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Effect of intervention in increasing knowledge and awareness of Human Papilloma Virus (HPV) infection and HPV vaccination among graduate students in a private university, Kedah state, Malaysia

Abstract

Background: It is imperative to establish concrete evidence regarding the effect of educational intervention in improving individuals' knowledge towards human papilloma virus (HPV) infection and vaccination initiatives among the unvaccinated age eligible adult population in Malaysia. The outcome measures were to assess the level of knowledge regarding HPV infection and vaccination among graduate students from a private university, Malaysia; to find the association between knowledge score and socio-demographic variables and to estimate the effect of educational intervention (pamphlet) tool at pre- and post-intervention studies.

Method: A longitudinal study, designed for repeated measures using pre-validated questionnaires, with pre- and post-test (0 and 1 month) among graduate students in Malaysia. The results from both phases were compared using McNemar's test and Wilcoxon signed rank test for precise differences in knowledge scores.

Results: The response rate was 58.8% (470/800), participants had a poor percentage and median knowledge score in pre-test, 45% [7(6), ranging 0 to 15] with age, course of study, year of study and location ($p<.01$). A significant increase in scores was observed post-intervention test, 83% [13(2), ranging 7 to 15] with course of study ($p<.01$). An exact McNemar's test determined that there was a strong statistically significant difference in the proportion of knowledge scores between pre- and post-test, $p<.01$. Wilcoxon test (N=470) confirmed a strong significant difference in knowledge score between both phases of study ($Z=17.2$, $N=470$, $p<.001$).

Conclusion: The findings reveal, even healthcare graduate students have poor knowledge regarding the various issue of HPV, which queries the status of general public with less literacy. It is strongly recommended that more exposures should be given to the general public to enrich their knowledge for vaccine acceptance and periodic Pap screening for females at risk.

Keywords: educational Intervention, healthcare graduate students, HPV infection, HPV vaccination, knowledge, pamphlet

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Introduction

Human Papilloma Virus (HPV) is the causative agent of several skin and mucosal diseases, including virtually all cases of the world's second most common female malignancy, cervical cancer, and genital warts, the most common disease occurring in sexually active population.[1] The early history of HPV infection and its relation to cervical carcinogenesis have been observed in many studies.[2] However, cervical cancer development is a long process lasting 15–20 years.[3] It implies, the persistence of infection with high-risk HPV type in a minority of infected women, leading to pre-cancerous lesions (3–5 years), and eventual development of invasive cancer in the long term (>10 years).[3,4]

HPV is usually transmitted through direct skin-to-skin contact, most often during penetrative genital contact (vaginal or anal sex).[5] Other non-genital contact without penetration (oral-genital, manual-genital, and genital-genital contact) can also lead to HPV infection but less common than sexual intercourse.[6] Sexual behaviour is the most constant predictor and most importantly, the number of sex partners is proportionately linked to the risk of HPV infection.[7–9] For women, the sexual activity of their partner(s) is also important for HPV acquisition. Among adolescent and college female's students, the HPV risk is increased if a woman's partner had or currently has other partners. HPV infections are also common in men who have sex with men (gay) and women who have sex with women (lesbian).

The development of HPV vaccine is a landmark in the history of immunisation, since this is one among the first vaccine primarily directed and perceived as anti-cancer vaccine. The HPV vaccine has the potential to complement secondary prevention and control cervical cancer morbidity and mortality worldwide if vaccinated before sex initiation in females.[10] The two presently available (quadrivalent and bivalent) and the latest nanovalent HPV vaccines have proven their efficacy in the prevention of pre-cancerous lesions (Cervical Intraepithelial Neoplasia–CIN), and can exert their maximum

efficiency if used at pre-adolescent age.[11] However, they need to extend their protective effect for many years if a substantial impact on HPV-related diseases has to be achieved.[12]

Most HPV infections are asymptomatic and resolve without treatment. However, some infections result in epithelial changes or cancer. Genital infection with low-risk HPV types is associated with genital warts however, the risk for anal, vulvar, and vaginal cancers is considerably less.[3,13] Women with HPV infection who spontaneously clear their infection and continue to be HPV DNA negative appear to be at very low risk for developing cervical cancer. Genital infection in men with low-risk HPV types is associated with genital warts.[14]

Prevention of genital HPV infection is important in reducing prevalence of genital warts, abnormal Pap tests, and cancer. HPV vaccines is the way of prevention and the new quadrivalent vaccine, Gardasil®, protects against four HPV types responsible for 70% of cervical cancers and 90% of genital warts.[15,16] The vaccine is administered through a series of three intramuscular injections over six-month period (0, 2 and 6 months).[17, 18]

The quadrivalent HPV vaccine was first licensed on June 8, 2006, by the Food and Drug Administration (FDA), becoming the first licensed vaccine to prevent cervical cancer and related HPV infections in females between the ages of 9 to 26 years.[19,20] In studies of over 11,000 females (9 to 26 years), the vaccine was found to be safe and cause no serious side effects except mild injection site pain. [21]

Outcome measures:

a) To assess the level of knowledge related to human papilloma virus (HPV) infection and vaccination among active graduate students in a private university, Malaysia.

b) To find the association between knowledge and socio-demographic variables regarding human papilloma virus (HPV) infection and vaccination among the study participants.

c) To estimate the effect of educational intervention (pamphlet) tool in knowledge score modification regarding human papilloma virus (HPV) infection and vaccination.

Methods and materials

A prospective longitudinal study was designed for repeated measures, with baseline and post-intervention data (one month apart) among active graduate students in a private university, Malaysia. The study was conducted between October and December, 2014. The questionnaire consisted of two sections, namely, socio-demographic details and survey items to measure knowledge domain. The participants included in the study were both male and female students, aged 18 to 26 years, undergoing graduate education from year 1 to year 4, and willing to participate in two study phases (one month apart). Participants with chronic illness, incomplete questionnaires or no show for either pre- or/and post-test were excluded. The estimated sample size was 323, calculated based on the total students enrolled in the graduate programmes of a private university at 95% CI, 5% margin of error and 50% response distribution. The recommended sample (20%) was added and rounded off to 390 in order to overcome any errors and increase the reliability of results.

Development of the questionnaire

The questions for the survey were mostly adapted from other published articles, designed to test the knowledge domains and contained the following information: socio-demographic details like age, gender, etc.; questions to assess knowledge regarding HPV infection, cervical cancer, its screening and vaccination.[22–26] The initial study questionnaire contained 20 knowledge testing items.

Validation of the questionnaire

The adapted 20 item questionnaire was content validated for its appropriateness to meet the study objectives by a group of experts from clinical pharmacy and pharmacy practice, faculty of pharmacy. The validated questionnaire was later scrutinized by an expert in Community Medicine from faculty of medicine, AIMST University, Malaysia. Three questions were removed at this stage as recommended to be inappropriate.

After a satisfactory content validation, face validation was done among 30 potential respondents, representing all courses. The participants were encouraged to inquire any doubt or confusion regarding the survey items and explained for better understanding and noted for subsequent corrections. The 17 item questionnaire was thus arrived.

The reliability test for Cronbach's alpha coefficient was conducted to test internal consistency (N=30). The alpha value was found to be. 769 for the initial 17 items. Two knowledge items were removed due to negative correlations. Hence the final, 15 item questionnaire with α value of .862, p<.001, showed good reliability and stability. The participants in this pilot study were excluded for final study.

Development of the interventional tool (pamphlet)

The education pamphlet was prepared with information extracted from Centres for Disease Control and Prevention (CDC)-fact sheet, 2008; Vaccine & Immunization, 2011; WHO/ICO HPV information centre, 2012; American Cancer Society, 2012&2013.[18, 27–31] The educational pamphlet was prepared with utmost care, so that all important information's regarding HPV infection and vaccination were addressed appropriately and the participants will be able to gain the necessary knowledge and awareness. The prepared pamphlet was content and construct validated and pilot tested (N=30) to confirm its appropriateness and effectiveness.

Modality of obtaining response

The participants were recruited based on convenience sampling, chosen to counter challenges of tracking the same participants for two successive data collections. A well-structured and pre-validated questionnaire was self-administered in class room settings and brief information was provided regarding the purpose, objectives and instruction for filling the survey questionnaire. The study was completely voluntary and participants were allowed to withdraw at any stage. The informed consent forms were signed before distribution of survey forms. The completed questionnaires (average time taken=12-15 minutes) were retrieved and compiled for data analysis.

Scoring grades and scoring pattern

The scoring grades were adopted from the Modified Bloom's cut off points,[32,33] score of 75-100% correct response was good, 50-74% was satisfactory, and score<50% was poor knowledge. One mark was given to each correct response and zero marks for incorrect response. Sum of all 15 items gave the total knowledge score which was categorised into good, moderate and poor.

Ethical considerations

Ethical clearance from the institutional review board (AIMST University) was obtained and informed consent forms were signed from participants after providing sufficient information regarding the purpose of the survey and assured the data will be used for research purpose only, maintaining high confidentiality at all levels.

Statistical analyses of data

The analysis was performed using IBM SPSS Statistics for Windows (Version 23). Descriptive statistics for frequency and percentage was computed for categorical variables. Numerical data was presented as median and interquartile range. The Chi-square test for independence was used for association between variables. McNemar's test and Wilcoxon Sign Ranked Test were used for inferential statistics to identify differences in knowledge scores between pre-and post-test. The significance level was set at .05 for all statistical tests and $p<.05$ was considered statistically significant.

Results

Among the 800 questionnaires distributed, 470(58.8%) valid questionnaires were retrieved with 41.2% drop-outs.

Socio-demographic characteristics

Among the 470 participants, most of the participants were aged 18-20 years 195 (41.5%), with a median age of 22(5); Females-358 (76.2%); Chinese-357 (76%); pharmacy graduate students-153 (32.6%); year four study-141 (30%) and urban location-320 (69.1%). The socio-demographic information is presented in Table 1.

Distribution of knowledge score among demographic variables (Pre-and Post-test)

The knowledge score of pre- and post-test were cross-tabulated with the socio-demographic variables and the results are summarized in Table 2. Regarding knowledge score at pre-test, it was observed that age, course of study, year of study and location showed statistically significant differences ($p < .01$), whereas, at post-test, only course of study showed any significance ($p<.01$) between the two phases (Table 2).

Effect of educational pamphlet on knowledge score differences

Four hundred and seventy participants were recruited to take part in an intervention study using structured and validated educational pamphlets. A pre- and post test was conducted and an exact McNemar's test determined that there was a strong, statistically significant difference in knowledge score between pre- and post-intervention test, $p<.01$.

A pre-test and post-intervention test with correct responses is summarized in Table 3. The percentage of correct answers increased significantly from 45% to 83% [Mdn.=7(6), 1 to 15 vs. 13(2), 7 to 15] between pre- and post-test. Further, the Wilcox on sign ranked test (N=470) revealed 11 negative ranks, 374 positive ranks and 85 ties at post-test ($Z=17.2$, $N=470$, $p<.001$) with a strong statistical significance.

The results at post-test reveals, there was a good knowledge score and observed the tool to be useful and successful instrument for expanding users' knowledge. About 10 out of 15 questions produced more than 100% increase in knowledge score and only three questions produced less than 25% increase. There was a significant increase in knowledge score for all the 15 items.

Interestingly, knowledge scores at post-intervention did not vary much by socio-demographic variables. Before accepting the educational intervention, most of the respondents were not aware of the nature of vaccine and the frequency of Pap screening done after 30 years of age.

Table 1 Socio-demographic data

Variables	Frequency (N=470)	Percentage (100.0)
Age in Years		
18 - 20	195	41.5
21 - 23	159	33.8
24 - 26	116	24.7
Gender		
Male	112	23.8
Female	358	76.2
Race		
Malay	7	1.5
Chinese	357	76
Indian	106	22.6
Course of Study		
Medicine	125	26.6
Dental	115	24.5
Pharmacy	153	32.6
Others	77	16.4
Year of Study		
Year 1	109	23.2
Year 2	115	24.5
Year 3	105	22.3
Year 4	141	30
Location by origin		
Rural	320	69.1
Urban	150	31.9

Table 2 Distribution of knowledge score among demographic variables

		Pre -Test				Post -Test				
Variables	**N(%)**	**P**	**M**	**G**	**¥p value**	**P**	**M**	**G**	**¥p value**	**WSRT‡**
Age in Years										
18 - 20	195 (41.5)	157 (80.5)	24 (12.3)	14 (7.2)	<.001*	0 (0.0)	23 (11.8)	172 (88.2)	0.69	
21 - 23	159 (33.8)	63 (39.6)	55 (34.6)	41 (25.8)		1 (0.6)	19 (11.9)	139 (87.4)		
24 - 26	116 (24.7)	39 (33.6)	55 (47.4)	22 (19.0)		0 (0.0)	16 (13.8)	100 (86.2)		
Gender										
Male	112 (23.8)	67 (50.8)	34 (30.4)	11 (9.8)	0.099	1 (0.9)	13 (11.6)	98 (87.5)	0.196	
Female	358 (76.2)	192 (53.6)	100 (27.9)	66 (18.4)		0 (0.0)	45 (12.6)	313 (67.4)		
Race										
Malay	7 (1.5)	3 (42.9)	2 (28.6)	2 (28.6)	0.897	0 (0.0)	1 (14.3)	6 (85.7)	0.944	
Chinese	357 (76.0)	198 (55.5)	100 (28.0)	59 (15.5)		1 (0.3)	42 (11.8)	314 (87.9)		
Indian	106 (22.6)	58 (54.7)	32 (30.2)	16 (15.1)		0 (0.0)	15 (14.2)	91 (85.8)		
Course of studying										
Pharmacy	125 (26.6)	57 (45.6)	39 (31.2)	29 (23.2)	< .001*	1 (0.8)	12 (9.6)	112 (89.6)	0.009**	
Dental	115 (24.5)	51 (44.3)	44 (38.3)	20 (17.4)		0 (0.0)	19 (16.5)	96 (83.5)		
Medicine	153 (32.6)	88	46	19		0 (0.0)	26 (17.0)	127 (83.0)		
Others	77 (16.4)	63 (81.8)	5 (6.5)	9 (11.7)		0 (0.0)	1 (1.3)	76 (98.7)		< .001*
Year of study										
Year 1	109 (22.2)	41 (37.6)	39 (35.8)	29 (26.6)	<.001*	1 (0.9)	12 (11.0)	96 (88.1)	0.268	
Year 2	115 (24.5)	51 (44.3)	44 (38.3)	20 (17.4)		0 (0.0)	19 (16.5)	96 (83.5)		
Year 3	105 (22.3)	57 (54.3)	32 (30.5)	16 (15.2)		0 (0.0)	15 (14.3)	90 (85.7)		
Year 4	141 (30.0)	110 (78.0)	19 (13.5)	12 (8.5)		0 (0.0)	12 (8.5)	129 (91.5)		
Native Location										
Urban	320 (68.1)	190 (59.4)	87 (27.2)	43 (13.4)	.01*	1 (0.3)	34 (10.6)	285 (89.1)	0.206	
Rural	150 (31.9)	69 (46.0)	47 (31.3)	34 (22.7)		0 (0.0)	24 (16.0)	126 (84.0)		

¥Chi square test; WSRT , ‡Wilcoxon Sign Ranked Test; *(p < .01); ** (p < .05); p < .05 is statistically significant; P- Poor, M- Moderate, G- Good.

Table 3 Proportion of correct responses, pre- and post-intervention test

Qn.No.	**Knowledge domain**	**Responses**			
	Questions	**Pre-test**	**Post-test**	**X^2**	**P value**
1	HPV infection affects skin and the moist membranes that line the human body.	171(36.4)	421(89.6)	226.28	<.001*
2	HPV can infect (both males and females).	186(39.6)	417(88.7)	192.36	<.001*
3	HPV infects mostly females.	312(66.4)	364(77.4)	15.86	<.001*
4	Women infected with HPV are more likely to get cancer of the cervix.	229 48.7)	419(89.1)	152.65	<.001*
5	Those infected with HPV are more likely to get pelvic warts, genital warts, penile cancer, cervical cancer and some other less common cancers.	196(41.7)	418(88.9)	175.69	<.001*
6	Most people who are infected with HPV do not know that they are infected.	176(37.4)	420(89.4)	212.41	<.001*
7	Signs and symptoms of HPV infection will take few months to years for developing.	193(41.1)	422(89.8)	190.42	<.001*
8	Mostly, HPV infection is transmitted through sexual intercourse.	225(47.9)	420(89.4)	161.53	<.001*
9	A vaccine is a biological preparation that improves immunity against a particular disease.	157(33.4)	421(89.6)	227.53	<.001*

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Table continued...

10	The HPV vaccination prevents HPV infection-associated development of cervical cancer, penile cancer, genital warts, and some less common cancers.	197(41.9)	420(89.4)	191.77	<.001*
11	The HPV vaccination can be given from the age of 9 to 26 years.	168(35.7)	420(89.4)	215.76	<.001*
12	The course of the HPV vaccination comprises of 3 doses.	409(87.0)	420(89.4)	0.99	0.32
13	The best age for HPV vaccination in girls is between is 9 to 14 years.	183(38.9)	430(91.5)	213.84	<.001*
14	Pap smear test can be used to screen cervical cancer.	275(58.5)	353(75,1)	30.25	<.001*
15	Under 30 years of age, Pap smear test is done once in three years.	82 (17.4)	445(94.7)	33.01	<.001*
Total Median Score		7 (6)	13 (2)	-	-
Percentage of correct responses		44.8	83.1	-	<.001**

*McNemar's Test ($p < .01$); **Wilcoxon Signed Rank Test ($p < .01$); $p < .05$ is significant.

Discussion

After carrying out the study, the response rate was found to be 82.8%, 662/800 at baseline (pre-test) and 58.8%, 470/800 response for both phases (pre- and post-test). Similar responses were reported in other studies.[34,37] The comparatively low response may be due to reluctance of target samples to answer same questionnaire multiple times, absenteeism or incomplete forms. A similar trend was reported in our earlier studies.[27,28] Based on their socio-demographics characteristics, the maximum participation were among those: aged 18-20 years, with median age of 22(5); Females; Chinese; Pharmacy students; year four study and urban located which was nearly consistent with other studies.[35–38]

Regarding distribution of knowledge score among demographic variables at baseline (pre-test), age, course of study, year of study and location showed statistically significant differences whereas, at post-test, only course of study showed significant differences ($p<.01$).[39] The results endorse that female respondents had better knowledge at baseline.[40,41]

The Chinese women have the highest rate of cervical cancer incidence in Malaysia.[42] An increasingly positive attitude towards sex was reported to be seen in both young Chinese men and women, which demonstrates the women's right to have sex before marriage. Hook-ups and casual sexual encounters are increasingly common and accepted among Chinese men and women. It is further reported, more and more Chinese women are delaying marriage that motivates women to seek sex before marriage. Although not all Chinese women feel this way, for many, pre-marital sex is an opportunity to assert their rights to sexual freedom. The higher percentage of Chinese participants in this study attracts additional scope to focus for educational intervention in this vulnerable, ethnic population.[43] A cultural health survey reported, the sexual habits and behaviours among Muslims report they are less likely to having had premarital sex than married Jews and Christians. Muslims are also less likely than affiliates of other religions to involve in premarital sex, gaying, lesbian, oral sex etc. which are prohibited including multiple sexual partners for women. This explains a much less probability for a Muslim with HPV infection.[44]

Among the 470 participants, including medicine, dental, pharmacy and other graduate students (Engineering, Business etc.) in the university, all of the respondents at baseline had poor knowledge score, with higher scores noted among 20-23 years old and first or second year of study participants. On an average, the knowledge scores significantly improved from 7 to 15 out of maximum 15 score after intervention ($p<.05$). These findings were consistent with a study in the US.[45]

The effect of educational pamphlet was tested for knowledge score differences between pre- and post-intervention studies using McNemar's test which determined, there was a strong statistically significant positive differences in the participants knowledge scores after intervention for all the 15 items ($p<.01$), except one which was consistent with a study by Berenson et al.[45]

According to the studies reported, it is shown that generally females have a relatively higher knowledge compared to the males. In pre-test, the overall median knowledge score among 358/470 females, was found to be 7(6) and 13(2) at post-test after pamphlets intervention. Among the male participants 112/470, the median knowledge score was 6(5) and 14(2). Though, there were no big differences in scores between genders, it shows that the participants' paid good attention to the HPV related issues and cervical cancer. Female participants also showed significant increase in median scores after intervention which shows, they pay strong attention and interest towards the issue as they are primarily at risk for HPV related cervical cancer.

As far as race or ethnicity is concerned, the 337/470 Chinese were the majority of the respondents making up three quarters of the study population. There was a significant increase in median knowledge score, 7(6) at pre-test and 14(2) ranging 7 to 15 at post-test. Most of the participants were from medical school (125/470), compared to others; however, pharmacy was not too far behind. There was a good improvement in median knowledge scores at pre- 9(6) and 14(2) post-test with statistical significance in knowledge score after intervention.[39]

Among the year of study category, year one (109/470) and two (115/470) had a better median knowledge 9(6)&14(2) respectively for pre-test, and 8(5)&13(2) for post-test. This may be probably due to the fact, it is during these early years of study, the healthcare students undergo pathology, patho-physiology and microbiology related courses in their curriculum which provides relevant knowledge.

As far as the native location was concerned, more than two third of the participants were from urban area (320/470). The median knowledge score did not differ much between urban, 6(6)&13(2) and rural residents, 8(6)&14(2) among the study population at pre- and post-test.[45,46]

Overall, the study showed that active graduate students undergoing healthcare related courses or otherwise, had poor or average knowledge score (44.8%) for all the 15 item HPV questionnaire at baseline study, with the exception of a few questions. Despite being multidisciplinary graduate students, only 57% had already known about HPV, nearly 49% knew HPV causes cervical cancer, 66% knew it infects mostly

females and 40%, aware it infects both genders equally. Similar types of studies conducted in Pakistan and Nigeria reported nearly similar outcomes.[47, 48] In contrast, a study in England, reported that nearly 75% of female participants had heard of HPV, and despite being aware, only 27% reported HPV causes cervical cancer.[16] Similarly, a Malaysian study among healthcare students reported around 80% knew HPV causes cervical disease, and nearly 54.6% reported HPV infects both men and women equally.[49]

The previous studies carried out in Malaysia showed that awareness to HPV infection and vaccination in Malaysia was low [50]. However, it is shown that knowledge is an important factor in influencing the perception and attitude of an individual in deciding their practice. Knowledge influences the decision making in undergoing Pap smear and vaccination initiatives. Physicians also play important role in providing information and recommendations on vaccination.[32,33]

Conclusion

The findings shows that even healthcare graduate students are having poor knowledge regarding the various issues at baseline, which gives rise to the doubt about the status of general public with less education and literacy. Therefore, it is strongly suggested that more exposures should be given to the general public to enrich their knowledge towards acceptance of HPV vaccination and periodic screening among the female population so as to decrease the incidence and mortality due to HPV related infection and cancer. In order to achieve the goal of reducing the infection rate of HPV in Malaysian, it is imperative that the health and education systems work together to deliver the messages to the students and general public at large. Focus should be given to the susceptible groups, mainly the adolescent and the young adults still unvaccinated.

Limitations

In spite of taking adequate care to follow the scientifically valid methods for samples, selection bias cannot be ruled out entirely as only a small proportion of the total target population was studied and all conclusions are limited to the one university study population only. The study participants may not have been truthful all the time in their responses. This study was not able to assess the potentially eligible population outside the university campus.

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Conflict of interest

The author declares that there is no conflict of interests involved in this study.

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