how often do you have someone help you read hospital materials? (0=all of the time, 1=most of the time, 2=some of the time, 3=a little of the time, 4=none of the time); (2) how confident are you filling out medical forms by yourself? (0=not at all, 1=a little bit, 2=somewhat, 3=quite a bit, 4=extremely); and (3) how often do you have problems learning about your medical condition because of difficulty understanding written information? (0=all of the time, 1=most of the time, 2=some of the time, 3=a little of the time, 4=none of the time). The total health literacy score was obtained by adding scores from three questions and ranging from 0 to 12. Health literacy was analyzed as a continuous variable. Previous studies with Korean samples reported reliability of the instrument's psychometric properties (Kim, 2010; Lee et al., 2015).

Health-related factors. Self-reported health status and family cancer history were included in health-related factors. Participants rated their current health with a single item that asked, "How would you rate your health at the present time?" Responses were "very poor," "poor," "fair," "good," and "excellent or very good." Self-reported health status was analyzed as a continuous variable that ranged from 1 to 5 (1=very poor, 5=excellent or very good). For family cancer history, participants were asked, "Have any of your family (parents, grandparents, siblings, or close relatives) ever had cancer of any kind?" (0=no, 1=yes).

Data Analysis

Univariate analyses were conducted to describe independent variables and rates of HPV and HPV vaccine awareness. Next, bivariate analyses were employed to examine the unadjusted association between each independent variable and HPV and HPV vaccine awareness. Lastly, binary logistic regression was used to examine the associated factors with HPV and HPV vaccine awareness. All statistical procedures were performed applying the SPSS 24.0 software package (IBM Corp., 2013).

Results

Sociodemographic characteristics of study participants

As seen in Table 1, less than one-third of participants were older than 50 years-old (28.9%). More than half of the participants were female (52.0%), and most participants were married or partnered (92.1%). Participants tended to have high household income at around \$75,000-\$99,999 (Mean=3.95, SD=1.14, range=1-5). Around one-third of participants had annual health check-ups (37.7%) and primary physicians (33.6%). Participants had a moderate English proficiency level (Mean=2.25, SD=0.69, range=1-4) and a low level of using the Internet for health purposes (Mean=3.59, SD=2.55, range=0-12). A moderate health literacy level (Mean=6.41, SD=3.00, range=0-12) and self-reported health status (Mean=3.21, SD=0.70, range=1-5) were reported. More than half of the

participants (52.5%) reported a family history of cancer.

HPV and HPV vaccine awareness

In Table 1, participants reported low HPV and HPV vaccine awareness rates, indicating that only less than one-third of participants have heard of HPV (31.7%) or HPV vaccine (29.5%). Age, gender, and Internet use for health purposes were significantly correlated with HPV and HPV vaccine awareness ($p<0.05$). Additionally, having annual health check-ups were significantly correlated with HPV awareness only ($p<0.05$), and health literacy was significantly correlated with HPV vaccine awareness only.

Associated factors with HPV and HPV vaccine awareness

Table 2 showed associated factors with HPV and HPV vaccine awareness. The findings showed that the same factors were significantly associated with HPV and HPV vaccine: age, gender, marital status, the Internet use for health, having annual health check-ups. In comparison, participants who were older than 50 years were less likely to hear of HPV (OR=0.16, CI=0.06-0.43, $p<0.05$) and HPV vaccine (OR=0.26, CI=0.10--0.66, $p<0.05$), females were more likely to hear of both HPV (OR=5.95, CI=2.77-12.80, $p<0.05$) and HPV vaccine (OR=5.20, CI=2.45-11.03, $p<0.05$). Moreover, participants who were married or partnered were less likely to hear of HPV (OR=0.23, CI=0.07-0.77, $p<0.05$) or HPV vaccine (OR=0.23, CI=0.07-0.77, $p<0.05$). Additionally, participants using the Internet for health purposes had a higher likelihood of being aware of the HPV vaccine (OR=1.15, CI=1.00-1.32, $p<0.05$). Lastly, participants who reported that they had annual health check-ups were more likely to hear of HPV

Table 1. Descriptive Information, HPV and HPV Vaccine Awareness Among Participants (N=278^a)

Total		N (%) ^b
Age	18-49yrs	197 (71.1)
	≥ 50 yrs	80 (28.9)
Gender	Male	133 (48.0)
	Female	144 (52.0)
Marital status	Single, separated, widowed, or divorced	22 (7.9)
	Married or partnered	256 (92.1)
Annual health check-up	No	172 (62.3)
	Yes	104 (37.7)
Primary physician	No	184 (66.4)
	Yes	93 (33.6)
Family cancer history	No	128 (46.7)
	Yes	146 (52.5)
Mean (SD) ^b		
Household income (range 1-5)		3.95 (1.14)
English proficiency (range 1-4)		2.25 (0.69)
Internet use for health (range 0-12)		3.59 (2.55)
Health literacy (range 0-12)		6.41 (3.00)
Self-reported health status (range 1-5)		3.21 (0.70)

^a, The study's total sample size may not be the same as the total sample size of the survey due to missing values; ^b, Means (SD) for continuous variables and n (%) for categorical variables.

Table 2. Descriptive Information, HPV and HPV Vaccine Awareness Among Participants (N=278^a)

		Heard of HPV (Yes) n (%)	Heard of HPV (No/Yes) p-value ^c	Heard of HPV Vaccine (Yes) n (%)	Heard of HPV Vaccine (NO/Yes) p-value
Total		88 (31.7)		82 (29.5)	
Age	18-49yrs	77 (87.5)	0.000***	70 (85.4)	0.001***
	≥50yrs	11 (12.5)		12 (14.6)	
Gender	Male	24 (27.3)	0.000***	23 (28.0)	0.000***
	Female	64 (72.7)		59 (72.0)	
Marital status	Single, separated, widowed, or divorced	10 (11.4)	0.14	10 (12.2)	0.085
	Married or partnered	78 (88.6)		72 (87.8)	
Annual health check-up	No	46 (52.3)	0.014*	44 (53.7)	0.057
	Yes	42 (47.7)		38 (46.3)	
Primary physician	No	55 (62.5)	0.326	55 (67.1)	0.812
	Yes	33 (37.5)		27 (32.9)	
Family cancer history	No	41 (47.1)	0.996	37 (45.7)	0.783
	Yes	46 (52.9)		44 (54.3)	
		Mean (SD)	p-value ^c	Mean (SD)	p-value
Household income (range 1-5)		4.10 (1.14)	0.144	4.05 (1.15)	0.384
English proficiency (range 1-4)		2.30 (0.66)	0.343	2.27 (0.67)	0.691
Internet use for health (range 0-12)		4.11 (2.45)	0.034*	4.17 (2.47)	0.023*
Health literacy (range 0-12)		6.92 (2.93)	0.057	7.14 (2.95)	0.009**
Self-reported health status (range 1-5)		3.22 (0.69)	0.754	3.24 (0.68)	0.503

^a, The study's total sample size may not be the same as the total sample size of the survey due to missing values; ^d, Means (SD) for continuous variables and n (%) for categorical variables; ^e, T-test for continuous variables and χ^2 for categorical variables; ^f, *p<0.05; **p<0.01; ***p<0.001.

(OR=2.92, CI=1.35-6.27, p<0.05) and HPV vaccine (OR=2.65, CI=1.25-5.64, p<0.05) (Table 3).

Discussion

This study aimed to examine the HPV and HPV vaccine awareness and its associated factors among KA residing in Alabama. Overall, the awareness of HPV and HPV vaccine levels were low, with about 30% reporting HPV and HPV vaccine awareness. These rates were much lower than the rates from previous studies (M. Kim et al., 2019). One study reported that 48% of KA college women have heard of HPV and 52% of the HPV vaccine (M. Kim et al., 2019). Also, one study found that 55% of Asian American women residing in California have heard of HPV (Becerra, et al., 2020). One explanation for the lower rate among KA in Alabama is the lack of health care resources provided in the Korean language in Alabama, which may prevent the residents from getting adequate information about HPV and HPV vaccine.

Several sociodemographic-related factors were associated with HPV and HPV vaccine awareness in this study, including age, marital status, and gender. KA who were older than 50 years old were less likely to be aware of HPV and HPV vaccine. Current study findings were commonly found in other studies with American and immigrant populations (Blake et al., 2015; Kim et al., 2019; Lee et al., 2018; McBride and Singh, 2018; Osazuwa-Peters et al., 2018). Younger generations were

more aware or literate in HPV-related information (Blake et al., 2015; Lee et al., 2018; McBride and Singh, 2018). A possible explanation is that once people get older and married, they tend to have a stable sexual partner and are less likely to get HPV infection. This is aligned with our findings that indicated being married was associated with less awareness of HPV and HPV vaccine. Hence, HPV and its vaccine education programs may not target the older and married population, leading to low awareness. Moreover, females were more likely to be aware as previous studies reported that miscomprehension in HPV infection causing female-specific cancer could contribute to lesser knowledge among males (Blake et al., 2015; Boakye et al., 2017; Minjin Kim et al., 2019; McBride and Singh, 2018; Osazuwa-Peters et al., 2018).

Other factors, including health-related factors and Internet usage, were associated with HPV and HPV vaccine awareness. Participants who had annual health check-ups had higher awareness than their counterparts, indicating that physicians' source of information and recommendation may have influenced higher awareness (Kim et al., 2019). Moreover, as Internet usage for seeking health information increased, participants were more likely to be aware of the HPV vaccine. As indicated by Lee et al., (2018)'s findings, the most frequent source of information about HPV vaccine by KA parents were obtained by physicians (66%) and online media (45%), suggesting that a similar trend may follow in our findings (Lee et al., 2019).

Table 3. Binary Logistic Regression on Predictors of HPV and HPV Vaccine Awareness

	Odds Ratio	
	HPV Awareness	HPV Vaccine Awareness
Age (ref=18-49yrs)	0.16***	0.26**
>=50yrs	(0.06, 0.43)	(0.10, 0.66)
Gender (ref=male)	5.95***	5.20***
Female	(2.77, 12.80)	(2.45, 11.03)
Marital status (ref=single, separated, widowed, or divorced)	0.23*	0.23*
Married or partnered	(0.07, 0.77)	(0.07, 0.77)
Household income (range 1-5)	1.22	1.12
	(0.89, 1.68)	(0.83, 1.53)
English proficiency (range 1-4)	1.24	1
	(0.69, 2.23)	(0.56, 1.80)
The Internet use for health purposes (range 0-12)	1.12	1.15*
	(0.98, 1.29)	(1.00, 1.32)
Annual health check-up (ref=no)	2.92**	2.65*
Yes	(1.35, 6.27)	(1.25, 5.64)
Primary physician (ref=no)	1.15	0.71
Yes	(0.51, 2.60)	(0.32, 1.59)
Family cancer history (ref=no)	0.79	0.93
Yes	(0.39, 1.57)	(0.47, 1.84)
Self-reported health status (range 1-5)	0.93	0.99
	(0.55, 1.58)	(0.58, 1.67)
Health literacy (range 0-12)	1.04	1.11
	(0.91, 1.20)	(0.97, 1.28)
Number of observations	208	208
Nagelkerke R Square	0.359	0.31
Hosmer and Lemeshow Test	0.064	0.574

*p<0.05; **p<0.01; ***p<0.001

Limitation

This study used a convenience sample of KA, limiting the generalizability to all KA in southern regions. Furthermore, this study's cross-sectional design cannot examine the causality between HPV and HPV vaccine awareness and their associated factors. Also, the study only assessed HPV and HPV vaccine awareness and do not reflect participants' HPV and HPV vaccine knowledge, such as that HPV is associated with certain cancers and the HPV vaccine can prevent cancers. Therefore, future studies are warranted to examine what type of information KA know and what areas require more education. Moreover, the sample's average household income in this study is considerably high (about \$75,000-\$99,999). Thus, future studies might explore HPV and HPV vaccine awareness among KA populations with lower income because previous studies reported that higher income is associated with higher HPV and HPV vaccine awareness levels (Kepka et al., 2018; McBride and Singh, 2018).

Implication for future practice

This study's findings indicate that culturally tailored education among KA residing in Alabama is needed to prevent adverse health outcomes. Considering the lack of culturally tailored healthcare resources in the study area,

health information distribution via healthcare providers, such as nurses, or by visiting community centers or through mobile messaging applications (e.g., Kakaotalk, a common messaging tool used by Koreans) could be effective. One study that provided a mobile text messaging intervention, which included basic information about cervical cancer, vaccine as a preventive measure, and anecdotes from KA, improved knowledge and vaccination uptake (Lee et al., 2016). Another study reported that text message reminders by providers to parents was the most effective intervention in improving immunization rates among adolescents (Bar-Shain et al., 2015). Moreover, utilization of technology is aligned with this study's finding because using the Internet for health was associated with higher HPV and HPV vaccine awareness levels. However, some information on the Internet may be inaccurate and misleading (Anderson and Klemm, 2008; Liu et al., 2015). To prevent the acquirement of wrong information, professionals should administer web-based education intervention. This may be beneficial due to low cost, convenience, individualized format, and distribution of reliable and comprehensive information (Anderson and Klemm, 2008). A systematic review examining the impact of Internet-based communication interventions between providers and patients with chronic conditions reported

improved patient knowledge on their conditions and self-management skills (de Jong et al., 2014). A similar approach can be applied to improve awareness of HPV and HPV vaccine among KA residing in Alabama.

Moreover, targeting specific population groups, such as males, older adults, and married couples, for education is urgent in KA. First, targeting the male population is needed because the incidence of HPV-associated cancers in men (e.g., penile, oral, and anal) in Alabama is higher (11.4 cases per 100,000) than the national average (10.9 cases) (U.S. Cancer Statistics Working Group, 2020). Educating males is also important to decrease the risk of HPV infection among females since HPV is a sexually transmitted disease. Following, educating the married group could benefit both themselves and their children as a systematic review found a positive association between parent awareness and HPV vaccination rates in their children (Newman et al., 2018). Improving HPV vaccine awareness among older women might have a positive impact on improving HPV vaccine uptake among adolescent girls, considering HPV vaccine awareness is a predictor of vaccine uptake among adolescent girls and older women are likely to be caregivers (Allen et al., 2010).

In conclusion, this study analyzed data from a sample of KA residing in Alabama and highlighted that education regarding HPV and HPV vaccine is needed for this population to further improve cancer prevention. The results showed a low HPV and HPV vaccine awareness rates among KA residing in Alabama. This study also has implications for intervention aiming to improve HPV and HPV vaccine awareness among this population. Intervention regarding HPV education to KA who are older, married or partnered, and male might improve the general HPV and HPV awareness levels among KA. Moreover, increasing KA's access to health information regarding HPV through the Internet might be an effective strategy to improve HPV and HPV vaccine awareness.

Author Contribution Statement

Hee Yun Lee contributed to conceptualization, data collection, and manuscript writing. Cho Rong Won, contributed to manuscript writing and review. Yan Luo contributed to data analysis and manuscript writing. Mi Hwa Lee contributed to manuscript writing and review.

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Scientific Body Approval

This study was approved by the University of Alabama.

How the ethical issue was handled

This study was approved by the University of Alabama Institutional Review Board (IRB).

Availability of Data

The data is available as requested to the first author.

Conflicts of interest

There are no conflicts of interest.

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