RESEARCH COMMUNICATION

Human Papillomavirus Vaccination Intention among Young Women in Thailand

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Abstract

Aims: The aims of this study were to examine knowledge and beliefs regarding HPV and cervical cancer and to predict HPV vaccination intention among young women in Thailand using a cross-sectional descriptive study design. Methods: A sample of young women aged 18-24 years (n = 391) were recruited from universities/colleges located in Chiang Mai, Thailand. An online survey was carried out to obtain young women's demographic, HPV and cervical cancer-related health characteristics, knowledge, and beliefs toward HPV and cervical cancer. Multivariate logistic regression analysis was used to determine significant independent predictors of HPV vaccination intention. Findings: Five participants (1.2%) had received at least one shot of the HPV vaccine. Of 386 participants, 218 (56.5%) reported high intention to obtain the HPV vaccine. Young women's knowledge about HPV and cervical cancer was moderate. The mean knowledge score was 7.89 (SD, 3.99; range, 0–15). Knowledge was significantly and positively related to perceived susceptibility, perceived seriousness, and perceived benefits of HPV vaccination, but negatively related to perceived barriers to HPV vaccination. Participants with a higher level of knowledge were significantly more likely to obtain the vaccine. A multivariate logistic regression model identified predictors of HPV vaccination intention: recommendations from significant others, perceived susceptibility, perceived benefits, and feeling embarrassed about getting the HPV vaccine. Conclusions: Health education efforts are needed to promote further understanding of HPV and cervical cancer, particularly with more attention to the HPV vaccination.

Keywords: Cervical cancer - HPV - awareness - vaccination intention - Thailand

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Introduction

HPV infection is the most common sexually transmitted disease worldwide, and contracting HPV is considered the greatest risk factor for developing cervical cancer (Hutchinson and Klein, 2008). Cervical cancer is one of the leading causes of cancer deaths among women in the world, mostly in developing countries (Ferlay et al., 2010). In Thailand, cervical cancer is the second most common cancer among women and the incidence of cervical cancer is relatively high in comparison with other developing countries in southern and southeastern Asia and the world (Ferlay et al., 2010). Recent WHO statistics report that 9,999 women annually are diagnosed with cervical cancer, and 5,216 will die from the disease (WHO/ICO Information Centre on HPV and Cervical Cancer, 2010).

The highest rates of HPV infection are found among sexually active adolescents and young adults under age 25 (Bleyer et al., 2006). Thailand has an adolescent and young adult population of 10.67 million aged 15 to 24 years (World Population Prospects, 2009). Studies have shown that Thai adolescents have now become more sexually active, and are more likely to engage in premarital sex, initiate sexual intercourse at an early age, encounter unwanted pregnancies, and contract sexually transmitted infections (STIs) (Kanato and Saranrittichai , 2006; Saranrittichai et al., 2006; Celentano et al., 2008; Thato et al., 2008). Recent statistics from the Bureau of Epidemiology, Department of Disease Control, Thailand, reported that the prevalence of STIs increased annually over the ten years 2000–2009, and that the highest STI rates were found among young adults aged 15–24 years (Reisinger et al., 2007).

Currently, two HPV vaccines – the quadrivalent HPV 6/11/16/18 vaccine (Gardasil 17®), and the bivalent HPV 16/18 vaccine (Cervarix®) – are available for primary prevention of cervical cancer. The vaccine should be given before an HPV infection is acquired; it is therefore recommended for young women before they begin having sexual intercourse (World Health Organization, 2007). Both vaccines were approved by the

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Food and Drug Administration of Thailand in 2007. The Royal Thai College of Obstetricians and Gynaecologists (RTCOG) and the Thai Gynecologic Cancer Society (TGCS) recommend that young women aged 11–26 years receive the HPV vaccine, especially before initiation of sexual intercourse. HPV vaccination in women older than 26 years and in sexually exposed women should be individualized (The Royal Thai College of Obstetricians and Gynaecologists, 2010).

To date, high acceptance of HPV vaccination or high interest in obtaining HPV vaccines has been reported among adolescents in many countries worldwide (McClelland and Liamputtong, 2006; Pitts et al., 2007; Woodhall et al., 2007; Gerend and Magloire, 2008; Hsu et al., 2009). A number of studies throughout the world have reported that adolescents and young adults have knowledge deficits about HPV and cervical cancer (Moreira et al., 2006b; Mosavel and El-Shaarawi, 2007; Di Giuseppe et al., 2008; Klug et al., 2008). Attitudes and beliefs also play a vital role in a person's decision to engage in health preventive behaviors. HPV vaccine acceptability has been shown to be influenced by attitudes and beliefs about disease and vaccination. Although numerous studies have examined knowledge and beliefs about HPV, cervical cancer, and vaccination among adolescents and young adults worldwide, to date little is known about HPV-related knowledge and beliefs in Thailand, and how these factors influence acceptability of the HPV vaccine. Understanding these factors will provide important guidance on developing culturally targeted HPV and cervical cancer messages to adolescents and young adults. The present study was aimed at examining the knowledge and beliefs of young Thai women regarding HPV and cervical cancer and their intention to obtain the HPV vaccine.

Materials and Methods

Sample and Setting

We conducted a cross-sectional, online survey of young Thai women aged 18–24 years in Chiang Mai, Thailand. This study combined convenience and snowball sampling methods. Considering that most young women in this age range are students at colleges or universities, four major government and private universities in Chiang Mai were contacted to recruit participants. Permission to access female students' e-mail addresses, and to place a study banner advertising the study, was obtained from each participating university. We sent invitational e-mails and a survey link to female students, and placed a study banner on all campus computers. If students agreed to participate in the study, they were linked directly from the banner to the web survey cover letter, which provided an informed consent statement which described the study objectives and steps used to ensure students' confidentiality. After reading the informed consent statement, if students voluntarily agreed to participate in the survey they were instructed to continue by clicking the link for the web survey. Later, attempts were made to recruit more students using snowball sampling. To do so, on the last page of the web survey students were encouraged to send the web survey link to other students they knew who were eligible and possibly interested in participating in the study. Additionally, the study web-link banners were placed on social network websites such as Facebook. Students were encouraged to send as many banners as possible to their network. Data were collected in January–February 2011. Approval to conduct the study was obtained from the university's institutional review board.

Measures

An online questionnaire was developed for data collection through the SurveyMonkey website. The questionnaire covered four sections: demographic characteristics, health characteristics related to HPV and cervical cancer, knowledge about HPV and cervical cancer, and beliefs toward HPV cervical cancer and vaccination. To assess HPV intention, young women were asked whether they had received the HPV vaccine and if not, how likely they were to get the HPV vaccine within the next year. Students were asked to mark a point on an 11-point visual analogue scale measuring their intention to receive the HPV vaccine, where 0 indicated no intention and 10 indicated strong intention. The mean score of intention was used as the cutoff to categorize vaccination intention as "high" or "low" for subsequent analysis.

Knowledge about HPV and cervical cancer were measured by 15 statements regarding HPV and cervical cancer. Participants were asked to rate their responses as "true," "false" or "don't know." They were given 1 point for each correct answer. "Don't know" responses were coded as false. A summation of the 15 items produced a total score. Scores ranged from 0 to 15, with higher scores reflecting greater knowledge. The items were modified from an existing knowledge questionnaire that had previously been used in an assessment of HPV and cervical cancer knowledge among the Thai population (Kietpeerakool et al. 2009).

Beliefs were measured using the Thai Human Papilloma Virus Beliefs Scale (T-HPVBS), which was developed for use in this study. Item generation for the 12 items was based on a comprehensive literature review using the Health Belief Model constructs: perceived susceptibility to disease, perceived seriousness of disease, perceived benefits of HPV vaccination, and perceived barriers to HPV vaccination (Denny-Smith et al., 2006; McClelland and Liamputtong, 2006; Brewer and Fazekas ,2007; Gerend and Magloire, 2008; McRee et al., 2009). These constructs have been widely proven to predict the use of preventive measures, including HPV vaccine acceptability (Gerend and Barley, 2009; Hsu et al., 2009). The T-HPVBS was originally developed in English and translated into Thai by a translator who was fluent in both languages. Instruments were content-validated by a panel of experts in cervical cancer. The content validity index (CVI) was calculated to be 0.97. Thai experts were asked to evaluate the cultural appropriateness of the translated scale. Minor changes in wording were suggested, and items were revised according their recommendations. The Thai experts then determined that the instrument was culturally appropriate. Items were measured on a 4-point Likert scale ranging from strongly disagree (1)

to strongly agree (4). The belief subscale scores were computed for the four constructs. A summation of items in each construct produced a total subscale score, with higher scores reflecting higher perceived susceptibility, seriousness, benefits, and barriers.

The instrument was pilot-tested with 30 young Thai women aged 18–24 years to ensure clarity of the instrument. Participants in the pilot study were asked if the content of each item was clear to them and whether they felt items were culturally appropriate. No issues of clarity or cultural inappropriateness were reported among participants in the pilot study. Test-retest reliability of the 15-item knowledge score was 0.75. The total 12-item T-HPVBS was 0.71, with breakdowns by category of: 0.75 (perceived susceptibility to disease), 0.79 (perceived seriousness of disease), 0.62 (perceived benefits of HPV vaccination), and 0.76 (perceived barriers).

Statistical Analysis

Basic descriptive statistics were performed to characterize the study population. Multiple logistic regression analysis was used to determine which independent variables were predictors of HPV vaccination intention. Exploratory factor analysis was performed to explore the factorial structure of the 12 items measuring HPV and cervical cancer-associated beliefs. Data were analyzed using Statistical Package for the Social Sciences (SPSS) version 17.0 for Windows (SPSS Inc., Chicago IL).

Results

Participants' characteristics

A total of 391 young women participated in the study. Of the 391 participants, 5 (1.2%) reported having received at least one shot of HPV vaccine. These were excluded from further analysis, resulting in a final sample of 386 young women in this study. Of the 386 eligible participants, the mean age was 20.63 years (SD, 1.46; range, 18–24). Most were single (93.8%), Buddhist (96.9%), and currently attending colleges/universities (90.2%). Of all participants, 252 (65.3%) reported parents' monthly household income below 30,000 baht (approximately $1,000 US) per month.

Almost 40% (148/386) of young women reported having prior sexual activity. The mean age of first sexual intercourse was 18.19 years (SD, 1.91; range, 13–24). Among the 148 sexually active women, 62.8% reported having one to two partners, while 37.2% reported having more than three partners in their lifetime. When asked about frequency of condom use, 19.6% reported using condoms regularly when having sex, while almost 52.7% never or rarely used condoms. A small percentage of the participants had a personal history of Pap smear (1.6%) and gynecological examination (6.7%), and a family history of cervical cancer (9.6%). Almost all participants (97.4%) reported receiving sex education in educational institutions.

HPV vaccination awareness and intention

Of all, 45.9% (177/386) had heard of HPV vaccines.

Table 1. Variables Associated with HPV Vaccination Intention

Variables	Low intention (n = 168)	High intention (n = 218)	p value
Age (Mean, SD)			
	20.27 (1.41)	20.91 (1.44)	0.000‡
Parental income			
Low	41 (10.6%)	67 (17.4%)	0.256†
Medium	62 (16.1%)	82 (21.2%)	
High	65 (16.8%)	69 (17.9%)	
Ever had sex			
Yes	49 (12.7%)	98 (25.4%)	0.002†
No	119 (30.8%)	120 (31.1%)	
Have family history of cervical cancer			
Yes	17 (4.4%)	20 (5.2%)	0.755†
No	151 (39.1%)	198 (51.3%)	
Ever heard about HPV vaccine			
Yes	66 (17.1%)	111 (28.8%)	0.023†
No	102 (26.4%)	107 (27.7%)	
Received recommendation to get an HPV vaccination			
Yes	16 (4.1%)	45 (11.7%)	0.003†
No	152 (39.4%)	173 (44.8%)	
Knowledge of HPV and cervical cancer (Mean, SD)			
	7.05 (4.21)	8.57 (3.67)	0.000‡
Total belief score (Mean, SD)			
	33.6 (4.77)	35.3 (4.64)	0.001‡
Perceived susceptibility subscale (Mean, SD)			
	3.74 (1.41)	4.67 (1.55)	0.000‡
Perceived seriousness subscale (Mean, SD)			
	9.84 (2.00)	10.14 (1.64)	0.130‡
Perceived benefits subscale (Mean, SD)			
	9.29 (1.63)	9.97 (1.61)	0.000‡
Perceived barriers subscale (Mean, SD)			
	10.8 (2.00)	10.6 (2.27)	0.387‡
Vaccine cost			
	2.94 (0.77)	2.98 (0.85)	0.624‡
Vaccine safety			
	2.41 (0.58)	2.33 (0.69)	0.225‡
Availability of HPV vaccine clinics			
	2.75 (0.69)	2.80 (0.70)	0.541‡
Feel embarrassed to get an HPV vaccination			
	2.65 (0.96)	2.45 (1.03)	0.058‡

The most common sources of information reported were educational institutions (54.8%), followed by the internet (53.7%), public media (47.5%), health care providers (41.2%), brochures/posters (38.4%), and family/friends (28.8%). Sixty-one participants (15.8%) reported receiving a recommendation that they be vaccinated. Participants reported recommendation by health care providers (62.3%), followed by friends (54.1%), someone they knew (39.3%), and parents (31.1%). The mean score of vaccination intention was 4.49 (SD, 3.39; range, 0–10). Using the mean score as the cutoff point, vaccination intention was categorized into high (n = 218; 56.5%) and low intention groups (n = 168, 43.5%). Bivariate analysis was conducted to determine the relationship between characteristics of participants and HPV vaccination intention. As anticipated, a number of variables were significantly associated with intention to receive the HPV vaccine (Table 1).

Knowledge of HPV and cervical cancer

The internal consistency coefficient of the 15-item

Table 2. Number of Respondents Answering Questions about HPV and Cervical Cancer Correctly

Statement	n	(%)
1. HPV infection is contracted by sexual contact. (true)	253	67.6
2. People can transmit HPV to their partner(s) even if they have no symptoms of HPV infection. (true)	222	59.4
3. Having multiple sexual partners increases risk of HPV infection. (true)	305	81.6
4. Sex at an early age increases risk of HPV infection. (true)	271	72.5
5. Genital warts are caused by HPV infection. (true)	147	39.3
6. Most people with genital HPV have no visible signs or symptoms. (true)	177	47.3
7. HPV infection can be prevented by vaginal douching after intercourse. (false)	121	32.4
8. HPV infection can be treated by antibiotics. (false)	111	29.7
9. Smoking increases risk of cervical cancer. (true)	279	74.6
10. HPV infection can cause cervical cancer. (true)	226	60.4
11. Cervical cancer symptoms commonly present with vaginal discharge or bleeding even in the early stages of disease. (false)	40	10.7
12. Cervical cancer can possibly cause bleeding after sex. (true)	165	44.1
13. A Pap smear is one of the measures to prevent cervical cancer by detecting changes in the cervix early before they become cancerous. (true)	238	63.6
14. A Pap smear is only indicated in women with vaginal discharge or bleeding. (false)	166	44.4
15. Unmarried women are not supposed to have a Pap smear. (false)	231	61.8

Table 3. Logistic Regression Model of HPV Vaccination Intention

Variables	Wald	SE	OR	95% CI
Ever had sex	3.12	0.26	1.58	0.95–2.63
Ever heard about HPV vaccine	0.23	0.27	0.86	0.50–1.51
Received suggestion to get an HPV vaccination	6.73	0.38	2.72**	1.27–5.80
Knowledge of HPV and cervical cancer	0.47	0.03	1.03	0.95–1.09
Perceived susceptibility	19.35	0.09	1.48**	1.24–1.76
Perceived seriousness	2.86	0.08	0.87	0.73–1.02
Perceived benefits	14.82	0.09	1.44**	1.19–1.74
Perceived barriers:				
Vaccine cost	1.67	0.16	0.80	0.57–1.11
Vaccine safety	0.00	0.20	0.98	0.65–1.47
Availability of HPV vaccine clinics	0.79	0.20	1.19	0.80–1.76
Feel embarrassed to get an HPV vaccination	4.12	0.13	0.76*	0.57–0.99

* Note. Log-likelihood = 424.65, χ^2 = 68.33, df = 11, $p < 0.001$, R^2 (Nagelkerke) 0.23; OR, odds ratio; SE, standard error; CI, confidence interval; *$p < 0.05$, **$p < 0.01$

knowledge score was 0.86. The mean knowledge score regarding HPV and cervical cancer was 7.89 (SD, 3.99; range, 0–15). Eight respondents (2.1%) scored full marks, while 16 (4.3%) scored zero. Table 2 illustrates the correct answers to these questions. A total of 81.6% correctly identified having multiple sexual partners as a risk factor of HPV infection. Older participants were more likely to have better knowledge about HPV and cervical cancer than younger women ($r = 0.28$, $p < 0.001$). No significant associations were found between knowledge and other demographic variables. Independent t-tests were performed to determine if there was a significant relationship between knowledge and other participants' characteristics. Participants who had heard of HPV vaccines had better knowledge about HPV and cervical cancer (mean, 9.92; SD, 3.11) than those who had never heard of HPV vaccines (mean, 6.11; SD, 3.83), $t(369.73) = -10.60$, $p < 0.001$.

HPV and cervical cancer-associated beliefs

Exploratory factor analysis using the 12 items measuring HPV and cervical cancer-associated beliefs identified four factors or subscales. These four factors explained 67.77% of the total variance of the construct of the T-HPVBS. All 12 items loaded significantly on one of the four factors. As hypothesized, the first factor, labeled as "perceived benefits," contained three items related to perceived benefits of HPV vaccination for health in general and for preventing HPV infection including cervical cancer. The second factor, labeled as "perceived seriousness," consisted of three items related to the perception of negative consequences of HPV infection and cervical cancer. The third factor, labeled as "perceived barriers," contained four items related to the perception of barriers to HPV vaccination including vaccine cost, vaccine safety, availability of HPV vaccine clinics, and feeling embarrassed to get an HPV vaccination. The fourth factor, labeled as "perceived susceptibility," consisted of two items reflecting perception of the risk of contracting HPV infection and/or of developing cervical cancer. Factor loadings within the various factors were good, from 0.50 to 0.93. The internal consistency coefficient of the total beliefs score was 0.76, with breakdowns by category of: 0.86 (perceived susceptibility subscale), 0.78 (perceived seriousness subscale), 0.82 (perceived benefits subscale), and 0.59 (perceived barriers subscale).

Young women's mean scores for perceived susceptibility were 4.25 (SD, 1.56; range, 2–8), for perceived seriousness 10.00 (SD, 1.81; range, 3–12), for perceived benefits 9.66 (SD, 1.65; range, 3–12), and for perceived barriers 10.63 (SD, 2.15; range, 4–16). Using independent t-tests, participants who reported having sexual intercourse (mean, 4.90; SD, 1.60) perceived themselves as more susceptible than those who had never had sex (mean, 3.87; SD, 1.40), $t(255.64) = -6.16$, $p < 0.001$. A significant relationship between the perceived barriers factor and history of sexual activity was also demonstrated, $t(357) = -2.81$, $p < 0.01$; participants who had had sex at least once received higher scores on the perceived barriers factor (mean, 10.39; SD, 2.03) than those who had never had sex (mean, 11.04; SD, 2.29).

Predictors of HPV vaccination intention

Multiple logistic regression was performed to assess predictors of HPV vaccination intention. Variables significantly and conceptually associated with HPV vaccination intention were entered in the model. For perceived barriers, given that Cronbach's alpha of this subscale was slightly low, individual items rather than subscales were entered in the model to see the associations of each barrier more distinctly. The significant predictors of HPV vaccination intention included: recommendations from others (OR, 2.72; 95%CI, 1.27–5.80), perceived susceptibility to HPV infection and cervical cancer (OR, 1.48; 95%CI, 1.24–1.76), perceived benefits of HPV vaccination (OR, 1.44; 95%CI, 1.19–1.74), and feeling embarrassed to get the HPV vaccine (OR, 0.76; 95%CI, 0.57–0.99) (Table 3).

Discussion

This is the first study to examine knowledge and beliefs regarding HPV and cervical cancer among Thai young women since the vaccines were approved in Thailand, and to predict their HPV vaccination intention. Generally, the knowledge of HPV and cervical cancer among Thai young women in this study was moderate. This could be explained by the fact that almost all participants in this study were college students who reported having received some form of sex education in educational institutions. (In Thailand, the Ministry of Education has formally incorporated sex education into the school curriculum.) However, approximately half of the participants in this study reported that they had not previously heard of the HPV vaccine. This is understandable because HPV vaccines have only recently become available in Thailand, and they have not yet been included in the national immunization program due to the country's financial limitations. Public information about the HPV vaccine is scant in Thailand.

Although the knowledge score did not significantly contribute to the regression model, young women who had better knowledge about HPV and cervical cancer showed significantly greater interest in receiving the HPV vaccine. To prevent HPV infection among adolescents and young adults, it is important to equip them with knowledge about HPV and cervical cancer. If they have a clear understanding of the disease associated with HPV infection and its consequences, they will be more likely to be aware of their risk of contracting HPV and to engage in preventive measures to prevent HPV infection. Findings from this study have important implications for health education and policy in relation to HPV and vaccination. Sexual health education curricula should include greater emphasis on HPV vaccination. When awareness of HPV vaccination among young women is low, it is crucial for policy makers to provide adequate public information on the HPV vaccine through various media channels.

Consistent with previous studies (Kahn et al., 2003; Hsu et al., 2009), results of the logistic model revealed that recommendation from significant others was a significant positive predictor of HPV vaccination intention. In this study, health care providers were the most commonly identified HPV vaccine recommenders. Studies have shown that recommendation by health care providers is a key factor in successful HPV vaccination programs and the most popular source of HPV information (Moreira et al., 2006a; Brewer and Fazekas, 2007; Chan et al., 2007). This finding suggests the crucial role of health care providers and significant others when communicating with adolescents about the HPV vaccine. Communication strategies must be established to promote HPV vaccination in the future.

Young women who perceived their susceptibility or risk of getting an HPV infection and cervical cancer were more likely to receive the HPV vaccine. This association is supported by previous research (Di Giuseppe et al., 2008; Gerend and Barley, 2009; Hsu et al., 2009). Obviously, risk perception serves as a basis for a decision to engage in health preventive behavior. As a result, it is easy to understand why a person who perceives a high risk of contracting HPV and developing cervical cancer is willing to be vaccinated. The perceived benefits of HPV vaccination was also a significant predictor of HPV vaccination intention. This finding was not surprising, considering that almost all the young women in this study had a high level of education, i.e. they were college or university students. Although half of the participants had never heard of the newly released HPV vaccine, they viewed HPV vaccination positively and were able to see its benefits. Previous research has also reported the association of high perceived benefits of HPV and high intention to receive the HPV vaccine (Di Giuseppe et al., 2008; Gerend and Barley, 2009). These findings suggest a critical need to develop evidence-based interventions for maximizing perceived susceptibility to HPV and the perceived benefits of immunization against HPV.

Perceived embarrassment over receiving the HPV vaccine was negatively associated with likelihood of getting the vaccine. This finding revealed a significant social stigma surrounding HPV vaccination among Thai young women. Similar findings have been observed in other Asian cultures (Wong, 2008; 2010). It is clear that young women link HPV vaccination with sexually transmitted diseases. Young Thai women in this study may misinterpret receiving an HPV vaccination as an admission that they are having premarital sex. The results indicate that culture might play an important role in the adoption of the HPV vaccine in Thai society, where premarital sex is considered unacceptable and public discussion of sexuality is inappropriate. Understanding this factor can help health care providers develop culturally targeted HPV and cervical cancer messages to remove the social stigma associated with receiving the vaccine. The key educational message – that HPV vaccination is given to prevent HPV infection, and is most effective for girls or young women before they begin having sex – should be delivered to target populations for HPV vaccination. Nevertheless it will be a great challenge for health care providers to deliver this message, because adolescents or parents of adolescents might infer that HPV vaccination could in effect serve as permission to have sex or as an encouragement of early sexual activity or promiscuity.

Several limitations of the current study must be

acknowledged to provide opportunities for future research. First, it should be noted that this was a convenience sample of college students in urban environments, and thus may not be representative of uneducated or rural young women in Thailand. Therefore, the findings from this study may not be generalizable to young women in other regions or population groups. Second, given the availability and accessibility of computing resources, this web survey might underrepresent or exclude students without access to the necessary computing infrastructure. Third, given the fact that this study attempted to predict young women's hypothetical intention to be vaccinated, whether their intentions predict subsequent actual vaccine uptake remain unknown. However, the use of an online survey is considered as a strength of this study. It enhanced disclosure of sexual behaviors, because young people may be more comfortable responding to sensitive sexual questions anonymously rather than via other modes.

In conclusion, although HPV vaccines have been shown to be effective in preventing HPV infection and in reducing cervical cancer, a significant proportion of young women in this study were unaware of the HPV vaccine and had a low intention of being vaccinated. Results from this study provide an empirical basis for future large-scale nationwide studies about HPV vaccination acceptability in Thailand. The findings point to factors potentially influencing HPV vaccination intention among young women which need to be addressed for the development of effective sex health education programs with a view toward preventing HPV infection and cervical cancer in Thailand.

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References

Bleyer A, O'Leary M, Barr R, Ries LAG (2006). Cancer epidemiology in older adolescents and young adults 15 to 29 years of age, including SEER incidence and survival: 1975-2000. National Cancer Institute, NIH Pub.

Brewer NT, Fazekas KI (2007). Predictors of HPV vaccine acceptability: a theory-informed, systematic review. *Prev Med*, **45**, 107-14.

Celentano DD, Sirirojn B, Sutcliffe CG, et al (2008). Sexually transmitted infections and sexual and substance use correlates among young adults in Chiang Mai, Thailand. *Sex Transm Dis*, **35**, 400-5.

Chan SSC, Cheung TH, Lo WK, Chung TKH (2007). Women's attitudes on human papillomavirus vaccination to their daughters. J Adolesc Health, 41, 204-7.

Denny-Smith T, Bairan A, Page MC (2006). A survey of female nursing students' knowledge, health beliefs, perceptions of risk, and risk behaviors regarding human papillomavirus and cervical cancer. *J Am Acad Nurse Pract*, **18**, 62-9.

Di Giuseppe G, Abbate R, Liguori G, et al (2008). Human papillomavirus and vaccination: knowledge, attitudes, and behavioural intention in adolescents and young women in Italy. *Br J Cancer*, **99**, 225-9.

Ferlay J, Shin, HR, Bray F, et al (2010). GLOBOCAN 2008, cancer incidence and mortality worldwide: IARC CancerBase No. 10 [Internet]. Lyon, France: International Agency for Research on Cancer; 2010. Retrieved Nov 10, 2010, from http://globocan.iarc.fr

Gerend MA, Barley J (2009). Human papillomavirus vaccine acceptability among young adult men. *Sex Transm Dis*, **36**, 58-62.

Gerend MA, Magloire ZF (2008). Awareness, knowledge, and beliefs about human papillomavirus in a racially diverse sample of young adults. *J Adolesc Health*, **42**, 237-42.

Hsu YY, Fetzer SJ, Hsu KF, et al (2009). Intention to obtain human papillomavirus vaccination among Taiwanese undergraduate women. *Sex Transm Dis*, **36**, 686-92.

Hutchinson DJ, Klein KC (2008). Human papillomavirus disease and vaccines. *Am J Health-System Pharmacists*, **65**, 2105-12.

Kahn JA, Rosenthal SL, Hamann T, Bernstein DI (2003). Attitudes about human papillomavirus vaccine in young women. *Int J STD AIDS*, **14**, 300-6.

Kanato M, Saranrittichai K (2006). Early experience of sexual intercourse: a risk factor for cervical cancer requiring specific intervention for teenagers. *Asian Pac J Cancer Prev*, **7**, 151-3.

Kietpeerakool C, Phianmongkhol Y, Jitvatcharanun K, et al (2009). Knowledge, awareness, and attitudes of female sex workers toward HPV infection, cervical cancer, and cervical smears in Thailand. *Int J Gynaecol Obstet*, **107**, 216-9.

Klug SJ, Hukelmann M, Blettner M (2008). Knowledge about infection with human papillomavirus: A systematic review. *Prev Med*, **46**, 87-98.

McClelland A, Liamputtong P (2006). Knowledge and acceptance of human papillomavirus vaccination: perspectives of young Australians living in Melbourne, Australia. *Sex Health*, **3**, 95-101.

McRee AL, Brewer NT, Reiter PL, et al (2009). The Carolina HPV Immunization Attitudes and Beliefs Scale (CHIAS): scale development and associations with intentions to vaccinate. *Sex Transm Dis*, **37**, 234-9.

Moreira ED, Oliveira BG, Ferraz FM, et al (2006a). Knowledge and attitudes about human papillomavirus, Pap smears, and cervical cancer among young women in Brazil: implications for health education and prevention. *Int J Gynecol Cancer*, **16**, 599-603.

Moreira ED, Oliveira BG, Neves RC, et al (2006b). Assessment of knowledge and attitudes of young uninsured women toward human papillomavirus vaccination and clinical trials. *J Pediatr Adolesc Gynecol*, **19**, 81-7.

Mosavel M, El-Shaarawi N (2007). "I have never heard that one": young girls' knowledge and perception of cervical cancer. *J Health Commun*, **12**, 707-19.

Pitts MK, Dyson SJ, Rosenthal DA, Garland SM (2007). Knowledge and awareness of human papillomavirus (HPV): attitudes towards HPV vaccination among a representative sample of women in Victoria, Australia. *Sex Health*, **4**, 177-80.

Reisinger KS, Block SL, Lazcano-Ponce E, et al (2007). Safety and persistent immunogenicity of a quadrivalent human papillomavirus types 6, 11, 16, 18 L1 virus-like particle vaccine in preadolescents and adolescents: a randomized controlled trial. *Pediatric Infect Dis J*, **26**, 201-9.

Saranrittichai K, Sritanyarat W, Ayuwat D (2006). Adolescent sexual health behavior in Thailand: implications for prevention of cervical cancer. *Asian Pac J Cancer Prev*, **7**, 615-8.

Thato R, Jenkins RA, Dusitsin N (2008). Effects of the culturally-

sensitive comprehensive sex education programme among Thai secondary school students. *J Adv Nurs*, **62**, 457-69.

The Royal Thai College of Obstetricians and Gynaecologists (2010). HPV vaccine and cervical cancer prevention. Retrieved Nov 12, 2010, from http://www.rtcog.or.th/html/articles_details.php?id=114

WHO/ICO Information Centre on HPV and Cervical Cancer (2010). Human papillomavirus and related cancers in Thailand summary report 2010. Retrieved Nov 9, 2010, from www.who.int/hpvcentre

Wong LP (2008). Young multiethnic women's attitudes toward the HPV vaccine and HPV vaccination. *Int J Gynecol Obstet*, **103**, 131-5.

Wong LP (2010). Knowledge and attitudes about HPV infection, HPV vaccination, and cervical cancer among rural southeast asian women. *Int J Behav Med*, 1-7.

Woodhall SC, Lehtinen M, Verho T, et al (2007). Anticipated acceptance of HPV vaccination at the baseline of implementation: a survey of parental and adolescent knowledge and attitudes in Finland. *J Adolesc Health*, **40**, 466-9.

World Health Organization (2007). Cervical cancer, human papillomavirus (HPV), and HPV vaccines: Key points for policy-makers and health professionals. WHO press, Geneva, Switzerland.

World Population Prospects (2009). New York, Population Division, Department of Economic and Social Affairs, United Nations Secretariat.