Knowledge, Attitude and Practice of Human Papillomavirus (HPV) Vaccination among Secondary School Students in Rural Areas of Negeri Sembilan, Malaysia

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Abstract

Introduction: Baseline information on knowledge, attitude and practice towards HPV vaccination is crucial to establish a progress track on the current HPV immunization program.

Aims: This study was designed to assess the knowledge, attitude and practice towards human papillomavirus (HPV) infection, cervical cancer and HPV vaccination practice among secondary school students in rural areas of Negeri Sembilan, Malaysia.

Methods: A cross sectional study was conducted in several schools in rural areas of Negeri Sembilan, Malaysia. The respondents were selected using simple random sampling method. Data was collected by face-to-face interview using standardized and validated questionnaire. Data analysis was done using SPSS version 21.0.

Results: A total of 380 respondents participated in this study. Females scored significantly higher for the knowledge items compared to the males. Majority of respondents (86.6%) indicated their intention to get HPV vaccines. Willingness to be vaccinated was significantly associated with the level of knowledge of cervical cancer (AOR 1.658; 95% CI 1.018-2.698; p=0.042). Gender (AOR 3.289; 95% CI 1.999-5.412; p<0.001) is a significant predictor for someone who rejects vaccination due to side effects. In this study, 89.8% of female respondents had been vaccinated against HPV.

Conclusion: Respondents showed poor knowledge level despite high HPV vaccination practice. Intention to get vaccinated was significantly associated with knowledge of cervical cancer. Therefore, it is necessary to educate the community members on HPV and HPV vaccine as HPV vaccination is the most effective way to prevent cervical cancer and its related diseases.

Keywords: Knowledge, attitude, practice, human papillomavirus, HPV vaccine, cervical cancer

Introduction

Human papillomavirus (HPV) is commonly associated with sexually transmitted diseases (STD) and is regarded as one of the major causes of global disease burdens. [1] There are 13 types of oncogenic HPV; types 16 and 18 are the most important causes of cervical cancer,[2,3] and the non–oncogenic types of HPV 6 and 11 are identified as the major causes for 90% of genital warts. [4,5]

Each year, there are over 500,000 cases and 275,000 mortality due to cervical cancer worldwide.[6] According to the Ministry of Health Cancer Statistics in 2007, approximately 2,145 Malaysian women were diagnosed with cervical cancer, with 621 deaths annually. When whole population is considered, Malaysia's cervical cancer mortality is more than two-fold higher compared to countries like United Kingdom, Finland and Netherlands.[7]

The quadrivalent (Gardasil) and bivalent (Cervarix) prophylactic vaccines have been approved by Food and Drug Administration (FDA) in June 2006 and October 2009 respectively for use in humans.[8] HPV vaccines targeted against high-risk HPV types have a higher potential to eliminate about 70% of invasive cervical cancer in women globally.[9] HPV vaccination is highly protective against HPV infection, [10] as supported by Markowitz et al. who demonstrated a 56% reduction of HPV infection cases among 14 to 19 years old female post vaccination. [11] In 2010, the Malaysian government established the national HPV vaccination program to reduce the national cervical cancer burden. The vaccination is given free of charge to female secondary school students, with the target age group of 13 years old.

Knowledge and attitude have been shown as important determinants for future vaccine acceptance.[12] A recent study showed that considerably high proportion of respondents (89.7%) show intention to get vaccinated if it was readily available.[13] Despite the free HPV immunization, acceptance of the vaccination program is not guaranteed as some of the parents are still against it due to various reasons.[14-16] It has been shown that knowledge of the consequences of HPV infection is lacking and many have misconceptions about vaccination. [17,18] Extensive studies have been done to assess knowledge and attitude towards HPV vaccine across the world. [19-22] However, there are limited investigations of HPV vaccine knowledge among secondary school students in Malaysia. In addition, not many studies included the males, despite the fact that both sexes can be infected with HPV and develop HPV-related diseases including cancer.[23] Therefore, this research was conducted to assess the current knowledge, attitude and HPV vaccination practice among secondary school students as they are the target age group and the vaccine is highly effective at this age.

Methods

This cross sectional study was conducted among secondary school students in rural areas of Negeri Sembilan from July to September 2015. Negeri Sembilan is located on the western coast of Peninsular Malaysia consists of seven district namely Seremban, Jempol, Port Dickson, Tampin, Kuala Pilah, Rembau and Jelebu. The secondary schools in Negeri Sembilan comprised

of 63 schools in rural areas and 61 schools in urban areas. According to the 2015 Perangkaan Pendidikan Malaysia (Ministry of Education) report, the population of secondary school students in Negeri Sembilan was 90330 and less than half (36409) of them were population in the rural areas.

The sample size proportion was calculated using OpenEpi software version 3.03a. The following assumptions have been made: proportion of respondents having low knowledge about HPV is 48.9% (p = 0.48)[24], design effect of 1 and 95% confidence interval. The estimated sample size was 380. Multi-stage sampling technique was applied. Firstly, six schools were randomly selected from a total of 63 schools in rural areas. The sample units were male and female from the age of 13, 14 and 16 years old. Then, simple random sampling method was used to select the respondents from each school. One or two classes were randomly selected from all classes of form one, form two and form four for each school. The sample was selected from the list of students in each selected class using systematic random sampling.

A standardized pre-test questionnaire was used in this research. A pilot study was done prior to this investigation to validate the questionnaire. A team of experts had reviewed the content of the questionnaire. The calculated Cronbach Alpha value for the questionnaire was 0.83. Training of interviewers was done before the study was conducted to minimize interviewer bias. Data was then collected via face-to-face interview. The questionnaire was divided into several sections which include the respondents' socio-demographic profiles, and questions to assess their knowledge, attitude and practice of HPV vaccination. In the knowledge section, respondents' familiarity with HPV, cervical cancer and HPV vaccination was assessed. The questions included were on symptoms of HPV infections, genital warts, risk factors and causes of cervical cancer, the Pap smear test, and HPV vaccination. In the attitude section, the respondents' intention to be vaccinated and reasons for their vaccine rejection was evaluated. For the practice section, the female respondents were inquired on their knowledge of the practice of HPV vaccination and the completion of all the prescribed dosages. Written consents were obtained from all respondents. Prior to the study, ethical approval was obtained from Ministry of Education Malaysia (ref: KP(BPPDP) 603/5/JLD.04 (97)).

Data was analysed using SPSS version 21.0 for windows (IBM Corp. Released 2012.Armonk, NY). Descriptive statistics were used to present mean scores and frequencies of socio-demographic profiles. Parametric test such as Independent t-test and One-way ANOVA were conducted to identify significant difference between knowledge scores of HPV infection, cervical cancer and HPV vaccines with gender, age and family history of the respondents. Statistical significance was set at 0.05. Multivariate logistic regressions analysis using 'enter' method was used to identify factors associated with series of attitude towards HPV vaccination (i.e. willingness to be vaccinated and reject vaccine due to side effect). The independent variables included in the models were gender, awareness towards HPV infection, cervical cancer and HPV vaccine scores, knowledge scores on cervical cancer and family member who have received HPV vaccine. Hosmer-Lemeshow test was used to assess the goodness of fit of the statistical model.

Results

Demographic Characteristics

The interviews were done in six rural schools in Negeri Sembilan. As these were face-to-face interviews, 100% response rate was achieved with a total of 380 respondents (Table 1).

Knowledge

Out of 380 respondents, only 50.3% have heard of HPV, 66.3% have heard of cervical cancer and 50.8% have heard of HPV vaccine (Table 2). Out of 191 respondents that have heard of HPV, only 19.4% of them knew the mode of transmission of HPV infection, although almost two-third of the respondents (65.4%) knew that HPV infection is asymptomatic (Table 2). Out of 252 respondents that have heard of cervical cancer, more than half of them (52.8%) knew that HPV infection can lead to cervical cancer and large number of the respondents (71.4%) did not know what was the Pap smear test (Table 2). The most correctly-answered questions on HPV vaccine answered by 193 respondents were: HPV vaccination is available for secondary school girls (91.2%); the HPV vaccine protects against genital warts and cervical cancer (79.8%), and the status of vaccination in Islam (75.1%) (Table 2). The least correctly-answered question was on the accessibility of the HPV vaccine to men, which was 13.5% (Table 2).

Overall, significant differences were found between mean score of HPV (p<0.001), cervical cancer (p<0.001) HPV vaccination knowledge (p<0.001) of different gender (Table 3). Older respondents had significantly higher mean knowledge score towards cervical cancer (p<0.001) and HPV vaccine (p=0.016) (Table 3). Respondents whose family member had previously received HPV vaccine were seem to have significantly higher knowledge of HPV (p=0.001) and HPV vaccine (p<0.001) (Table 3).

Attitudes

The number of respondents who indicated their intention to get vaccinated against HPV was quite high (86.6%). The model showed that willingness to get vaccinated was significantly associated with knowledge of cervical cancer (p=0.042). No significant association was found between willingness to get vaccinated and gender, awareness and family member who previously had received HPV vaccine (Table 4). Respondents who were concerned about side effect of the vaccine can be significantly predicted by gender; males were more likely to reject HPV vaccine due to its side effects (p<0.01) (Table 4). The Hosmer and Lemeshow goodness-of-fit tests for both models were not significant, indicating a good model of fit (Table 4). The Cox & Snell R Square and the Nagelkerke R Square indicated that 6.6% and 12% of the variability in model 1 was explained by this set of variables, whereas for model 2, 14% and 19% of the variability was explained by the same set of variable (Table 4).

Practice

HPV vaccination rates was described according to first, second and third dosage. In this assessment, only data from female respondents from age of 14 and 16 years were taken into account (Figure 1).

Discussions

Cervical cancer is the second most common cancer among women in Malaysia, after breast cancer. [6] Globally, cervical cancer is also reported to be the second leading cause of cancer mortality in women.[6] Malaysia introduced the free HPV vaccination program in 2010. [14] Before the HPV vaccination era, Malaysian secondary school students have inadequate knowledge of HPV and cervical cancer, as demonstrated by Rashwant et al. [20,21] In an effort to determine the current status of knowledge, attitude and vaccination rates, a cross-sectional study was conducted and 380 secondary school respondents from rural areas of Negeri Sembilan were interviewed. This will be the first study to examine the knowledge, attitude and HPV vaccination rate five years after the introduction of national HPV immunization program among secondary school students in Malaysia.

A study in 2007 among 1,341 Italian adolescent female reported low level of awareness towards HPV (29.8%) [22] with a similar report in Sweden in 2008; only 13.5% out of 608 Swedish secondary school students were aware of what is HPV (13.5%).[25] In contrast, our study found that at least half of the respondents have heard of what is HPV (50.3%). However, it is still lower than the study done in 2010 among 833 15-year old Spanish girls (89.9%).[26] This difference in awareness may be due to the fact Spain has implemented routine HPV vaccination for girls aged 14 since 2008; therefore their students have better exposure and higher awareness compared to those in our study.[26]

To date, there were no reports that assessed HPV infection knowledge among secondary school students in Malaysia. Swedish secondary school students demonstrated low knowledge level of HPV transmission (9.2%), and the role of HPV infection in males (4.1%).[25] Spanish adolescents also showed low level of knowledge on the role of HPV among males (26.9%).[26] Interestingly, our secondary school students recorded higher knowledge regarding HPV transmission (19.4%) and the role of HPV in males (34.6%) compared to the other studies mentioned previously.[25,26] Unfortunately, our study identified only 34.6% respondents who recognized HPV as sexually transmitted disease, which is lower than Di Giuseppe's study among young Italian women aged 14 to 24 years old (75.2%).[22] Our study also showed that Malaysian students in rural Negeri Sembilan had better knowledge (29.8%) of the association between HPV and genital warts, compared to only 14% of Spanish adolescent females.[26] A study conducted in Sweden found that 30% of high school students knew that HPV was a common cause of STD after the intervention, in comparison to only one student before the intervention.[27] Therefore, it can be concluded and recommended that proper intervention and education in school setting have a good potential to help increase the students' knowledge about HPV.

252 respondents (66.3%) in this study have heard of cervical cancer, reflecting the outcome of a study done in Sarawak (60.5%). But this number is lower than the findings of a study in Kuala Lumpur (80.4%) and Melaka (69%).[20,21,28] A possible explanation may be the lack of exposure about cervical cancer cases in the rural areas compared to the urban.[29,30] This finding justifies the need for a public health intervention to disseminate information on cervical cancer prevention to the non-urban population. In another study among 550 secondary girls students in Kuala Lumpur, almost half of the respondents knew that a virus is the cause of cervical cancer, but only

24% of them knew it was HPV.[21] In our study, 52.8% of the respondents knew that HPV was the cause of cervical cancer.

Cervical cancer can also be prevented by early screening using Pap smear. Decrease of cervical cancer cases have been reported by 80% in developed countries due to an effective detection of pre-cancerous lesion through screening program.[31] In Malaysia, Pap smear was done as an opportunistic screening.[32] Only 30% of the secondary school students from Kuala Lumpur knew about the role of Pap smear, similar to the findings of our study (25.8%).[21] It is important to note that even after vaccination, women still need to undergo Pap smear screening due because the HPV vaccine is not protective against all types of HPV.[21] In our study, knowledge of cervical cancer was significantly associated with age. The 16-year old students showed higher cervical cancer knowledge scores compared to students aged 13 and 14 years old ($p<0.001$). Similar findings was also seen among secondary school students in Sarawak.[20] This suggests that the level of knowledge is affected by their maturity, extra years of school and education.

We found that half of the respondents (50.8%) have heard of the HPV vaccine compared to the two local studies done in 2009 (11.8%) [21] and 2008 (10%).[33] Gottvall et al. (2009) reported that adolescent respondents' lack of awareness towards HPV vaccine was only 5.8% in Sweden.[25] Increased awareness (77.6%) were also noted by a study conducted in 2011 among school girls in Melaka.[28] On the knowledge of HPV vaccination, 79.8% of the respondents knew that HPV vaccine prevents the development of genital warts and cervical cancer. This mirrors the data among Spanish female adolescents (67%).[26] This may be due to greater exposure to information about the HPV vaccine after the introduction of national HPV immunization programs well as numerous campaigns by both public and private sectors. Majority of the respondents chose health professional as their common sources of information with regards to HPV (41.3%) and HPV vaccine (49.5%) which is similar among California high school girls.[34] This is because of ethical conduct require health professionals to explain about the objective of vaccination before it takes place. In contrast, high school students in Canada reported that the information was mostly received from school during their sex education classes.[35]

Male vaccination was thought to be beneficial in the prevention of virus transmission from male-to-female and male-to-male.[12] Furthermore, a gender-neutral approach to vaccination will help to improve herd immunity, especially when female vaccination coverage is low.[36,37] In 2011, the US Advisory Committee on Immunization Practice approved the use of quadrivalent HPV vaccine for boys aged 11-21 years for the prevention of genital warts and HPV-related cancers, [38] and it has been shown to be 90% effective in preventing HPV infection and genital warts in adolescent males.[39] Australia was among the first country to introduce HPV vaccine to males. [40]

To date, no study has been conducted to assess male secondary students' knowledge of HPV vaccination in Malaysia. This was the first study to do so, and it was revealed that the male respondents' knowledge was low compared to the females, consistent with the data obtained by Gottvall.[25] A possible explanation for this may be because the current vaccination program was focused solely on adolescent girls in order to reduce the incidence of cervical cancer (Ministry of Health Malaysia). It is important for men to be fully informed and made aware of HPV's relation with cervical cancer and its' prevention so they would support their family members to vaccinate against HPV. This will also encourage them to take precautionary measures against HPV

infections. Although the Malaysian government National HPV Vaccination program are not extended to the male students, men can still get the vaccine from private health care providers. Thus, it would be advantageous to educate both male and female about HPV infection, transmission, its incidence, prevalence and prevention regardless of whether the country apply female-only vaccination or gender-neutral approach.

A previous study have reported that only 51.5% of the Malaysian women have been vaccinated against HPV.[41] Several studies reported that the cost of HPV vaccination is one of the major barriers that could influence the vaccine's uptake.[17,42,43] The recommended 2-dose HPV vaccine costs approximately US$ 120 (MYR 400) per dose in Malaysian private health provider.[28,41,43] A study in Penang reported that they were only willing to spend MYR 100 and not more for the HPV vaccine [43] and a study in Lebanon among female college students found that having low economic status was significantly associated with negative attitude toward the vaccine.[44] Hence, providing free vaccination will be beneficial to address this issue for women in the lower socioeconomic bracket. The present study showed that the numbers of female respondents who have been vaccinated (89.8%) are considerably high, in agreement with a previous study done in Melaka (77.9%).[28] These results may be explained by the fact that the government has been promoting massive HPV awareness campaigns through the media in recent years.[28] In addition, the incorporation of HPV vaccine into the national vaccination programs in Malaysia also helps to increase the vaccination rates.

Our study also highlights the intention of rural secondary school students to receive the HPV vaccine. The willingness to receive the vaccine (86.6%) was even higher than recent study among secondary school students in Kuala Lumpur (69.3%).[21] This indicates that with efficient delivery strategies, the vaccine coverage will be improved under the national HPV immunization program. Rwanda introduced their national HPV immunization program in 2011 and the coverage of HPV vaccination is high, which is up to 93.23% among girls in six grades.[45] Even so, the HPV vaccine adherence in Western countries such as United States and Spain showed decreased coverage over the years despite their early introduction of routine HPV immunization in 2007 and 2008 respectively.[26,46] This may suggest that a more effective delivery strategies and constant messaging on benefits of HPV vaccine may be necessary.

It is interesting to note that the present study showed that knowledge about cervical cancer significantly predicts the intention to get vaccinated. The odds of a person willing to be vaccinated is 1.66 times higher for someone who has good knowledge of cervical cancer than for a person who does not have good knowledge of it. Marty et al. [37] and Rashwan [19] also reported a similar finding; knowledge on HPV vaccine and cervical cancer is significantly associated with perceived benefits towards HPV vaccine. A study among school girls in United Arab Emirates showed that the vaccination rates was just over 50% and lack of knowledge was found to be significantly associated with it.[47] The fact that the decision to get vaccinated is largely influenced by knowledge indicated that continuous education about HPV and cancer is vital. In contrast, HPV vaccination acceptance was rather low (22.3%) among secondary school students in Sarawak, suggesting that information about HPV and its prevention might be less-publicized in non-urban areas.[20] Therefore, it is important to plan appropriate strategies to increase public awareness about HPV, cancer and its prevention for the target population.

Concern about the HPV vaccine side effects of the vaccine was one of the important barriers for not having vaccination, as reported by studies done among school girls in Sarawak and the United Arab Emirates.[20,47] This study demonstrated that males tend to reject HPV vaccine due to its side effects. Hence, there is a need to educate the public, especially males, that the benefits greatly outweigh the risk of side effects in HPV vaccination as reported in previous studies.[38,48]

Conclusions

To conclude, this study revealed that knowledge of HPV and its preventive measures among the respondents were still insufficient. Attitude towards HPV vaccination was significantly associated with knowledge about cervical cancer. In addition, vaccination practice among secondary school girls was high, indicating that the national HPV immunization program was effective in delivering the HPV vaccine. Nevertheless, more effort should be implemented to educate the public about cervical cancer and its risk factors, especially in the rural areas, to improve the population's acceptance of HPV vaccination. In addition this study also provided an insight of the status quo of a health program in Malaysia which can be used to plan appropriate intervention strategies directed to secondary school children.

List of Abbreviations

HPV - Human Papillomavirus
STD - Sexually Transmitted Disease
DNA - Deoxyribonucleic Acid
FDA - Food and Drug Administrations
MYR – Malaysian Ringgit
US – United States

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Conflict of Interest

The authors declare that they have no conflict of interest.

Ethical Approval

All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

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Table 1: Demographic background of respondents (N=380)

Characteristics	n (%)
Gender	
Male	166(43.7)
Female	214(56.3)
Age	
13 years old	139(36.6)
14 years old	124(32.6)
16 years old	117(30.8)
Race	
Malay	328(86.3)
Chinese	30(7.9)
Indian	19(5.0)
Others	3(0.8)
Had family member with cervical cancer	
Yes	13(3.4)
No	339(89.2)
Not sure	28(7.4)
Had family member who has vaccinated against HPV	
Yes	144(37.9)
No	127(33.4)
Not sure	109(28.7)

Table 2: The responses to a questions on HPV, HPV vaccine and cervical cancer knowledge (N=380)

No	Item	Responses		
		% answering correctly(n)	% answering incorrectly(n)	% answering 'don't know'(n)
	Do you know about Human Papillomavirus (HPV)? (N=380)	**50.3(191) - yes**	**49.7(189) - no**	**-**
1	HPV infection is uncommon in Malaysia (n=191)	27.2(52)	20.4(39)	52.4(100)
2	HPV is responsible for sexually transmitted infection (STI) (n=191)	34.6(66)	7.9(15)	57.6(110)
3	HPV is transmitted via close skin-to-skin contact(n=191)	19.4(37)	36.1(69)	44.5(85)
4	Smoking can increase the risk of getting HPV infection(n=191)	25.1(48)	19.9(38)	55(105)
5	People can get HPV infection for a long time without knowing it(n=191)	65.4(125)	5.8(11)	28.8(55)
6	HPV can cause genital warts(n=191)	29.8(57)	5.8(11)	64.4(123)
7	Men can be infected by HPV(n=191)	33(63)	35.1(67)	31.9(61)
8	Men also have a potential to develop cancer due to HPV infection(n=191)	34.6(66)	18.3(35)	47.1(90)
	Do you know about cervical cancer? (N=380)	**66.3(252) -yes**	**33.7(128) - no**	**-**
9	HPV can lead to cervical cancer(n=252)	52.8(133)	4.4(11)	42.9(108)
10	Cervical cancer can affect men(n=252)	50(126)	14.3(36)	35.7(90)
11	HPV types 16 and 18 will most likely cause cervical cancer(n=252)	37.7(95)	7.1(18)	55.2(139)
12	Pap smear test is a screening test to detect cervical cancer (n=252)	25.8(65)	2.8(7)	71.4(180)
	Do you know about the HPV vaccine? (N=380)	**50.8(193) -yes**	**49.2(187) -no**	**-**
13	HPV vaccination is currently offered freely to secondary school girl (n=193)	91.2(176)	1(2)	7.8(15)
14	HPV vaccine is currently accessible to men(n=193)	13.5(26)	59.6(115)	26.9(52)
15	HPV vaccine is delivered in a series of 3 shots injection over 6 month schedule(n=193)	61.7(119)	11.9(23)	26.4(51)
16	HPV vaccine can prevent the development of genital warts & cervical cancer(n=193)	79.8(154)	2.6(5)	17.6(34)
17	HPV vaccine is most effective on someone who are not sexually active(n=193)	61.1(118)	5.2(10)	33.7(65)
18	Vaccination is allowed in Islam and other religion(n=193)	75.1(145)	5.7(11)	19.2(37)

Table 3: Factors associated with knowledge of HPV, cervical cancer and HPV vaccine among secondary school students (N=380)

Characteristics	Mean score (95% Cl)					
	Knowledge of HPV (0-8 item)	*p*-value	Knowledge of cervical cancer (0-4 item)	*p*-value	Knowledge of HPV vaccine (0-6 item)	*p*-value
Gender						
Male	0.84(0.60-1.07)	$p<0.001^{**}$	0.66(0.51-0.81)	$p<0.001^{**}$	1.03(0.76-1.30)	$p<0.001^{**}$
Female	1.75(1.50-2.01)	t= -5.147[c]	1.46(1.31-1.61)	t=-7.368[c]	2.66(2.37-2.94)	t=-8.225[c]
Age						
13 years old	1.14(0.84-1.45)	*p*=0.08	0.80(0.62-0.98)	$p<0.001^{**}$	1.80(1.45-2.13)	$p=0.016^{*}$
14 years old	1.31(0.99-1.62)	F(2,377)=2.52[b]	1.03(0.83-1.24)	F(2,377)=16.4[b]	1.70(1.30-2.10)	F(2,377)=4.18[b]
16 years old	1.65(1.31-1.99)		1.57(1.38-1.76)		2.41(2.02-2.80)	
Had family member with cervical cancer						
Yes	1.38(0.35-2.42)	*p*=0.92	1.62(1.03-2.20)	*p*=0.24	3.15(1.95-4.36)	*p*=0.11
No	1.36(1.17-1.56)	F(2,377)=0.087[b]	1.10(0.98-1.23)	F(2,377)=1.422[b]	1.91(1.68-2.13)	F(2,377)=2.202[b]
Not sure	1.21(0.45-1.98)		1.00(0.58-1.42)		1.86(1.03-2.69)	
Had family member who has vaccinated against HPV	1.68(1.37-2.00)	$p=0.001^{*}$	1.33(1.13-1.53)	*p*=0.10	2.71(2.35-3.07)	$p<0.001^{**}$
Yes	1.39(1.05-1.72)	F(2,249.4)=7.309[a]	1.04(0.85-1.23)	F(2,248.4)=4.714[a]	1.45(1.09-1.81)	F(2,248.84)=15.229[a]
No	0.88(0.60-1.16)		0.91(0.71-1.10)		1.52(1.17-1.87)	
Not sure						

[a]Significance by Welch F test [b]Significance by ANOVA F test [c]Significance by independent t-test

Table 4: Association between predictor variable and attitude towards HPV vaccination

Predictor variables	Attitude item					
	Want to be vaccinated			Reject vaccine due to side effect		
	AOR	CI(95% Confidence interval)	*p*-value	AOR	CI(95% Confidence interval)	*p*-value
Gender	1.664	0.805-3.442	0.17	3.289	1.999-5.412	<0.001**
Awareness						
HPV	1.880	0.908-3.890	0.09	1.071	0.646-1.776	0.79
Cervical cancer	1.062	0.448-2.517	0.89	1.644	0.860-3.142	0.13
HPV vaccine	1.309	0.651-2.630	0.45	1.492	0.914-2.435	0.11
Knowledge on cervical cancer	1.658	1.018-2.698	0.042*	0.978	0.737-1.298	0.88
Had family member who has vaccinated against HPV	1.403	0.678-2.903	0.36	1.158	0.711-1.888	0.56

AOR = Adjusted odd ratio ; CI = Confidence Interval

Model 1 Want to be vaccinated; Hosmer and Lemeshow test, $X^2(8) = 14.865$, $p=0.06$; Cox and Snell $R^2=0.066$; Nagelkerke $R^2=0.120$. Model 2 Reject vaccine due to side effect; Hosmer and Lemeshow test, $X^2(8)=5.976$, $p=0.65$; Cox and Snell $R^2=0.141$; Nagelkerke $R^2=0.191$.

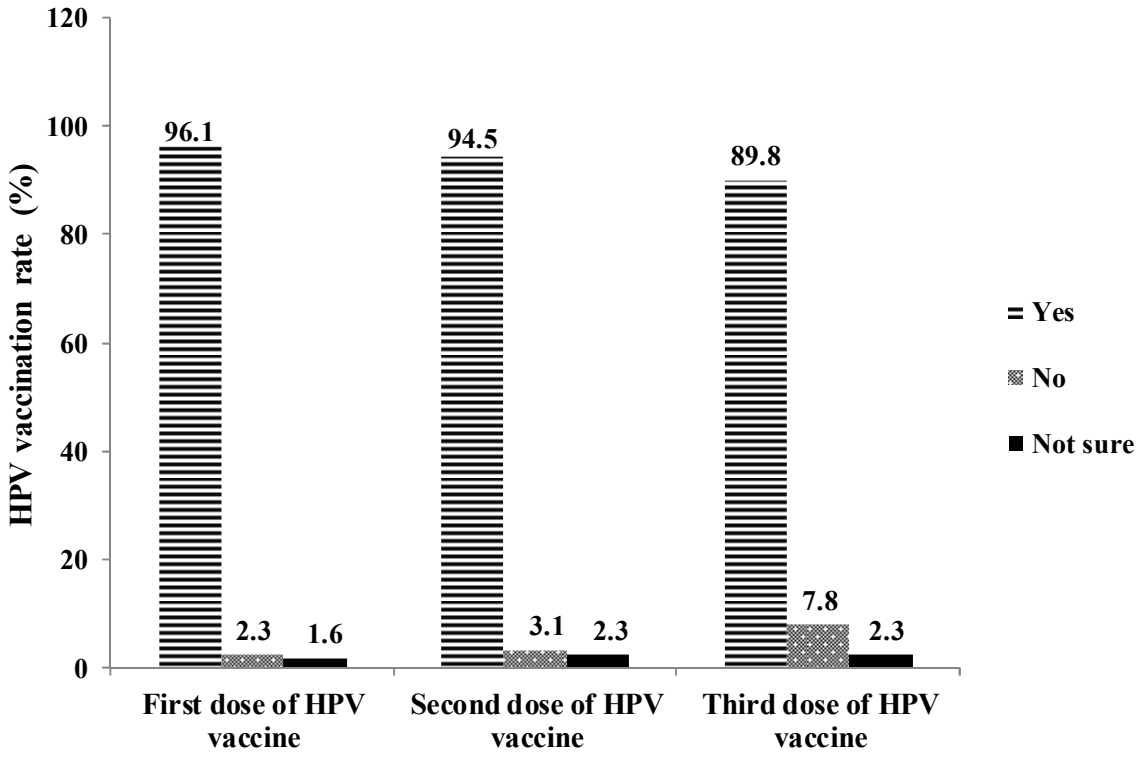

Figure 1: HPV vaccination rates among female respondents (n=128)