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The influence of knowledge, attitude, and motivational factors on the willingness of mothers for their female children to undergo human papillomavirus vaccination

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Abstract:

BACKGROUND: Cervical cancer remains to be the second leading cancer and cause of cancer-related deaths among Filipino women despite the use of the Papanicolaou screening. Latest research has shown that the human papillomavirus (HPV) is a necessary cause of cervical cancer. With major morbidity and high mortality rates associated with HPV infection and cervical cancer, several modes of primary and secondary forms of prevention have to be implemented. Among the primary modes of prevention is the administration of the preventive vaccine, which has consistently shown to decrease substantially HPV disease and cervical cancer rates in developed countries. In our country, before a successful vaccination, program is implemented, several sociocultural issues have to be addressed. Knowledge, attitude, and motivational factors are vital in determining acceptance of the vaccine. One relevant setting is exploring the willingness of mothers to get their female children vaccinated even before they become sexually active.

OBJECTIVES: The aim of the study was to determine the association of the knowledge, attitude, and motivational factors of mothers on their willingness for their female children aged 9–13 years to undergo HPV vaccination at a tertiary government hospital.

STUDY DESIGN: This was a cross-sectional study that was carried out at a government institution.

POPULATION: The population consisted of 352 mothers with female children aged 9–13 years consulting the outpatient clinics at the department of obstetrics and gynecology at a tertiary government hospital.

MATERIALS AND METHODS: A pretested and validated survey was given to 352 respondents. They were asked to answer a self-administered questionnaire that included sociodemographic, reproductive, sexual history variables, knowledge, and attitude, and motivational factors toward the disease and the associated vaccine.

RESULTS: Using the survey proportion estimation methods, the prevalence of women who were willing to enroll their daughters for HPV vaccination was 97.18% ($n = 42$, 95% confidence interval [CI]: 94.91 to 98.46%). It can be noted that only a third of the sample had high knowledge on the vaccine and its use 34.93% ($n = 124$, 95% CI: 30.25 to 39.92%). More women who reached college level (χ^2: 5.67) and also those whose youngest child was between 11 and 13 years old (χ^2: 8.82)-had higher knowledge scores than otherwise. Those who have an annual income of greater than or equal to *P* 60,000 (χ^2: 16.55) and are non-Catholic (χ^2: 18.77) – also appeared to have higher knowledge ratings on the questionnaire. Women who never to a few times a year attend church-related activities had higher knowledge scores compared to women who were more frequent goers (χ^2: 16.33). For the attitude toward the vaccine, more mothers believed that getting the vaccine would not have an effect on a girl's sexual activity and most agreed that they would not be viewed as bad parents. Most women also did not believe that religion would affect their willingness to vaccinate their

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children. There was an association in the degree of agreement between negative and positive attitudes from the Chi-square test performed (χ^2: 7.44, *P*: 0.01). There were more agreeing responses from factors determining positive attitude and more disagreeing responses in the factors determining negative attitude. With regard to motivational factors, more women agreed that the cost was prohibitive and that they were more willing if only two doses would be required for their daughters. They were also not concerned about what other parents may think about getting the vaccine. Most answered that they were willing to follow their doctors' recommendations and they have trust in vaccine manufacturers. Most women were also concerned that their daughters may get cervical cancer in the future. There was no difference in the proportion of agreeing responses between positive and negative motivating factors among the study participants (*Z*: 0.30, *P*: 0.79). This suggested that these factors could be important predictors of willingness to use vaccination on their children. Based on the crude odds ratios from the logistic regression, the likelihood of being willing to administer HPV vaccine to their children was almost twice as the knowledge score and scores on the positive attitude items increased, and was found to be statistically significant. At the same time, the odds of willingness increased by more than twice as the score on the negative attitude items decreased, and was also significant. There was no noted association for the other predictors of the association.

CONCLUSION: The role of knowledge and attitudes on the negative perceptions on the vaccine were important predictors of the willingness of mothers to have their female children vaccinated against HPV infection.

Keywords:

Cervical cancer, human papillomavirus, vaccination

Introduction

The most common sexually transmitted infection (STI) globally is human papillomavirus (HPV) infection. It has been estimated that at least 50% of all sexually active people will acquire HPV infection during their lifetime.[1] HPV is a necessary cause of cervical cancer, with HPV types 16 and 18 accounting for about 75% of all cervical cancer cases in the Asia Pacific region, which is similar to Western countries.[2] In a recent meta-analysis among 1 million women in five continents, the estimated HPV global prevalence was 11.7%, and among women with type-specific HPV data, 5 viral high-risk types were the most commonly identified types.[3]

Other cancers such as anal, oral, and penile cancer are also strongly associated with HPV as well.[4] HPV comprises different types of viral strains and oncogenic types 16 and 18 cause around 75% of all cervical cancers. Nononcogenic types 6 and 11 can cause condyloma acuminata (genital warts) in both sexes. Most cases are asymptomatic infections but they could cause neoplastic epithelial changes leading to cervical cancer.

Despite knowledge on etiology and preventive measures, around 274,000 deaths each year occur worldwide attributable to cervical cancer. About 85% of these occur among developing countries. In nonindustrialized countries, most women are diagnosed in late stages wherein the disease is more difficult to manage.[4]

The incidence of cervical cancer among Asia Oceania countries varies widely from the lowest in Australia with the age-standardized rate of 4.9 per 100,000 women to the highest at 32 per 100,000 women in Nepal. Our country has an incidence of 12 per 100,000. It remains to be the second leading cancer and the leading cause of cancer-related deaths among Filipino women.[5] Between 1980 and 2010, the mortality rate has not improved at 44% because of late-stage diagnoses resulting from a lack of screening and inadequate treatment services.[4]

Various methods of primary and secondary forms of prevention are very relevant to make an impact in decreasing the incidence of cervical cancer. Primary prevention is by immunization and the majority of Asia Oceania countries consider that HPV vaccination among teenagers before sexual debut should be implemented at large, in accordance with the World Health Organization (WHO) position recommendations. Barriers to low-resource countries include a lack of national support to ensure wide coverage of vaccination among adolescents. Another obstacle is the lack of knowledge among the general population about the disease and its causality. Public awareness and health workers education are much needed for compliance and effective implementation of immunization programs. Health professionals should continue to educate women and inform them of the benefits of preventive interventions. Support should also be elicited from the national health ministry, and possibly from international health agencies such as the Global Alliance for Vaccines and Immunization, the United Nations Children Fund, the WHO, and the Global Fund.

Another primary preventive strategy is the use of condoms. The use of condoms is a barrier method in preventing pregnancy but it also minimizes the risk of contracting HPV during sexual activity. In our country, only the male condom is available. It is not a perfect strategy as various factors affect the efficacy of condom use such as knowledge on correct usage.[6] The risk of acquiring condyloma is reduced with condom use. Condom usage also confers protection against chlamydia and human immunodeficiency virus (HIV). Chlamydia and HIV are also proven co-factors in the development of

cervical cancer. The rate of male condom use is very low in our country at 1.2%, which is far from the ideal use rate of 80% to prevent pregnancy and transmission of diseases.[7]

Secondary prevention is through cervical cancer screening. Many countries in Asia including the Philippines consider this an effective strategy. It should be offered especially to target populations, those sexually active women in particular over 30 years of age. Different screening techniques are used such as visual inspection with acetic acid (VIA), rapid affordable HPV test, and cytology.[8] Among these, the simplest method is the VIA wherein diluted acetic acid or table vinegar is applied over the cervix and detecting acetowhitening. Acetowhite areas need further investigation. It is desirable to perform adjunct methods to confirm screening results using cytology, colposcopy, and biopsy, before referring women for therapy. "erapy and treatp technique, though, should be considered depending on disease prevalence, the efficiency of service delivery, rates of follow up visits, and resources. Screening should be offered to all women at least once in their lifetime, but preferably every 5 years using VIA, or every 10 years if using HPV testing. In our country, the total Pap smear coverage of Filipino women aged 18%–69% was very low at 7.7%.[9] Most importantly, similar to vaccination, public awareness and health workers education are essential for full implementation to ensure high compliance and a successful program.[10]

In this study, the aim is to determine the influence of knowledge, attitude, and motivational factors on the willingness of mothers for their female adolescent children to undergo HPV vaccination, which is one of the primary methods of cervical cancer prevention.

While HPV vaccination has successfully lowered the incidence of both cervical cancer and genital warts in developed countries such as the United Kingdom and Australia, the vaccination rates are low in the Philippine setting.

A cost–utility analysis of cervical cancer screening and HPV vaccination done in the local setting by Guerrero *et al*.; it showed that high VIA coverage among 35–40-year-old women at 5-year intervals is the most efficient and cost-saving strategy in reducing the cervical cancer burden in the Philippines and adding HPV vaccination program with high coverage among 11-year-old girls would be cost-effective if the vaccine had a life-long duration of efficacy.[11]

At present, two vaccine types (quadrivalent and bivalent) have shown high efficacy against cervical intraepithelial neoplasia and invasive cancers associated with vaccine types (HPV 16 and 18). The administration of any of these vaccines has been anticipated to be a critically important measure to reduce the incidence of cervical cancer globally.

Since the introduction of the human papillomavirus virus vaccine in 2006 in the United States, many ethical issues and controversies have arisen. These include the notion that having completed the vaccine series would be a license for people to engage in unprotected sexual activity or various forms of sexual contact. There are issues about who to vaccinate, the costs, and affordability, and there are religious beliefs that contradict immunization practice. Even in the US, when this vaccine was first approved for use among young girls, there have been controversies when different states tried to mandate vaccination. Ethical issues then included infringement upon one's autonomy and liberty.

There are also religious concerns that this vaccine that protects against a STI will contradict abstinence-based practices. There were also concerns that the vaccine could force a child to undergo an intervention that is incongruent with her family beliefs. Since it was first approved for female indication only, issues came up regarding equality of gender since the potential impact of this product also includes protecting males from STI and genital cancer.

There have been various studies conducted concerning ethical issues on HPV vaccination. A recent study in the US involving 339 young adolescents aged between 13 and 21 years showed that HPV vaccination among young adolescent girls did not change their sexual habits or practices. Most of the women were black and belonged to the lower socioeconomic class. It was shown that young women having the vaccine did not see it as a license to have more sexual partners or forgo the use of condoms. It was also mentioned that the small group of young girls who misunderstood their risk of STIs after getting vaccinated did not change their behavior as a result. One of the lead authors, Dr. Jessica Kahn, from Cincinnati Children's Hospital Medical Center in Ohio, concluded that there were other contributing factors as to whether an adolescent will decide to have sex or not, and whether they decide to limit their number of partners or use condoms. In parallel with the common notion, Dr. Kahn was mainly concerned that parents'dconcerns about changes in sexual behavior might still be keeping them from getting their children vaccinated.[12]

In year 2007 and just before the United States Food and Drug Administration approval of the vaccine, Hopenhayn *et al*. studied and measured women acceptance of the vaccination for themselves and for adolescent girls in two Kentucky counties, in which the incidence and mortality rates of cervical cancer were among the highest in the United States. Hopenhayn

et al. carried out a telephone survey of 629 participants. Questions included awareness of HPV, acceptability of HPV testing and vaccination, smoking behavior, and demographics. In this study, 85.2% of respondents were interested in receiving the vaccine for themselves. Younger women were more accepting and smokers were three times more likely to support receiving the vaccine. Respondents reported that it was much less acceptable to give the vaccine to girls aged 10–15 years, than to themselves (67% vs. 85.2%). Married women were least likely to approve of a vaccination for girls. Higher income levels and educational attainment had a negative effect on acceptance while the respondents with the lowest incomes were more likely to favor vaccination for girls.[13]

Conceptual framework

In this study, the participants are mothers with 9–13-year-old daughters; since in our Filipino culture, it is still the mother who frequently decides for the health of her family [Figure 1]. She is often referred to the "light of the family." In a study done by Alampay and Jocson in 2011, Filipino mothers were more progressive in granting their children more agency, independence, and encouragement to express themselves. It was mentioned that Filipino mothers are the primary caregivers and are more likely to get involved in modern childbearing that is presented in mass media, reading materials, and parenting seminars.[14]

In another publication by Espina in 1996,[15] overprotection is the expression of mother's love in Filipino culture. Moreover, it is considered the norm culture in our local setting. As such, this culture also involves the mother being in charge of taking care of her children's education, safety, and health. This entails submitting themselves to frequent medical checkups and ensuring the good health of their children.

Hence, in this particular study, mothers were employed as respondents since mothers would be more willing to ensure the healthcare of their daughters, especially when it may come to preventing genital cancers. The respondents were asked to fill out a questionnaire [Appendix A].

The questionnaire included demographic information including the age of the respondent, gender and ages of children, education, and income. It also included religious affiliation, participants' knowledge of HPV and its related diseases, and knowledge of the vaccine. It also included items pertaining to the perceived likelihood to vaccinate in general and will take into consideration the cost, physician and drug company trust/mistrust, peer reaction, and concern about promoting sexual activity among young girls.

It is very relevant to elicit for sociodemographic data since these factors well affect parental vaccine acceptance. In a telephone survey carried out by Hopenhayn *et al*.,[13] among 629 participants, they found that younger women were more accepting of the vaccine and acceptance was three times more among smokers. Those who are married in a relationship were also more likely to give the vaccine to their children. Conversely, those belonging to higher income levels were less likely to approve vaccination of their children than those in lower income brackets. In the local study done by Dr. Domingo and Dr. Castro,[16] there was also decreasing vaccine acceptability as the gross family income increased. Their study also demonstrated that mothers who finished at most secondary schools were more accepting of the vaccine compared to those who earned a college degree or a postgraduate course.

For the key domains that were explored in this present study, it was very important to study the knowledge, attitude, and motivational factors that influence vaccine acceptance of Filipino mothers for their children.

The following domains were defined as follows (operational definitions):

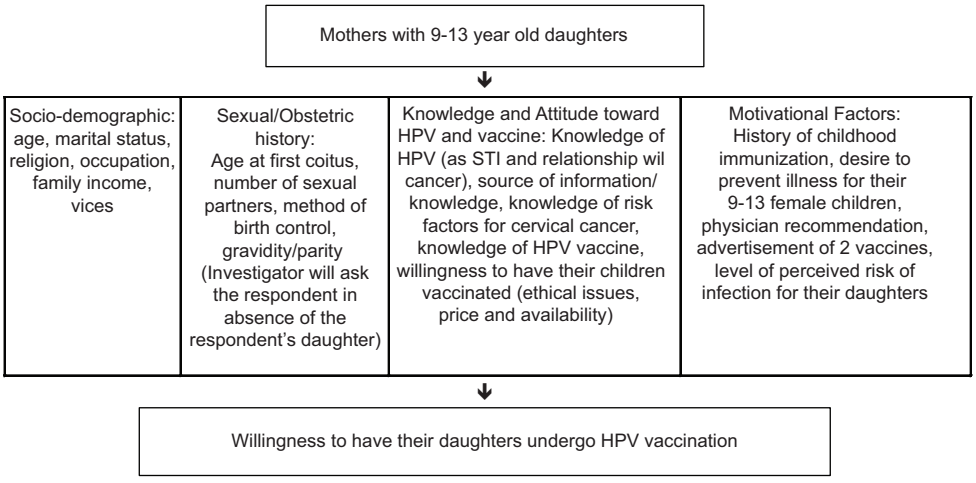

Figure 1: Conceptual framework of the research. HPV: Human papillomavirus, STI: Sexually transmitted infection

1. Knowledge – included the subjective knowledge of the HPV as a STI, that it can cause genital warts and cervical cancer; also included knowledge that cervical cancer can affect women sexually active of any age; included knowledge of the existence of a prophylactic vaccine, its benefits to a young girl future health, its efficacy and side effects, and its availability at the physicians' clinics
2. Attitude – included the subjects attitude or notion that getting the vaccine may or may not have an effect on a girls sexual activity; included concerns that family and friends would view the mother herself as a bad parent if she allows her child to have the vaccine and concerns that her religion will affect her willingness to have her child immunized; views that the mother can be a role model for parents if they allow their children to get vaccinated
3. Motivational factors – included considerations of vaccine costs, acceptance of other parents, physician recommendations, trust in vaccine manufacturers, concern that their daughters may be affected by cervical cancer in the future
4. Willingness of mothers – included the mothered intention to vaccinate their children or intent to recommend vaccination for family members and views regarding a mandatory vaccine requirement for young girls.

Review of related literature

From the search engine PubMed and the use of terms or key concepts "oncepts r," "oncepts," "oncepts rela factors," "actorss," "act vaccine acceptability," 21 citations were obtained. From these citations, only those written in English language and those articles involving direct knowledge, attitude, and motivational factors of mothers and their acceptance of the HPV vaccine were considered. Only those with full articles were chosen for critical appraisal. For other citations, in which only abstracts were provided, a table of objectives, methods, results, and conclusions is constructed.

A pilot study was conducted in year 2007 by Mitchell and Ely regarding knowledge and attitudes toward HPV vaccination in an Appalachian Kentucky county.[17] This study aimed to identify barriers to parental willingness to vaccinate girls before they initiate sexual activity and become infected. Overall, there was a high percentage of parents who expressed intention to vaccinate their children.

To gain insight into factors that affect a parents choice of whether to seek the vaccine for their daughters, Dempsey *et al*. in the year 2006 found that while providing HPV information sheets to parents improved knowledge about the vaccine, there was not a statistically significant difference in HPV vaccine acceptability between those who got information sheets and those who did not. Attitudes and life experiences appeared to be more important factors than knowledge in influencing parental choice.[18]

In the local setting, a study was done in 2006 at the Philippine General Hospital by Dr. Domingo and Dr. Castro on the knowledge and attitude of mothers and adolescents regarding HPV and its potential vaccine. It included 195 mothers of daughters aged 12 to 15 years who consulted at the Philippine General Hospital General OB-GYN clinic and Gynecologic Cancer Clinic at the Cancer Institute. They were given a questionnaire that included their knowledge of cervical cancer etiology and the usefulness of a vaccine. It was shown that in this study, only 14.4% knew of a vaccine against HPV, and only 31.8% were aware that HPV was the causative agent of cervical cancer. The authors concluded that there was really a need to educate women regarding the association between HPV and cervical cancer. They also concluded that initiation of a program or campaign among adolescents who are not sexually active might be difficult and these programs should include educational ones aimed at mothers of these young women. There should be emphasis also on knowledge of the benefits of a preventive vaccine. The authors also stated the need for widespread government vaccination programs.[16]

The study adopted a structured, validated, and translated questionnaire administered by an interviewer/enumerator (face to face) to determine the influence of knowledge, attitude, and motivational factors of Filipino mothers regarding illnesses caused by HPV including their attitude regarding the administration of HPV vaccine to their female children, and their willingness to have their female young children vaccinated.

The questionnaire was adopted from the study done by Mitchell and Ely in the year 2008.[17] This was a pilot study done among 58 parents in an Appalachian Kentucky county to determine potential knowledge and attitude barriers to adolescent HPV immunization. Their survey ran for 6 weeks. The authors in the said study had the objective to give useful information to the county's healthcare policymakers. They also concluded that results can be applied to policies, educational practices, and preventive measures. They designed the study to address the levels of knowledge and attitudes including religious, social, and financial views.

In a study done by Ezeanochie and Olagbuji in 2014 on determinants of acceptability by mothers of HPV vaccination for their adolescent children in Nigeria, they found that 70% accepted vaccination of their daughters, 30% were unwilling and the most common reason for unwillingness was that it may encourage sexual

promiscuity (62.3%). Mothers with poor knowledge of STI were significantly more unwilling to accept HPV vaccines compared to those with average or good knowledge ($P = 0.002$).[19]

In another study done in Spain by Godoy Verdugo *et al*. in 2013 in examining HPV vaccine acceptability among mothers with adolescent girls between 9 and 13 years old, mothers were interrogated about HPV vaccine acceptability, reasons provided for acceptance or nonacceptance and if mothers know that vaccine is offered free for public health institutions. Results showed that 89% of mothers reacted positively to the possibility of vaccinating their daughters; reasons of vaccine nonacceptance were because not knowing enough about infection, mothers felt that their daughters were not at risk for acquiring HPV infection, the vaccine is new and mothers unknown side effects; 39% of mothers want to know more about the vaccine safety, 21% about the length of protection duration, and 16% concerning about if the vaccine is effective; 57% of mothers know that the Health Secretary offers vaccine for free; mothers who have had their daughters vaccinated, had daughters with lower age (9.8 ± 0.9 vs. 10.8 ± 1.3 years, $P = 0.0001$), were more frequently married (79% vs. 51%, $P = 0.002$), and were more likely to report that they had heard about HPV vaccine from some source (100% vs. 66%, $P = 0.0001$), than mothers who have not yet had their daughters vaccinated.[20]

In Hong Kong, Choi *et al*. did research to determine vaccine acceptability among mothers and adolescents in 2013. The authors concluded that the gap between acceptability and actual uptake of HPV vaccination among adolescent girls suggested that coverage is likely to be low without an organized HPV vaccination program, although the difference might be partially attributed to the possibility that at the time of the interview female adolescents who were willing to be vaccinated had not yet taken action. They also stated that policymakers should devise tailored, targeted, and efficient vaccination strategies to achieve universal coverage for an effectively organized HPV vaccination program.[21]

In China in year 2013, Zhang *et al.* conducted a study to determine perceptions and acceptability of HPV vaccination among parents of young adolescents. The results showed that only 36.2% of the parents accepted the vaccine for their children. Knowledge about HPV and HPV vaccine was a positive correlate with HPV vaccination acceptability (P trend = 0.003). Grade of the child (P trend = 0.015), prior vaccination experience outside the National Expanded Program on Immunization (odds ratio [OR]: 1.43; 95% confidence interval [CI]: 1.19–1.72), fear of cervical cancer and/or genital warts (OR: 2.47; 95% CI: 2.00–3.05), and prior consultation regarding HPV vaccine information (OR: 2.35; 95% CI: 1.57–3.52) were also positively associated with higher HPV vaccine acceptability; acceptability was lower in mothers (OR: 0.45; 95% CI: 0.37–0.54) who had better education (P trend = 0.009). About 57.3% of the parents agreed that the most appropriate venue for HPV vaccination was the local center for disease prevention and control. They concluded that there was a low acceptability of HPV vaccination among parents of young adolescents in China. There are many challenges in implementing the HPV vaccination program and their findings will serve as valuable references for future HPV vaccination policies and campaigns after HPV vaccines are approved in China.[22]

Haesebaert *et al.* conducted a quantitative–qualitative study in France to determine women's knowledge of and attitudes toward cervical cancer prevention and the acceptability of HPV vaccination among those with 14–18-year-old daughters in 2012. Their objective was to determine French women's knowledge of and attitudes toward cervical cancer prevention and the acceptability of HPV vaccination among those with 14–18-year-old daughters. The authors found that few mothers are opposed to HPV vaccination. Factors associated with acceptability were knowledge about the vaccine, acceptance of other vaccines and, unexpectedly, lack of knowledge about the recommended frequency of Pap testing. On multivariate analysis, compliance with recommendations for Pap test screening and socioeconomic factors had no effect on views about HPV vaccination. They concluded also that given that concern about possible side effects is the major barrier to wider acceptance of the HPV vaccine in France, general physicians have a key role in providing information.[23]

A Thai study conducted by Mairaing *et al.* looked into maternal acceptance, attitude, and knowledge on HPV vaccination for their daughters in 2012. Moreover, their results showed a total of 173 mothers were able to complete the survey response rate of 86.5% (173/200); no difference in characteristics and lifestyles of the responders; basic knowledge scores were higher in the subjects who had higher education level and regular cervical screening history. Most of the subjects (>85%) recognized that HPV is associated with cervical cancer but more than half of them were confused about the route of transmission. Basic knowledge scores are increased in all acceptability groups (strongly agree to strongly disagree) after be informed about HPV and vaccine was observed. Most subjects (78.6%) agree to their daughters' vaccination indicating high vaccine acceptance; leading factors to maternal acceptance were free vaccination, negative attitudes such as the sexual

behavior of daughters, and positive attitudes such as vaccine efficacy.[24]

Podolsky *et al.* and in 2009 made research to compare HPV vaccine acceptability between U. S. and Salvadoran populations. In their study, parental acceptance of HPV vaccination was higher in a sample of Salvadoran subjects than in a sample of U. S. Latinas ($P < 0.001$ for daughters and sons). Reasons for objecting to HPV vaccination differ in the two locations. There are important differences between Salvadoran and U. S. subjects. The study showed Salvadorans are more accepting of HPV vaccination, and parental acceptance is unlikely to be a barrier to widespread vaccination in El Salvador. They also concluded that targeted educational materials are needed in both locations.[25]

Lazcano-Ponce *et al.* carried out another Latin study in Mexico in 2001. Their aim was to determine the acceptability of the HPV vaccine among mothers of adolescents in Cuernavaca, Mexico. A survey was carried out in a random sample of 880 women between the ages of 15 and 49 years in the metropolitan area and these women were interviewed to obtain information concerning their knowledge of risk factors for cervical cancer and their perception of the usefulness of vaccines. They were provided with information on the main risk factors for cervical cancer and the future availability of a HPV vaccine to prevent cervical cancer. The authors explored, with parents, the possible acceptability of an HPV vaccine for their teenaged daughters. The degree of acceptability and its association with a series of sociodemographic and reproductive factors were assessed. Results showed that the respondents had little knowledge regarding the etiology of cervical cancer. Only 1.9% said that the principal risk factor was infection with HPV. About 84.2% were aware of the usefulness of vaccines and 83.6% of the women indicated that they would allow their daughters to participate in a trial to evaluate the effectiveness of an HPV vaccine that helps prevent cervical cancer. The main factor associated with the acceptance of a possible vaccine against HPV was the knowledge of the usefulness of vaccines (OR = 6.5, 95% CI 5.2–8.2). A history of two or more sexual partners (OR = 2.2, 95% CI 1.3–3.6) increased acceptability. Acceptance was not associated with the number of live births (never vs. ever OR = 0.9, 95% CI 0.3–2.1). There were 525 women with children over the age of 10 years (59.6%). The prevalence of acceptability among these women was 80.1%, not statistically different from the remainder of the sample ($P > 0.05$).[26]

Research conducted in North Carolina in 2007 by Sperber *et al.* looked into the influence of parent characteristics and disease outcome framing on HPV vaccine acceptability among rural, Southern women. This study explored the impact of framing the vaccine's benefits, with respect to the disease outcome being prevented, on women's HPV vaccination intentions for themselves and for an adolescent daughter. They were able to show that women reported high intentions to vaccinate against HPV. Women reported higher intentions to vaccinate adolescent daughters than themselves, and this relationship varied by how the HPV vaccine was framed (preventing HPV, cervical cancer, or genital warts). Older women reported lower vaccination intentions than younger women. The authors concluded that messages to mothers about the HPV vaccine for their daughters might be made more effective by framing the vaccine in terms of cancer and sexually transmitted disease prevention.[27]

In 2009, research was done by Wong about preventing cervical cancer through HPV vaccination by getting perspectives from focus groups. Their aim was to assess the mother's knowledge and attitudes toward HPV vaccination. Results were that respondents have low awareness about the newly released vaccine and the link between HPV and cervical cancer. When provided with information about HPV and cervical cancer, most mothers were in favor of protecting their daughters from cervical cancer using the vaccine. As with any new vaccine, efficacy and safety were the major concerns, particularly when the vaccine is recommended to preadolescents. Many expressed concerns about the high cost of the vaccine and hope that the inoculation could be at least partially subsidized by the government. A minority were concerned that the sexually transmitted disease-related vaccine would promote sexual activities, and some opposed making vaccination mandatory.[28]

Healy *et al.* looked into parent and provider perspectives on immunization in 2013. They accomplished the study by the survey of parents and providers (pediatricians, nurses, and medical assistants) in randomly selected practices in Houston, Texas. These surveys assessed demographics, perceptions of immunization importance, safety and efficacy, and acceptability of vaccine delivery. Most surveyed parents believe vaccines are important for child health and rate disease prevention higher than the number of injections entailed. Providers underestimate the importance of some vaccines to parents and overestimate parental concerns regarding the route of administration. They also concluded that future research should focus on how this mismatch impacts parental vaccine decisions.[29]

A question is also included if mothers would be willing if the vaccine was offered for free to their children. Price considerations are a big factor, and in some developed countries, government programs exist wherein the

vaccine is subsidized or given for free. The Philippine Department of Health (DOH) has an existing program which is the Community-Based HPV Immunization Program which started in August 2015. Two doses of HPV vaccines are administered for free to girls aged 9–10 years old in 20 priority provinces. These 20 priority provinces are North Cotabato, Sarangani, Davao Oriental, Sulu, Zamboanga del Sur, Lanao del Sur and Maguindanao in Mindanao; Iloilo and Negros Occidental in Western Visayas; Cebu and Negros Oriental in Central Visayas; Northern Samar, Eastern Samar and Leyte in Eastern Visayas; Quezon, Camarines Sur, Masbate in Southern Luzon; and Apayao, Ifugao, and Pangasinan in Northern Luzon.[30] This program superseded the initial school-based immunization program (SBIP) guidelines because at the last-minute HPV vaccination was pulled out in the SBIP. Hence, what remained in the SBIP were just measles-rubella and tetanus toxoid vaccination.

The HPV vaccination for 9–10-year-old girls pushed through in the community-based program. Coverage to date has been 80% for the first dose and 76% for the second dose, in the 20 priority provinces. For 2017, the target was to vaccinate more than 700,000 girls in 46 provinces and cities. Negotiations were being made between the Department of Education and DOH to bring it back to the SBIP as originally intended by former DOH Secretary Janette Garin.[31] Seven Metro Manila cities were included in 2017.

Significance of the study

Several studies were done globally to assess and determine the association of knowledge, attitude, motivational factors, and parental acceptance of an STI or HPV vaccine. In the local setting, only one study was done in year 2005 and the association of the abovementioned factors with maternal acceptability of an HPV vaccine was not determined. There is a need to do a local study to determine the association of the said factors and maternal vaccine acceptance. There is also a need to update the local healthcare providers general knowledge and attitude of mothers toward HPV disease and the current anti-HPV vaccine since the only research done in the local setting was conducted 10 years ago. The local study enrolled mothers with preadolescent daughters aged 12–15 years.

Latest studies have shown vaccine efficacy and safety among children at earlier ages such as 9–13 years. In this present study, mothers of female children aged 9–13 years were enrolled. The Centers for Disease Control and Prevention recommend the administration of either the bivalent or quadrivalent HPV vaccines among children aged 9–13 years in two doses.[32] Studies have shown strong immunogenicity and long duration of protection against HPV when either vaccine is given to children at these ages.[33] In our country, the Philippine Pediatric Society, Inc.[34] and the Philippine Obstetrical and Gynecological Society, Inc.[35] have both included in their recommendations HPV vaccination among young girls.

Objectives of the study

General objective

The general objective of the study was to determine the association of the knowledge, attitude, and motivational factors of mothers on their willingness for their female children aged 9–13 years to undergo HPV vaccination at the Philippine General Hospital.

Specific objectives

1. To describe the baseline sociodemographic characteristics of the respondents
2. To determine the correlation of sociodemographic variables with
   a. Knowledge of HPV, cervical cancer, and the prophylactic vaccine
   b. Attitudinal factors
   c. Motivation factors.
3. To evaluate the association of the level of knowledge, type of attitude, and type of motivation of mothers towards HPV vaccination and their willingness to accept HPV vaccination for their female children
4. To determine with the use of logistic regression analysis which key domain factor/s is/are predictive of the willingness of mothers to vaccinate their children.

Materials and Methods

Study design

This study used a cross-sectional design among mothers consulting at the outpatient clinics of the department of obstetrics and gynecology at a tertiary government hospital.

Patients and methods

The target population comprised Filipino mothers with daughters aged 9–13 years old, seeking consult at the outpatient clinics of the Department of OB-GYN at a tertiary government hospital.

Inclusion criteria were the following:
1. Women with female children only aged 9–13 years and with good functional status
2. Informed consent.

Exclusion criteria were the following:
1. Women who cannot understand Filipino.

This tertiary government hospital was chosen as a site because the author considered it an institution that

would serve as a cross-section of the population. These women consulting at the outpatient clinics represented the cross-section and an observational study was done to analyze data collected at a specific point in time. Women who satisfied the inclusion criteria were invited by the researcher to participate as they came for consultation at the outpatient clinics until the sample size was reached. Recruitment was voluntary. The purpose of the study and participantal rights were explained in detail by the investigator. Those who agreed to participate were given written informed consent and this was obtained by the researcher.

The questionnaire [Appendix A] was handed over by a research assistant. They were seated in a quiet area of the waiting room at the outpatient clinic, answered about 1 hour, and then were asked to place the completed survey in a locked box upon completion. In case some clarifications were needed, the enumerator assisted the respondents.

For this study, the questionnaire was translated into the vernacular.

The survey requested demographic information including the age of the respondent, gender and ages of children, education, and income. The survey also included religious affiliation, participants knowledge on HPV and its related diseases, and knowledge of the vaccine. It also included items pertaining to the perceived likelihood to vaccinate in general and took into consideration the cost, physician and drug company trust/mistrust, peer reaction, and concern about promoting sexual activity among young girls.

Most items were assessed using a 5-point Likert scale with responses ranging from strongly agree to disagree (1-strongly agree, 2-somewhat agree, 3-neither agree or disagree, 4-somewhat agree, 5-strongly disagree). The survey tool was designed to provide acceptable frequency scales for all items included.

The research protocol was submitted to the Ethics Review Board according to ethical standards of the institution for final approval. The study was carried out in 4 months. The first 3 months were data collection and the last month was the analysis of results and writing of the paper.

Potential biases

Potential selection bias of the sample population included selection bias from undercoverage. Since the researcher only used convenience sampling from a government institution, the mothers invited to participate may have belonged to only one-or two-income brackets. A solution to the problem was to include mothers from the private clinics of the institution or to enroll mothers from a different private institution.

The study may also suffer from non-response bias, as some participants may be unwilling to start and complete the questionnaire. Having the researcher explain the objectives of the study including the benefits of completing the survey questionnaire can minimized this. The enumerator also helped in clarifying any issues the respondent may have.

There could also be interviewer bias. To help minimize or avoid this, only one research assistant was employed by the researcher to standardize interaction with the respondents.

Confounding can also be a potential problem when an observed association is due to three factors: the exposure: knowledge, attitude, and motivational factors of mothers; the outcome: willingness to vaccinate their children; and a third factor which is independently associated with both the outcome of interest and the exposure. Before the study, matching patients for age, gender, and other demographic factors can create similar cohorts among identified confounders. Identified confounders can be controlled by analyzing the association between the exposure (knowledge, attitude, and motivational factors and the outcome (willingness to vaccinate their children) only in cohorts similar for the identified confounder. Regression analysis can be used to control for identified confounders during data analysis.

Statistical consideration

Sample size calculation

The recruitment and data gathering ran for 3 months. There were around 120 mothers seen daily at the outpatient clinics and this translated to around 7200 mothers seen in 3 months. From the local study done by Dr. Domingo and Dr. Castro, the acceptability of the HPV vaccine among mothers studied at that time was 74.5%.[16]

Using Epi Info 7 Software (developed by the Centers for Disease Control and Prevention [CDC], Atlanta, Georgia, USA), with a confidence level of 95%, confidence limits of 5%, and expected frequency of 74.5%, the size was 281 respondents. Assuming a response rate of 80%, the sample size was

$N = 281/0.80 = 351.25$ or 352 respondents.

Statistical analysis

Continuous variables were initially examined in terms of their original distribution before being analyzed as categories. The willingness of mothers to get their children vaccinated was used as the dependent variable for evaluation and quantification of associations.

To evaluate the relationship between the willingness of mothers and sociodemographic, reproductive, and sexual historical variables and knowledge of cervical cancer etiology and the existence of a vaccine, *P* values were estimated using the Pearson Chi-square test or the Fisher exact test.

Logistic regression analysis was used to determine which independent variable such as the knowledge, attitude, and motivational factors of mothers was associated with the outcome (willingness to get their children vaccinated or not).

Results

Sociodemographic characteristics of the respondents were described as to age distribution, mean age, educational attainment, and family income level [Table 1]. The number of female children aged 9–13 years was described as well as religious affiliation and sexual habits.

Using the Likert scale to assess the independent variables (knowledge in Table 2a, atttitude in Table 2b, and motivational factors in Table 2c) the most frequent response or the mode was extracted. A bar chart was used to describe the median values for these independent variables.

Table 1: Baseline demographic characteristics of respondents (*n*=352)

Characteristics	*n* (%)
Maternal age (years)	43±6.43 (24–62)
Age (years)	
20–30	4 (3.23)
31–40	50 (40.32)
41–50	59 (47.58)
51–60	11 (8.87)
Highest educational attainment	
High school level	285 (80.28)
College	54 (15.21)
Diploma	2 (0.56)
Master's	1 (0.28)
Baccalaureate	10 (2.82)
Associate	3 (0.85)
Age of youngest child (years old)	
8–10	197 (55.49)
11–13	158 (44.51)
Annual family income	
<P 60,000	341 (96.06)
P 60–180,000	9 (2.54)
P 180–360,000	3 (0.85)
>P 360,000	2 (0.56)
Frequency of attending church	
Never	1 (0.28)
A few times in a year	68 (19.15)
A few times in a month	140 (39.44)
Weekly	146 (41.13)
Religion	
Roman catholic	340 (95.77)
Protestant	3 (0.85)
Others	12 (3.38)

Descriptive statistics such as mean, standard deviation, frequency, and percentage were used to describe the study population. Cross-tabulations of their responses on the knowledge, attitudes, and motivation items were performed, and a horizontal bar graph to illustrate them was also created.

Pearson's Chi-square tests and Fisher's exact tests were performed to determine the association between sociodemographic variables and knowledge score categories, attitude scores, as well as motivation scores among the respondents. The *Z*-test of proportions was also performed to determine differences between the percentages of categories across these variables.

Survey estimation was also performed to account for linearized point and interval estimates of proportions and regression coefficients [Table 3].

To evaluate the relationship between the willingness of mothers and sociodemographic, reproductive, and sexual historical variables and knowledge of cervical cancer etiology and the existence of a vaccine, *P* values were estimated using Pearson's Chi-square test or Fisher's exact test.

Logistic regression analysis was used to determine which independent variable such as the knowledge, attitude, and motivational factors of mothers was associated with the outcome, which was the willingness to get their children vaccinated (willing or not willing). Forward variable selection was used to adjust for the multivariable model in this study.

Using the survey proportion estimation methods, the prevalence of women who were willing to enroll their daughters for HPV vaccination was 97.18% (n = 42, 95% CI: 94.91 to 98.46%). It can be noted that only a third of the sample had high knowledge on the vaccine and its use 34.93% (n = 124, 95% CI: 30.25 to 39.92%).

It was noted that more women who reached college level (χ^2: 5.67) and also those whose youngest child was between 11 and 13 years old (χ^2: 8.82)-had higher knowledge scores than otherwise. Those who have an annual income of greater than or equal to *P* 60,000 (χ^2: 16.55) and are non-Catholic (χ^2: 18.77) – also appeared to have higher knowledge ratings on the questionnaire. Women who never to a few times a year attend church-related activities had higher knowledge scores compared to women who were more frequent goers (χ^2: 16.33).

Table 2a: Level of knowledge of human papillomavirus across demographic variables (*n*=352)

Characteristics	Good knowledge, *n* (%)	Moderate, *n* (%)	Poor knowledge, *n* (%)	*P*
n (%)	124 (34.93)	99 (27.89)	132 (37.18)	
Age (years)				
20–30	4 (3.23)	1 (1.01)	6 (4.55)	0.70
31–40	50 (40.32)	43 (43.43)	46 (34.85)	
41–50	59 (47.58)	47 (47.47)	67 (50.76)	
51–60	11 (8.87)	8 (8.08)	13 (9.85)	
Educational attainment				
High school level	92 (32.28)	86 (30.18)	107 (37.54)	0.05*
College level	32 (45.71)	13 (18.57)	25 (35.71)	
Age of youngest child (years old)				
8–10	58 (29.44)	66 (33.50)	73 (37.06)	0.01**
11–13	66 (41.77)	33 (20.89)	59 (37.34)	
Annual family income				
<P 60,000	112 (32.84)	98 (28.74)	131 (38.42)	0.01**
≥P 60,000	12 (85.71)	1 (7.14)	1 (7.14)	
Frequency of attending church				
Never to rarely	34 (49.28)	18 (26.09)	17 (24.64)	0.01**
A few times in a month	33 (23.57)	45 (32.14)	62 (44.29)	
Weekly	57 (39.04)	36 (24.66)	53 (36.30)	
Religion				
Roman catholic	111 (32.65)	99 (29.12)	130 (38.24)	0.0**
Others	13 (86.67)		2 (13.33)	

*P 0.05 = statistically significant, **P 0.01 = statistically significant

Table 2b: Type of Attitudes toward human papillomavirus vaccine use across demographic variables

Characteristics	Negative attitude, *n* (%)	Positive attitude, *n* (%)	*P*
n (%)	126 (35.49)	229 (64.51)	
Age (years)			
20–30	4 (36.36)	7 (63.64)	0.68
31–40	53 (38.13)	86 (61.87)	
41–50	56 (32.37)	117 (67.63)	
51–60	13 (40.63)	19 (59.38)	
Educational attainment			
High school level	93 (32.63)	192 (67.37)	0.03*
College level	33 (47.14)	37 (52.86)	
Age of youngest child (years old)			
8–10	65 (32.99)	132 (67.01)	0.27
11–13	61 (38.61)	97 (61.39)	
Annual family income			
<P 60,000	114 (33.43)	227 (66.57)	0.01**
≥P 60,000	12 (85.71)	2 (14.29)	
Frequency of attending church			
Never to rarely	32 (46.38)	37 (53.62)	0.01**
A few times in a month	30 (21.43)	110 (78.57)	
Weekly	64 (43.84)	82 (56.16)	
Religion			
Roman catholic	113 (33.24)	227 (66.76)	0.01**
Others	13 (86.67)	2 (13.33)	

*P 0.03 = statistically significant, **P 0.01 = statistically significant

It can be noted that more women whether they finished high school or college had much more positive attitudes toward the use of the vaccine (χ^2: 5.17). Women with less than PhP 60,000 income had more positive attitudes towards HPV use than otherwise (χ^2: 16.06). There were more women who are of Roman Catholic faith (χ^2: 17.91) and attend religious activities a few times in a month (χ^2: 20.10) – also appeared to have more positive attitude ratings on the questionnaire than their counterparts.

It was noted that most women who attend religious activities a few times in a month had more positive motivations towards the use of the vaccine while those who weekly attend church-related activities have more negative motivation scores (χ^2: 51.78). At the same time, women who practice faith aside from Catholicism had more negative motivation ratings than otherwise (χ^2: 6.53).

Based on the items in the questionnaire, the first three questions in Table 4 were worded to discern negative attitudes toward the vaccine, while the remaining items determine positive attitudes. There was an association in the degree of agreement between these dichotomized attitude questionnaires from the Chi-square test performed (χ^2: 7.44, P: 0.01). There were more agreeing responses from the last four items and more disagreeing responses in the first three questions.

Based on the items in the questionnaire, the first 3 questions in Table 5 represented possible barriers toward the use of HPV vaccine, while the remaining items determined facilitating aspects. There was no difference in the proportion of agreeing responses between positive

Table 2c: Type of motivation toward human papillomavirus vaccine use across demographic variables

Characteristics	Negative motivations, *n* (%)	Positive motivations, *n* (%)	*P*
n (%)	169 (47.74)	185 (52.26)	
Age (years)			
20–30	4 (36.36)	7 (63.64)	0.29
31–40	62 (44.60)	77 (55.40)	
41–50	91 (52.60)	82 (47.40)	
51–60	12 (38.71)	19 (61.29)	
Educational attainment			
High school level	131 (46.13)	153 (53.87)	0.22
College level	38 (54.29)	32 (45.71)	
Age of youngest child (years old)			
8–10	93 (47.21)	104 (52.79)	0.82
11–13	76 (48.41)	81 (51.59)	
Annual family income			
<P 60, 000	159 (46.76)	181 (53.24)	0.10
≥P 60, 000	10 (71.43)	4 (28.57)	
Frequency of attending church			
Never to rarely	33 (47.83)	36 (52.17)	0.01**
A few times in a month	36 (25.90)	103 (74.10)	
Weekly	100 (68.49)	46 (31.51)	
Religion			
Roman catholic	157 (46.31)	182 (53.69)	0.02*
Others	12 (80)	3 (20)	

*P 0.02 = statistically significant, **P 0.01 = Statistically significant

Table 3: Logistic regression analysis

Predictors	Crude OR (95% CI)	*P*	Adjusted OR (95% CI)	*P*
Knowledge score	1.84 (1.15–2.96)	0.01*	1.68 (1.05–2.70)	0.03*
Scores on positive attitude items	1.72 (1.07–2.76)	0.02*	0.58 (0.29–1.15)	0.12
Scores on negative attitude items	0.44 (0.26–0.74)	0.01*	0.29 (0.13–0.65)	0.01*
Scores on positive motivation items	1.21 (0.78–1.89)	0.39	2.12 (0.44–10.11)	0.34
Scores on negative motivation items	0.96 (0.60–1.54)	0.86	2.81 (0.54–14.73)	0.58

*P 0.03 = statistically significant. OR: Odd ratio, CI: Confidence interval

Table 4: Attitude toward human papillomavirus vaccine (*n*=352)

Items	Strongly agree, *n* (%)	Agree, *n* (%)	Disagree, *n* (%)	Strongly disagree, *n* (%)
Getting the vaccine will send a message to young girls that it is OK/alright to have sex	53 (14.93)	59 (16.62)	110 (30.99)	29 (8.17)
I would not seek this vaccine for my daughter because of my religious beliefs	37 (10.42)	64 (18.03)	109 (30.70)	35 (9.86)
I would not want people who go to my church to know that my daughter got the HPV vaccine	30 (8.45)	66 (18.59)	109 (30.70)	35 (9.86)
Getting the vaccine will have no have effect on a girl's sexual activity	43 (12.11)	67 (18.87)	114 (32.11)	17 (4.79)
I can be a role model for parents by getting this vaccine for my daughter	64 (18.03)	74 (20.85)	98 (27.61)	14 (3.94)
I believe my religion would support this vaccine for girls	45 (12.68)	66 (18.59)	110 (30.99)	24 (6.76)
I believe that other parents who go to my church will get this vaccine for their daughters	47 (13.24)	69 (19.44)	108 (30.42)	17 (4.79)

HPV: Human papillomavirus

and negative motivating factors among the study participants (Z: 0.30, P: 0.79). This suggested that these factors could be important predictors of willingness to use vaccination on their children.

Based on the crude odds ratios (OR) from the logistic regression, the likelihood of being willing to administer the HPV vaccine to their children was almost twice as the knowledge score and scores on the positive attitude items increases, and was found to be statistically significant. At the same time, the odds of willingness increased by more than twice as the score on the negative attitude items decreased, and was also significant. There was no noted association for the other predictors of the association.

Table 5: Motivational factors (*n*=352)

Items	Strongly agree, *n* (%)	Agree, *n* (%)	Disagree, *n* (%)	Strongly disagree, *n* (%)
The cost of the vaccine will prevent my family from getting it for my daughter/s	72 (20.28)	128 (36.06)	82 (23.10)	13 (3.66)
I would be more willing to get this vaccine for my daughter if only two (2) doses are required rather than three (3) doses	90 (25.35)	92 (25.92)	83 (23.38)	14 (3.94)
I am concerned that my family and friends would view me as a bad parent if I allowed my daughter to get this vaccine	101 (28.45)	71 (20)	89 (25.07)	27 (7.61)
I intend to get the vaccine for my daughter and/or recommend it for female family members	69 (19.49)	122 (34.46)	80 (22.60)	14 (3.95)
I would be more than willing to get this vaccine for my daughter if I knew other parents were doing so	82 (23.10)	109 (30.70)	81 (22.82)	21 (5.92)
I am not concerned about what other parents think of my child getting this vaccine	102 (28.73)	73 (20.56)	87 (24.51)	18 (5.07)
I would be more than willing to get this vaccine for my child if my doctor recommended it	112 (31.55)	75 (21.13)	87 (24.51)	12 (3.38)
I do trust drug companies that make the HPV vaccine	105 (29.58)	79 (22.25)	90 (25.35)	11 (3.10)
I believe that the HPV vaccine should be mandatory for all girls entering middle school	88 (24.79)	85 (23.94)	97 (27.32)	14 (3.94)
I am concerned that my daughter may be affected by cervical cancer someday	91 (25.63)	87 (24.51)	95 (26.76)	13 (3.66)

HPV: Human papillomavirus

Discussion

From the literature, it is known that HPV is a necessary cause of cervical cancer. It is well demonstrated in research that chronic infection will cause about 99.7% of invasive cervical cancers.[36] This is not surprising considering that HPV is the most common STI globally with a prevalence of 42.5% among women aged 14 to 59 years. Various types of HPV were studied. About 90% of benign conditions such as genital warts are caused by types 6 and 11. Oncogenic types 16 and 18, on one hand, account for 70% of cervical cancer globally.[37]

In the year 2006, the first anti-HPV vaccines were licensed for use, the quadrivalent and the bivalent vaccines. Cervical intraepithelial neoplasia is the precursor to cervical cancer. Up to 96% of HPV 16-and HPV 18-related cervical intraepithelial neoplasia cases can be prevented by both vaccines. The advantage of the quadrivalent vaccine is that it also is prophylactic against genital warts and it can also prevent vaginal, vulvar, and anal dysplasia.[38]

Since vaccines are mainly prophylactic, the earliest age of immunization is very important. Vaccine efficacy can be optimal if the anti-HPV vaccine is given before coitus. The recommended youngest age to administer the product is 9 years old. This is mainly because this age represents the age limit cutoff for clinical trials. Moreover, since the vaccine is prophylactic, the acquisition risk was estimated through the age of sexual initiation. In the US, one out of four females reported being sexually active by age 15, four out of ten by age 16, and seven out of ten by age 18 years.[39] The risk of acquiring HPV infection is also based on exposure probability since viral infection sets in after few years of first coitus. A study among college women revealed that about 39% were infected after 2 years of sexual activity. Another study involving adolescents aged 13 to 21 years, showed that about 70% had the infection within 5–7 years from first sexual contact.[39]

The first was the one done by Zalameda-Castro and Domingo (2007) which showed vaccine acceptance of 75.4%.[16] In this present study, it is shown that the prevalence of mothers willing to have their daughters vaccinated is very high at 97.18%. Hence, so far, this is the highest percentage of willingness among similar researches related to HPV vaccination acceptance. The study by Ezeanochie and Olagbuji in 2014 showed maternal vaccine acceptance of 70%[19] and that of by Godoy Verdugo *et al*. in 2013 was 89%,[20] and research done by Choi *et al*. in Hong Kong vaccine acceptability among mothers was only 37.6%.[21] For this current study, the increase in vaccine acceptance can be explained by more knowledge of the disease and the vaccine, greater provider recommendations, and increased desire to prevent cancer among their daughters. These factors were also seen in the research done by Jeudin *et al*. in 2013 in the United States that proved that vaccine acceptance was higher among Asian races compared with other ethnic groups residing in the USA.[40]

For the demographic variables, it was shown that more women who finished college (χ^2: 5.67) had higher knowledge scores about HPV. This means that mothers who were college graduates were more aware of the availability of the anti-cervical cancer vaccine and that HPV is a sexually transmitted virus that can cause cervical cancer [Table 1]. From the landmark study of Dr. Domingo and Dr. Castro in 2006, it was evident at that time that there was little knowledge as only 31.8% of the respondents knew of the virus compared with this present study wherein there was moderate-to-good knowledge of the virus among 62.82% of the respondents.[16] Previous surveys showed that

HPV vaccine acceptance was lower among women who had limited knowledge and had language barrier.[41] In a span of around more than 10 years, more Filipinas are educated. The functional literacy rate (10 to 64 years old; basic reading, writing, and computational skills) in the year 2003 of 84.1% increased to 90.3% and more women are finishing at least secondary school and college. According to the Philippine Statistics Authority in 2013, more women were finishing college than men.[42] Five percent of women took college in 2000 compared with 11.4% in 2013. This increase in education may have contributed to the parallel increase in knowledge about HPV and its disease and associated genital cancer. This is also similar to previous studies done by Maness *et al*., that showed that a college degree had higher knowledge of HPV [Table 2b].[43] This means that HPV education should be increased among Filipinos with lower education, as more knowledge about HPV and its associated diseases can influence childcare decisions within the family, and this will ultimately impact vaccination uptake. The questionnaire also included knowledge that the vaccine may be available at their local health centers (LHC) and more women answered that they are aware that it is available in their LHC. With the recent DOH campaign and program on HPV vaccination, it can be said that the campaign was successful. In fact, free HPV vaccines were given to 10–14-year-old female children among selected schools. Information material was handed over to parents and informed consent was obtained from parents. This entails that parents are more accepting of the HPV vaccine as long as they are well-informed.[44]

Women with children aged 11 to 13 years had higher knowledge scores compared with women with children aged 8 to 10 years [Table 2a]. This demonstrates that our own DOH and healthcare professionals were successful in promoting information about HPV and sexual transmission and its relation to genital cancers. In our local setting, our government has been successful in promoting childhood vaccination. In 2014, the DOH trained about 11,000 nurses in vaccination. This has helped to educate parents and has helped the government reach its goal of close to 95% vaccination coverage among children under 5 years of age. The DOH was also successful in giving out free measles-mumps-rubella and tetanus toxoid booster doses to grades 7–10 adolescents or 1st–4th-year high school students. These were children aged 11 to 14 years of age and this reflects the popularity of vaccination among parents of this age group as shown in this current study.[45]

With regard to family income, those mothers with family income of more than PHP 60,000 a year had more knowledge than those with lesser annual income. The annual family income of PHP 60,000 was chosen for this study and was based on the Philippine Statistics Authority 2015 Family Income and Expenditure Survey.[46] In a study on why children were not vaccinated conducted by Favin *et al*. in the year 2012, one of the key factors of undervaccination of children was family characteristics. The authors identified poverty since mothers have competing priorities, and they were being socially alienated and they frequently encounter financial barriers.[47] Having a low family income also translated to having mothers not being well educated and not exposed to immunization practices for their children. Moreover, in another research conducted by Jeudin *et al*. in 2013, it was also demonstrated that Asians living in the United States in poverty had limited knowledge of the HPV vaccine and had poor vaccine acceptance.[40] In the local study by Drs. Domingo and Castro out of 195 subjects, only 28 mothers or 14.4% at that time had heard of the HPV and its relation to cervical cancer though the vaccine acceptance was high at 75.4%.[16]

With regard to religion and level of knowledge for HPV, those who were non-Catholic appeared to have higher knowledge rating (32.65% vs. 86.67% in favor of non-Catholics, $P = 0.01$), as well as women who never to a few times a year attend church-related activities had higher knowledge scores compared to those who were more frequent goers. In 2014, the WHO Strategic Advisory Group of Experts on Immunization conducted an interview study with immunization managers in 13 selected countries to understand vaccine hesitancy determinants. Results showed that in one country, some Catholic groups had vaccine refusal. This is related to religious beliefs of the apostolic religion and they were also the group that were reluctant to bring their children to the hospital for immunization.[48]

For the relation of maternal age and attitude toward HPV vaccination for their children, there was no significant difference among the different age groups of the mothers. This was in congruence with a study done in Honduras which also showed that attitude toward immunization was the same across all age groups of the mothers interviewed.[49] Another study conducted in Germany revealed that attitude to HPV vaccination for their children was not related to maternal age.[50] The authors concluded that it was education that was more important in determining parental attitude to vaccination.

With regard to the relation of the type of attitude toward the HPV vaccine and demographic profile, it was noted that more women whether they finished high school or college ($P = 0.03$) had much more positive attitudes toward the use of the vaccine (χ^2: 5.17). Women with less than *P* 60,000 income had more positive attitudes toward HPV vaccine use than otherwise (χ^2: 16.06). More women who are of Roman Catholic faith (χ^2: 17.91) and those who attended religious activities a few times in a month (χ^2: 20.10) appeared to have more positive

attitudes than their counterparts. This was in contrast to a Korean study done in 2016 among mothers of female adolescents wherein it was shown that as the level of education rose, women had more negative attitudes toward the vaccine for their daughters. The authors cited the main reason for this was that more mothers would have been concerned about the possible side effects of the vaccine with increasing levels of education.[51] In a study in Nigeria, the positive attitude among mothers increased with a higher level of education. The authors explained that higher educational qualifications had higher awareness of HPV vaccines than those less educated.[52]

In our own study, women who finished high school and college had positive attitudes toward the vaccine ($P = 0.01$). This can be explained by the fact that Filipino women with higher education have more access to the Internet and informational material. According to McCann World group's study on Truth about Moms, Filipino mothers look for "wellness in everything," and they use technology to find the most advanced solutions and best options to protect their children from all harm. This included the use of the Internet.[53]

It was also noted that women with a family income of less than PHP 60,000 per year had more positive attitude toward vaccination for their children than those who earned more ($P = 0.01$). This was in contrast with most studies done abroad, wherein higher income was often associated with positive attitudes toward HPV vaccination. In a survey done in Turkey, mothers cited expenses as the main reason for not vaccinating their children.[54] Another study recently conducted in Shandong, China, among 1578 mothers who had daughters aged 9–17 years revealed that women who had low family earnings had negative attitudes toward HPV immunization for their daughters. The other factor cited in this study was low knowledge of the virus and the diseases among mothers with low education.[55] Our current study, though, was in concordance with very recent research conducted in Thailand wherein it was demonstrated that mothers belonging to lower income levels had more positive attitudes toward HPV vaccination. Mothers belonging to lower-income brackets in this Thai study perceived more benefits compared to parents with a higher income.[56] This could be explained by the fact that women whose families earn less may have been recipients of free vaccines given by the government compared to families belonging to higher income levels. Belonging to higher income may also mean higher education and more negative attitudes toward vaccination as mothers may have negative notions about vaccine-related adverse effects and have more concerns regarding vaccine efficacy. This was also seen with the school-based vaccination program given by our own DOH wherein there was some hesitancy among mothers. The success rate for our own program was only 64% due to parental hesitance that included fears of vaccine side effects.[57]

There was more positive attitude among women belonging to the Roman Catholic Religion and among those who attended religious activities a few times a month than their counterparts ($P = 0.01$). This was congruent with the Thai study that found that having a religious belief was correlated with positive attitudes toward HPV vaccination. The explanation could be that parents who reported that religion is an important factor have a strong belief in "good or bad things." Some believe that the risk of cancer can be real and the vaccine is the solution to resolve this.[58] In contrast, a recent study in the United States revealed that mothers who attended more church services had negative attitudes and less favorable beliefs compared with their counterparts who do not have a religion.[59] This was also congruent with a UK study that revealed that parents who belonged to a religion had more negative attitudes and fewer acceptances toward HPV vaccination.[60] Some studies showed that religion did not influence parental attitudes toward HPV vaccination. A study conducted in Canada[61] indicated that religion was not an important factor in determining attitudes toward vaccination, as well as another study conducted in Sweden[62] also demonstrated that religion did not affect parental attitude to HPV vaccination. We can realize the differences among different countries with regard to the influence of religion on HPV vaccine acceptance. Religion is an important part of culture and different religious beliefs would have varied influences on attitudes to immunization.

With regard to the relation of demographic factors with motivational factors, the same trend was seen with having positive attitude. Most women who attended religious activities a few times a month had more positive motivation toward the use of the vaccine than those who weekly attended church-related activities. At the same time, women who belong to Catholicism had more positive motivation ratings than otherwise. A survey done among guardians of girls in 2012 in Argentina showed that motivational factors were not significantly different among different religions,[63] although the predominant religion in that study was Roman Catholicism, which was similar with our local study. Whereas a qualitative study among African parents residing in a city north of England revealed that having a strong religion was one of the factors for negative motivation toward HPV vaccination for the main reason that religious beliefs and principles were shaping a child's behavior so that their risk was greatly reduced due to good moral behavior, and so the prophylactic vaccine is not needed.[64] In our own local study, women who were Roman Catholics

had strong motivation to giving the HPV vaccine. This could be explained by the fact that Catholics believe that it was possible to separate the decision to vaccinate from any implied encouragement of sexual behavior. In fact, the Catholic Medical Association (CMA) stated in a position paper in 2007 that the prevention of disease is a moral good regardless of the behavior that caused the disease.[65] The CMA opposed mandating HPV immunization as the requirement for school entry, not due to religious aspects, but citing respect for parental autonomy and stating that HPV is not communicable through ordinary respiratory contact and hence it does not pose a health risk. Some Filipino parents also frame the HPV vaccine not in terms of sexual activity, but rather they see it as a cancer-prevention vaccine, thus, lowering any idea of engaging in early premarital sex.

For the other demographic factors, there were no significant differences with regard to motivation toward the use of the HPV vaccine for their daughters.

On assessment of attitude toward the HPV vaccine [Table 4], based on the items of the questionnaire, the first three questions were worded to discern negative attitudes toward the vaccine, while the remaining items determined positive attitudes. It was noted that there was an association in the degree of agreement between these dichotomized attitude questionnaires from the Chi-square test performed (χ^2: 7.44, *P*: 0.01). There were more agreeing responses from the last four items and more disagreeing responses in the first three questions. For the first three items, most of the mothers disagreed when they were asked if the vaccine would send a message to young girls that it is all right to have sex. Most mothers also strongly disagreed when asked if they would not seek this vaccine because of their religious beliefs, and when asked if they would not want people who go to their church to know that their daughters got the HPV vaccine.

From the latest Young Adult Fertility and Sexuality Study in the Philippines Study in the year 2013[66] to look into updated information on different ranges of sexuality and reproductive health issues among Filipino youth, it revealed that the youth (aged 15–19 years, younger cohort and 20–24 years, older cohort) in a live-in relationship increased from 5.9% in 2002 to 13.8% in 2013. The results also indicated that there was an increasing trend in the proportions of youth engaging in early sexual activities (sexual activity before age 18). It increased from 13% in 1994 to 23% in 2013 and among females, there was an increase from 12% in 1994 to 22% in 2013. These data implicate the increased exposure to risk of reproduction and STIs among our youth, including HPV infection. These facts prove the need for awareness of the infection and the significance of promoting the prophylactic anti-HPV vaccine.

From our current study, it showed that more mothers agreed to have their daughters vaccinated against HPV and that they do not believe that the vaccine will be a license to having sex. This paralleled the results from a study done[67] by Schuler *et al*. to identify characteristics of parents who believe in sexual disinhibition after HPV vaccination for their daughters. From this research, the authors demonstrated that few parents believe that the HPV vaccine is likely to lead to increased sexual activity among female daughters. It is important to characterize parents who have beliefs in behavioral disinhibition as healthcare providers encountering parents who may have the need for information about this population.

With regard to attitude toward vaccination and religious beliefs, it was demonstrated that mothers had a positive attitude on the HPV vaccine in the sense that the majority (30.70%) disagreed that they would not get the vaccine for their daughters because of their religious beliefs and that majority also disagreed that they do not want other churchgoers to know that their daughters got the vaccine. This meant that mothers did not give their willingness based on their religion. They also do not want to keep other churchgoers from knowing the vaccine status of their children. These results were in contrast to the study published by Dubé *et al*. in 2014 regarding[48] mapping vaccine hesitancy with country-specific characteristics, wherein it was shown that religious beliefs are often a causal factor. In this study, the authors noted that religious beliefs were linked to refuse all vaccines and not just the HPV vaccine. They cited a Catholic pro-life group that identified the tetanus toxoid vaccine as a contraceptive hormone that brings about abortion or infertility among women. It was also a Catholic group that opposed the HPV vaccine and this was most likely due to concerns that the vaccine would be a license to early sexual activity and promiscuity. The specific countries, though, were not identified in the paper. The differences in this current study and the research by Dubé *et al*. proved that among Filipinos, religion is not a strong factor in vaccine acceptance. Other factors were more important in determining vaccine acceptance such as mass communication and media environment, "internet stories," geographic barriers, and general lack of knowledge among recipients and healthcare providers.[48]

In another study by Ruijs *et al*. conducted in the year 2011[68] and published in the year 2012, the majority of the parents surveyed reported having fears that they had made the wrong decision to vaccinate their children. The parents also in that study interpreted the side effects as a possible punishment from God and served as a warning sign to stop vaccinating.

In the Philippines, women are now more educated and they do not allow religious beliefs to influence decisions

regarding vaccination. In the research by Dubé *et al*.,[48] it was also shown that the population often misperceives nonserious adverse events after immunization. In this current study, religious beliefs did not influence many mothers' decisions toward vaccination. This implies that Filipino mothers now are more independent and do not allow religion to influence healthcare decisions.

For the motivational factors [Tables 2c and 5], the questions included the cost of the vaccine, dosing frequency, the influence of other parents, recommendations of doctors, trust with drug companies, and knowledge that their daughters may be afflicted with cervical cancer in the future. The first three questions in the questionnaire represented possible barriers toward the use of the HPV vaccine, while the remaining items determined facilitating aspects. It was noted that there was no difference in the proportion of agreeing responses between positive and negative motivating factors among the study participants (Z: 0.30, P: 0.79). This suggested that these factors could be important predictors of willingness to use vaccination on their children.

Most mothers agreed (36.06%) that the cost would prevent them from getting the vaccine for their daughters. This is in agreement with the study done by Dr. Domingo and Dr. Castro[16] wherein they showed that the main reason for nonacceptance was the prohibitive cost of the vaccine. Several other studies on HPV vaccine acceptance showed that cost was one of the barriers to immunization. A systematic review done by Holman *et al*. in 2014 about barriers to HPV vaccination among US adolescents revealed that[69] financial concerns and parental attitudes were barriers to providing the vaccine to patients. In this review, the authors identified vaccine's effect on sexual behavior, low perceived risks of infection, social influences, and vaccine cost as potential barriers among parents. In a study by Katz *et al*. in a US community in Tennessee[70]-specific barriers to HPV vaccine were cost, side effects, and sociocultural factors including poor attitude toward preventive health, and lack of privacy. In a study done by Tan and Thirumoorthy regarding barriers to HPV vaccination in Asian countries in 2017,[71] reasons given by respondents included fear of side effects, cost, the need for three doses, and the perception that they will not get HPV-associated diseases. In all these studies about barriers to vaccination, it is evident that cost is a prime consideration in nonacceptance of the HPV vaccine.

For the number of doses needed, it was highly evident that the majority of mothers agreed that they are willing to get the vaccine for their daughters if only two doses were needed. The majority of immunization products require complete three doses for full protection and this includes the HPV vaccine. Among the pediatric vaccines that require three doses are diphtheria, tetanus, acellular pertussis vaccine, pneumococcal conjugate vaccine, inactivated poliovirus, rotavirus vaccine, and the hepatitis B vaccine.[72] Although three-dose regimens are with proven safety and efficacy, multi-dose schemes are very expensive. Even in developed countries such as the United States, three-dose regimens of the HPV vaccine are difficult to complete. In a review by the Centers for Disease Control and Prevention in the United States, in the year 2012, only about 38% of teen girls received all three doses and this was considered to be "unacceptably low." The need for three doses posed challenges and costs and timing are important factors. Studies were underway in the past few years that proved the efficacy and safety of two-dose regimens for children and teens aged 9 to 14 years and on October 19, 2016, the CDC recommended two vaccine doses for HPV vaccine for children and teens aged 9–14.[73] Reducing the vaccine doses will definitely result in reduced costs and greater adherence.

Another possible barrier to vaccination was the concern that family and friends would view the respondent as a bad parent if she allows her daughter to get the HPV vaccine. The implication was that mothers who consented to vaccination might allow their daughters to engage in early sexual activity. More mothers responded positively to this item. In the Filipino community, religion is a strong cultural factor. In a predominantly Christian and Catholic country, engaging in early sexual relations is considered a sin. The HPV vaccine could be viewed as a potential license to engage in early sexual relations and this was proven in various prior studies. A systematic review of the literature conducted in 2013 among US adolescents showed the barriers among parents are concerns about the effect on sexual behavior, low perceived risks of infection, social influences, irregular preventive care, and vaccine costs.[69] The authors concluded that continued efforts are needed to be sure that both healthcare professionals and parents understand the significance of immunizing adolescents before they engage in sexual activity. Another systematic review conducted in 2013 about barriers to facilitators to HPV vaccination of young women in high-income countries included 41 studies.[74] One of the factors identified was that parents do not allow their daughters to be vaccinated based on cultural or religious perceptions about sexual activity. In the local study done by Dr. Domingo and Dr. Castro,[16] a significant reason for nonacceptance is that it might promote unsafe sexual behavior among adolescents. In contrast, an updated study[75] looking into the facilitators and barriers of HPV vaccination among adolescents and their parents in Hong Kong, showed that parents were not concerned that their daughter would engage in early sexual activity. Few parents indicated that they were worried about the perceived perception of promiscuity.

In this particular study, the reasons given by parents for not vaccinating their daughters were possible side effects and effectiveness of the vaccine. More than 80% of parents in this study indicated that the link between HPV vaccination and promiscuity was not a concern. The majority were not concerned on the perception that their daughters would be sexually active at an early age or that the vaccine would encourage them to begin having sex earlier. This proved the contrast of a predominantly Christian country as opposed to a non-Christian country.

More parents in this study answered that they were willing to get this vaccine for their children if their doctors recommended it. This is in congruence with the majority of studies conducted about parental acceptance. In a study conducted in a California pediatric practice,[76] it proved that the most common reason for accepting the vaccine was the strength of provider recommendation (84.1%) and available information (63.4%). The authors stressed the importance of the strength of physician recommendations and improved public education about HPV vaccines. In a recent systematic review and meta-analysis[77] done in determining factors influencing vaccine acceptance in South East Asian and Western Pacific Regions, it was shown that negative factors were lower level of knowledge and less confidence in the safety and efficacy of the vaccine, perception of high price, low perception of contracting HPV infection, and lack of concrete recommendations from healthcare providers. Another study done in the USA among parents exploring facilitators and barriers to the HPV vaccine initiation and completion showed that healthcare provider recommendation was a very important factor in the decision to vaccinate their children.[78] In our own setting, Filipino patients still have very high regard for their family doctors and they treat doctors and other healthcare professionals with respect and authority.[79] These results were also in congruence with a study done in 2011 in the US that concluded that among other factors, it was physician recommendation, which was the top reason for intent to receive any of four adolescent vaccines.[80]

Regarding trust with vaccine manufacturers, more mothers expressed trust with drug companies. This parallels a study done regarding vaccine acceptability among women in the Philippines[81] in 2010, which revealed that 87.4% of the respondents had trust in the companies that make the vaccines. Majority of the respondents even believed that vaccine manufacturers have a role in lobbying for drafting legislation on immunization policies.[82] This is in contrast, on one hand, to a study conducted in European countries wherein results showed distrust of pharmaceutical companies among other factors such as general population hesitancy due to safety issues, lack of awareness, and low perceived severity of illness.[83] In our local setting, most women and their families are well influenced by physicians and along with this, comes trust in pharmaceutical companies.

More women did not agree that the HPV vaccine should be mandatory for all girls entering middle school (ages 13–14 years). This is in contrast to a study done by Kane *et al*.[84] in 2012 regarding the implementation of HPV immunization in the developing world wherein it was shown that in the developing countries that were included, school-based HPV immunization is a well-accepted strategy.[84] Another study done in the US regarding the acceptability of school-based health centers for HPV vaccination showed high acceptability among both parents and adolescents. They expressed favorable attitude to this strategy.[85] Our own DOH has an existing school-based strategy with other vaccines such as measles vaccine, and tetanus-diphtheria vaccine wherein the target rate is 95% coverage among grade 1 students.[86] Low success rate of 64% coverage was attributed to delayed procurement of the said vaccines and low parental consent.[87] Our own DOH was also very successful[44] in implementing the school-based HPV immunization program among about 722,000 grade 9 female students. Mothers in this current study showed reluctance to school-based HPV immunization programs. The main reasons for low acceptability may be due to lack of awareness about this strategy.

Regarding the concern that their daughters may be affected by cervical cancer in the future, there was not much difference in the proportion of agreeing and disagreeing responses. This means there should be increased awareness of HPV. This is consistent with other studies mentioned above that proved that a relevant factor in reluctance or vaccine hesitancy was lack of knowledge about HPV and its relation with cervical cancer. There was in general low perception of disease causality.[83] In one study conducted in Brazil in 2010, only 7% of primiparous women had knowledge of HPV and its causality with cervical cancer.[87] The authors concluded that these young low-income primiparous women could benefit much from educational interventions to encourage cervical cancer prevention programs.

A parallel study done among Chinese women in 2017 revealed that about 26.5% of women surveyed were aware of the role of HPV in cervical cancer but knowledge about the vaccine was rather low.

In the local study by Zalameda-Castro and Domingo [16], only 31.8% of respondents were aware that HPV was a causative factor in cervical cancer. This demonstrated a rather low knowledge of mothers at that time of HPV and cervical cancer. There was not much improvement in the knowledge of mothers about HPV and cervical

cancer. This is an area where healthcare professionals and agencies can intervene to promote knowledge among the general population.

Based on the crude ORs from the logistic regression [Table 3], the likelihood of being willing to administer the HPV vaccine to their children was almost twice as the knowledge score and scores on the positive attitude items increases, and was found to be statistically significant. At the same time, the odds of willingness increased by more than twice as the score on the negative attitude items decreased, and were also significant. There was no noted association for the other predictors of the association.

Adjusted ORs were computed to account for the interplay of these variables with each other and clarify the association. The likelihood of willingness among these women increased almost twice as the knowledge scores increased; and the same likelihood increased more than three times as the scores on the negative attitude items decreased. There was no noted association in the other variables from the adjusted model.

Conclusion

This current study showed that the prevalence of women willing to get their daughters vaccinated with anti-HPV vaccine was very high at 97.18% although only one-third of women surveyed had high knowledge of the vaccine (34.93%) and its utility. The higher the educational attainment of the respondent, the greater the knowledge about HPV and the associated vaccine. Women who had children aged 11 to 13 years also had higher knowledge of the virus and the causality with cervical cancer and the vaccine. It appeared also those women who had higher family incomes and were non-Catholic had higher knowledge about HPV and its related diseases and the availability of the vaccine.

For the attitudinal factors, the majority of mothers did not believe that getting the vaccines would be a license for their daughters to engage in sex. Most women considered that religion would not be a deterrent in seeking the vaccine for their female children. The subjects, though, negatively responded to being a role model for other parents if they get the vaccine for their daughter, and most believed that their religion would not support this vaccine. As also mentioned above, women are now more educated and they do not allow religious beliefs to influence decisions regarding vaccination. This implies that Filipino mothers now are more independent and do not allow religion to influence healthcare decisions.

There was an association in the degree of agreement between these dichotomized attitude questionnaires from the Chi-square test performed (χ^2: 7.44, P: 0.01). There were more agreeing responses from the positive attitudes and more disagreeing responses in the negative attitudes toward the vaccine.

For the motivational factors, the cost of the vaccine did not appear to be a hindrance to getting the vaccine, and more women were willing if only two doses were recommended. Most also intended to get the vaccine for their daughters and for other female family members. Physician recommendations and trust in vaccine manufacturers were also positive factors in getting the vaccine for their daughter.

As such it can be said that the role of knowledge and attitudes on the negative perceptions on the vaccine were important predictors of willingness for the vaccine (with $P < 0.05$).

It is implicated that there is a strong need to increase knowledge of HPV and the associated disease, that cervical cancer, and the prophylactic vaccine to increase the willingness of Filipino mothers to have their female children vaccinated. Healthcare providers together with our own government health agencies should put as a priority, making concerted efforts to decrease negative attitudes toward HPV immunization.

Every effort should be made to increase or improve the knowledge of the general population about HPV and its relation with genital warts and cervical cancer. In the existence of knowledge gaps among populations, targeted communication is very relevant to enhance dialog about the vaccine among patients and healthcare providers. Educational programs can be instituted to educate our women and mothers on the virus and its associated diseases. One method is to give informational handouts to school-aged children addressed to their parents. Outreach to parents can also be done at the community level at the local barangay health centers. Educational material can be given out at these centers and health workers can institute lay lectures. At the national level, the DOH can hold educational campaigns through lay forums. Since most women look up to physician recommendations regarding vaccination, strategies can be done to further educate healthcare providers on how to communicate with parents to encourage HPV vaccination. These strategies could well result in increased willingness of mothers to have their children immunized or intention to recommend vaccination among family members.

For the negative attitude toward the HPV vaccine, this included the notion that the vaccine may have an effect on their daughter's sexual activity, or that their religion would be a negative factor to get their children immunized. The majority of women did not believe that

the vaccine would encourage their daughters to engage in sexual activity and the majority of respondents also did not view their religious beliefs as hindrance to vaccination. Although these are positive attitudes toward vaccination, as mentioned above, it is important to characterize parents that have beliefs in behavioral disinhibition as healthcare providers encountering parents may have the need for information about this population. As healthcare providers, we should emphasize among mothers that the HPV vaccine does not early promote sexual engagement, as proven in various studies. Immunizing children as appropriate for age should be regarded as an anti-cancer strategy and not as giving license for young people to initiate sexual relations. Religion is very much a part of Filipino culture, and as evidenced by local studies, including this current research, parents, and guardians are influenced by religious beliefs in their decision-making in providing healthcare for their families. Reasons for personal religious beliefs should be addressed, especially with regard to safety concerns. Being a predominantly Roman Catholic country, it should be emphasized that the Catholic Church actually is provaccination. The religion teaches that "if no safe, effective alternative vaccines exist, it is lawful to use these vaccines if danger to the health of children exists or to the health of the population as a whole."[88] While refusal to vaccination is not always related to religious activities or beliefs, other factors such as social and political issues should be looked into. This requires the government and other healthcare sectors to put much-concerted effort in educating mothers and making the HPV vaccine available and accessible to young female adolescents.

Strengths and limitations

This current research is one of few local studies to look into vaccine acceptance among Filipino mothers. The first local research was conducted more than a decade ago and we have the need to update our knowledge on the different factors that affect vaccine acceptance of mothers for their female children to determine what area we could still improve as healthcare providers in terms of promoting education about HPV and the prophylactic vaccine.

This study aimed to describe the influence of knowledge, attitude, and motivational factors on HPV vaccine acceptance among mothers of female adolescents across different ethnic and income groups. This study only focused on female vaccination. Male vaccination and comparison of different immunization systems (provider-based, school-based, compulsory) in high-income countries were not addressed. Studies that will deal on factors related to vaccine acceptance among mothers with male adolescent sons are much needed. There was bias of the sample population since convenience sampling from only one government institution was utilized. The mothers invited to participate may have belonged to only one-or two-income brackets. Future studies may include mothers from the private clinics of the institution or to enroll mothers from a different private institution.

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Conflicts of interest

There are no conflicts of interest.

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Appendix

Appendix A - Questionnaire

THE INFLUENCE OF KNOWLEDGE, ATTITUDE, AND MOTIVATIONAL FACTORS ON THE WILLINGNESS OF MOTHERS FOR THEIR FEMALE CHILDREN TO UNDERGO HUMAN PAPILLOMAVIRUS VACCINATION

Demographic Information:

1. Age ____
2. Address _____
3. What are the sex and ages of your children? _____
4. What is your education level?
   Some high school _____
   Diploma _____
   High school graduate _____
   Some college _____
   Associate degree _____
   Bachelor degree _____
   Masters degree _____
5. What is your annual income level?
   Below P 60, 000 _____
   P 60,000-P 180,000 _____
   P 180,000-P 360, 000 _____
   Above P 360, 000 _____
6. Do you attend church?
   Never _____
   A few times a year _____
   A few times a month _____
   Every week _____
7. My religious preference is:
   Catholic _____
   Protestant _____
   Muslim _____
   None _____
   Other _____

The Philippine Department of Health has an existing program which is Community-Based HPV Immunization Program which started in August 2015. Two doses of HPV vaccines are administered for free to girls in grade four aged 9-10 years old in 20 priority provinces. These 20 priority provinces are North Cotabato, Sarangani, Davao Oriental, Sulu, Zamboanga del Sur, Lanao del Sur and Maguindanao in Mindanao; Iloilo and Negros Occidental in Western Visayas; Cebu and Negros Oriental in Central Visayas; Northern Samar, Eastern Samar and Leyte in Eastern Visayas; Quezon, Camarines Sur, Masbate in Southern Luzon; and Apayao, Ifugao, and Pangasinan in Northern Luzon (44). Metro Manila is not yet included at the present in this program.

Statement	Strongly agree 1	Somewhat agree 2	Neither agree or disagree 3	Somewhat disagree 4	Strongly disagree 5
1. I am aware that there is a vaccine that can prevent cervical cancer					
2. HPV is a STI					
3. HPV can cause genital warts					
4. Cervical cancer can affect women who are sexually active of any age					
5. Getting the vaccine would be beneficial to a young girl's future health					
6. The HPV vaccine is available at the local health center in my area of residence					
7. I worry that the side effects of the vaccine might be dangerous for my daughter					

STI: Sexually transmitted infection, HPV: Human papillomavirus

In this section about knowledge, please rate the following statements.

Statement	Strongly agree 1	Somewhat agree 2	Neither agree or disagree 3	Somewhat disagree 4	Strongly disagree 5
1. Getting the vaccine will send a message to young girls that it is OK/alright to have sex					
2. Getting the vaccine will have no have effect on a girl's sexual activity					
3. I can be a role model for parents by getting this vaccine for my daughter					
4. I would not seek this vaccine for my daughter because of my religious beliefs					
5. I believe my religion would support this vaccine for girls					
6. I believe that other parents who go to my church will get this vaccine for their daughters					
7. I would not want people who go to my church to know that my daughter got the HPV vaccine					

HPV: Human papillomavirus

In this section about attitude, please rate the following statements

Statement	Strongly agree 1	Somewhat agree 2	Neither agree or disagree 3	Somewhat disagree 4	Strongly disagree 5
1. The cost of the vaccine will prevent my family from getting it for my daughter/s					
2. I intend to get the vaccine for my daughter and/or recommend it for female family members					
3. I would be more than willing to get this vaccine for my daughter if I knew other parents were doing so					
4.I would be more willing to get this vaccine for my daughter if only two (2) doses are required rather than three (3) doses					
5. I am concerned that my family and friends would view me as a bad parent if I allowed my daughter to get this vaccine					
6. I am not concerned about what other parents think of my child getting this vaccine					
7. I would be more than willing to get this vaccine for my child if my doctor recommended it					
8. I do trust drug companies that make the HPV vaccine					
9. I believe that the HPV vaccine should be mandatory for all girls entering grade 4 (aged 9–10 years)					
10. I am concerned that my daughter may be affected by cervical cancer someday					

HPV: Human papillomavirus

In this section about motivational factors, please rate the following statements.

Are you willing to have your female child immunized with the HPV vaccine?

Yes _____ No _____

This is the end of the questionnaire.

Thank you very much for your participation.