Factors Associated with Human Papillomavirus Vaccination among Chinese Female University Students in Hong Kong

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Abstract

This study explored the participation rate for human papillomavirus (HPV) vaccination, determined their level of acceptability of HPV vaccination and identified its associated factors among female university students in Hong Kong. A convenience sample of 247 female university students was recruited from a university in Hong Kong in 2008. The uptake rate of HPV vaccine was 9.7%. Higher level of knowledge in cervical cancer and vaccine, acceptability of HPV vaccine, and perceived barrier of 'not likely to have cervical cancer' of HPV vaccination were associated with a greater likelihood of HPV vaccination while a higher level in the perceived barrier of 'cost of vaccination' was associated with a smaller likelihood of the vaccination. The uptake of HPV vaccine was low in Hong Kong female university students. A number of modifiable factors associated with HPV vaccination were identified which provides specific targets for interventions.

Keywords: Cervical cancer, HPV vaccination, knowledge, acceptability, female university students, Hong Kong

1. Introduction

Cervical cancer is the second most common cancer among women worldwide (World Health Organization (WHO), 2010a). There were about 530,000 new cases of invasive cervical cancer and resulted in more than 275,000 deaths of women in 2008 (Parkin el al., 2006; International Agency for Research on Cancer, 2013). Both the incidence and mortality rates of this disease have been increasing worldwide, and it was projected that there will more than 720,000 new cases and about 400,000 cervical cancer deaths in 2025 (Ferlay et al., 2010; WHO, 2010b). In Hong Kong, it is the ninth most common cancer and the eighth most common cause of cancer deaths among women, and the disease accounted for a crude mortality rate of about one third of the cases (Hong Kong Cancer Registry, 2014).

Cervical cancer is primarily link up with the infection of human papillomavirus (HPV), a virus that can be detected in over 99% of the cases (Weinstock et al., 2004; Schiffman et al., 2007). HPV vaccine was proven as an effective preventive measure to reduce the public health burden of cervical cancer and HPV-related diseases (Centre for Disease Control and Prevention (CDC), 2010). Currently, the recommended target age group of HPV vaccine is between 9 and 25 years old and the vaccine is administered as three-dose injections prior to the onset of sexual activity of women for optimal protection from HPV infection (Saslow et al., 2007; Twinn, et al., 2007; Villa, et al., 2007). The vaccine uptake rate however was below 20% in many countries including Hong Kong (Lopez and McMahan, 2007; Kahn et al, 2008; Allen et al, 2009; Gerend and Shepherd, 2011; Sheinfeld et al, 2011; Garcini et al, 2012; Li et al., 2013).

In the literatures, a number of factors have been reported to be associated with HPV vaccination.

Older in age, having insurance coverage, receipt of childhood vaccine, higher maternal education, more healthcare utilization, better knowledge about HPV infection, better vaccine acceptability, reasonable cost of the vaccine, higher perceived effectiveness of the vaccine, less fear of side effects and doctors' recommendation were consistently shown to be positively associated with HPV vaccination (Zimet et al., 2005; Gerend et al, 2008; Garcini et al, 2012; Kessels et al., 2012; Cover et al, 2013; Hoque et al, 2013; Kiely et al, 2013; Li et al., 2013; Lima et al, 2013; Ratanasiripong et al, 2013). However, the relationship of some psychosocial variables including perceived susceptibility to cervical cancer and severity of cervical cancer of the uptake of the vaccine were unclear: non-significant correlations were reported in a number of studies (Licht et al., 2010; Brewer et al., 2011). Yet, most of these studies were conducted for non-Asian population and the generalizability of the findings to the Chinese population is unclear due to differences in cultural beliefs and social norms (Lee et al., 2007).

All women are susceptible to HPV infection once they have sexual activities, and it is highly prevalent in women younger than 25 years old (WHO, 2010b). In Hong Kong, its prevalence was the highest in women aged 20-29 years old although it declined with age (Liu et al., 2011). Thus, college-aged women who are at their early 20s compose a high-risk population for HPV infection. In Hong Kong, HPV vaccination is neither compulsory nor financially aided by the government and it can be received from private or government clinics. However, information regarding the HPV vaccine uptake rate and the associated factors of participation in HPV vaccination in the Chinese populations was scarce. There were a few studies conducted in Hong Kong but most of them were focused on adolescent girls and none of them identified associated factors of HPV vaccination (Chan et al., 2007; Chan et al., 2009; Kwan et al., 2009; Wong et al., 2009; Li et al., 2013). This study thus was aimed to examine the uptake rate of HPV vaccination among female university students who are regarded as well-educated and have better cognitive capacity rather than being influenced by their parents or others when making decision of HPV vaccination. The study also identifies demographic and health-related variables that are associated with HPV vaccination. The study hopes to generate important and unique information that will enhance the planning, promotion and delivery of cancer prevention service for female university students with the goal of reducing the incidence of cervical cancer in the highly educated women in their lifetime.

2. Methods

2.1. Study Design, Sampling and Data Collection

This was a descriptive cross-sectional study conducted from November to December in 2008 among the female university students, born in Hong Kong and aged below 26 years old. With the use of convenience sampling, eligible participants were recruited at the university hostels and health clinic of the Chinese University of Hong Kong by the first author. After obtaining the written consents, respondents were asked to complete the survey instrument and return in anonymous envelops after completion at the sites. Ethical approval for this study was granted by the Research Ethics Committee of the participating university. Respondents were ensured that their participation in the study was voluntary and they had the right to withdraw at any time without any penalty. Written and informed consent was obtained from all participants who took part in this study.

2.2. Measures

A researcher-developed survey instrument, based on the Health Belief Model (Becker, 1984), consisting of 34 items was used in the study. The information on three sections: (a) knowledge of cervical cancer and HPV vaccine, (b) health beliefs about HPV vaccination and (c) demographic data were used for data analysis.

HPV vaccination: The primary outcome of the study is the uptake of HPV vaccination and was measured by one item. Participants were asked to indicate whether they had ever taken HPV vaccination, with the variable coded as 1 = *yes* and 0 = *no*.

Knowledge of cervical cancer and HPV vaccine: Participants' knowledge of cervical cancer and HPV vaccine was measured by four items on the cause of cervical cancer, the number of injections required for HPV vaccination, whether they had ever heard of HPV vaccine to prevent cervical cancer and where they can receive the vaccine respectively. For all the four questions, one score was given to a correct answer while zero score for an incorrect answer. An aggregate knowledge score was then created by summing up all correct answers. The possible range of the knowledge score is 0 to 4, and a higher score indicates more knowledgeable on the cervical cancer and HPV vaccine.

Health beliefs toward cervical cancer and HPV vaccine: Five health beliefs towards cervical cancer and HPV vaccine: (1) perceived susceptibility, (2) perceived severity, (3) acceptability, (4) perceived effectiveness and (5) perceived barriers were measured using 5 items. For susceptibility to cervical cancer and severity of cervical cancer and acceptability of HPV vaccine, each of them was measured by one item using a 0-10 scale (0=not likely at all, 10=the most likely). Perceived effectiveness of HPV vaccination was measured with two items by asking participants to indicate the level of their perceived effectiveness of HPV vaccine before one becomes sexually active and after sexually active using the 0-10 scale. Importance of five barriers to receiving HPV vaccine were measured with one item by asking participants to rank the importance of five hindering factors of receiving the vaccine including "not likely to have cervical cancer', 'cost of vaccination', 'not sure of the vaccine's effect', 'afraid of side effect' and 'discouraged by others'. For each participant, the hindering factor ranked as the first priority was assigned a score of 5, the factor ranked as the second priority a score of 4 and so on to the factor ranked 5 a score of 1. A higher score indicates more important of the barrier in delaying HPV vaccination.

Demographic data: Information on age, major of study and whether the participants had sexual experience were also collected. Among those who had sexual experience, they were also asked whether contraceptive methods were used or not.

2.3. Statistical Analysis

Characteristics of the sample were summarized by descriptive statistics, mean and standard deviation for continuous variable and percentage for categorical variables. Bivariate and multivariate analyses were performed to identify factors associated with HPV vaccination. In the bivariate analyses, the independent *t*-test was used to compare continuous variables, with the chi-square test used for categorical variables. Factors associated with HPV vaccination in the bivariate analyses with a p-value < 0.2 were included in the multivariate logistic regression model to better assess the effect of associated factors on HPV vaccination. Data were analyzed using SPSS 20.0, with p-values less than 0.05 considered statistically significant in the final logistic regression model. Results of the logistic regression were presented by the odds ratios (OR) and associated 95% confidence intervals (CI).

3. Results

3.1. Demographic and HPV-Related Characteristics of the Participants

A total of 388 questionnaires were distributed and 312 (80.4%) completed questionnaires were collected. Among the returned questionnaires, 65 were excluded as the participants were not born in Hong Kong. Data of 247 questionnaires were used in the current analysis. In Table 1, it summarizes the demographic characteristics, sexual history, and use of HPV vaccination of the 247 female university students. Their mean age was 20.36 years (SD = 1.15), and 26.7% were studying medical sciences. Thirty-six (14.6%) had engaged in sexual activities before, and among them, 31 (86.1%) would use contraceptive methods. Overall speaking, the respondents were quite knowledgeable about HPV and HPV vaccine with a mean of 3.1 out of a range of 0-4. Their mean scores in perceived severity of cervical cancer, acceptability of HPV vaccine and perceived effectiveness of HPV vaccine before sexual experience were high while those in perceived susceptibility to cervical cancer and perceived effectiveness of HPV vaccine after sexual experience were on the low side. Only a few of the respondents (9.7%) had received the vaccine.

3.2. Factors Associated with Participation in HPV Vaccination

In Table 2, it shows the results of bivariate analyses and multivariate logistic regression for factors associated with participation in HPV vaccination. In the bivariate analyses, seven factors were associated with HPV vaccination at $p < 0.20$ included age ($p = 0.11$), knowledge score ($p < 0.01$), perceived susceptibility to cervical cancer ($p = 0.12$), acceptability of HPV vaccine ($p < 0.01$), perceived effectiveness of HPV vaccine before sexual experience ($p = 0.14$), and two barriers of HPV vaccination of 'not likely to have cervical cancer' ($p = 0.07$), and 'cost of vaccination' ($p = 0.06$). These factors were thus entered into the multivariate logistic regression model. Results in Table 2 show that knowledge score, acceptability of HPV vaccine, and the two barriers of HPV vaccination remained statistical significant in the logistic regression. The final logistic regression results revealed that female university students who had higher knowledge of cervical cancer and HPV vaccine, more acceptable to HPV vaccination, felt that 'not likely to have cervical cancer' as an important barrier to HPV vaccination were more likely while those who felt that cost of vaccination as an important barrier to HPV vaccination were less likely to receive HPV vaccination.

4. Discussion

The present study provides new information on the participation of HPV vaccination and the associated factors among female university students in Hong Kong. Only 9.7% of the respondents had received the vaccine. The current results show the participation rate in Hong Kong is much lower than that in female students in two universities in US (43.6%) (Licht et al., 2010). Although the participating rate in female university students is slightly higher than that reported in Hong Kong adolescent girls (7.2%) (Li et al., 2013), the current findings highlight the importance of promoting HPV vaccination in preventing cervical cancer in this high-risk group of cervical cancer in Hong Kong even though they have high level of education.

Our results showed that better knowledge in cervical cancer and HPV vaccine and higher acceptability of HPV vaccination were associated with a greater likelihood of taking the HPV vaccination which is in line with previous studies in the general female population (Black et al., 2009; Garcini et al., 2012; Cover et al., 2013; Kiely et al., 2013; Lima et al., 2013) and in the female teenager subgroup (Kessels et al., 2012). But the current results were contradicting to a previous study targeting female US undergraduates in which the overall knowledge score was not significantly associated with vaccine uptake after adjusting for demographic characteristics (Licht et al., 2010). This inconsistent finding in this previous study might be due to the small variations in the knowledge scores for the respondents in that study.

According to the Health Belief Model, susceptibility, severity and benefits should be positively associated with screening, while barriers should be negatively associated (Becker, 1984). In this study, we found that the perceived barrier 'cost of vaccination' was negatively associated with HPV vaccination which is in line with some previous studies (Hsu et al, 2011; Dorell, 2012). But another barrier 'not likely to have cervical cancer' was positively associated with HPV vaccination which is opposite to the theory-predicted direction of the relation. It is possible that for those respondents who had vaccinated might have increased their perception on this barrier because they felt the vaccination would protect them from HPV infection and hence they were unlikely to have cervical cancer.

Furthermore, we found susceptibility to cervical cancer, severity of cervical cancer and perceived effectiveness of HPV vaccine were not associated with HPV vaccination. It might be possible that other factors such as cancer fatalism that appeared to be an important factor in cancer screening in the Chinese women population (Liang et al., 2004) might have hindered their action to cervical cancer screening. The findings on the relationship between HBM constructs and HPV vaccination were mixed in the literatures: some studies reported null relations (Brewer et al., 2011; Dempsey et al, 2006; Reiter et al, 2009) while other studies reported significant results (Brewer and Fazekas, 2007; Gerend et al, 2007; Friedman and Shepeard, 2013; Hofman et al, 2013). Indeed, null and theory-contradicting findings on the relationships of these HBM related constructs and other cancer screenings such as colorectal cancer were frequently observed in the Chinese population (Leung et al., in press). Hence, the study findings suggest that further studies should consider extending Health Belief Model by incorporating other important factors such as cancer fatalism in predicting the behaviors of various cancer screenings in the Chinese population.

This study has several limitations. First, the results are limited by the cross-sectional design that causal inferences of the findings cannot be made. Second, the participants were recruited from one university in Hong Kong using convenience sampling that the sample is not representative of the general female university students in Hong Kong and hence limits the generalizability of the current results. Third, this questionnaire adopted the Health Belief Model to explore the health beliefs that influenced one's decision-making of HPV vaccination but the social factors that may influence the women's choice were not explored. Yet, the findings enhanced our understanding of the perceptions and needs of HPV vaccine promotion strategies among the Chinese women with higher educational level. In conclusion, the study showed that the participation rate of cervical cancer screening is suboptimal, and that knowledge about cervical cancer and HPV vaccine, acceptability of the vaccine and two barriers to vaccination, i.e. belief of 'not likely to have cervical cancer' and 'cost of HPV vaccination' seem to be important factors in the promotion of vaccination among female university students in Hong Kong. The current study extends research in health promotion to a specific population of females who are receiving territory education. With this information, health professionals in Hong Kong can play a more active role in making recommendation for HPV vaccination by providing more appropriately target programmes and policies in promoting HPV vaccination to this particular group of young women.

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Table 1: Demographic and HPV related Variables of the Respondents (n=247)

Demographics	
Age, M±SD (range)	20.4±1.2 (18-25)
Major of study, n (%)	
Medical Sciences	66 (26.7%)
Others	181 (73.3%)
Had sexual experience, n (%)	36 (14.6%)
Use of contraceptive methods, n (%)	31 (86.1%)
HPV related variables	
Knowledge score, M±SD (range)	3.1±1.2 (0-4)
Perceived susceptibility to cervical cancer, M±SD (range)	4.1±2.0 (0-10)
Perceived severity of cervical cancer, M±SD (range)	7.0±1.9 (0-10)
Acceptability of HPV vaccine, M±SD (range)	7.1±2.0 (0-10)
Perceived effectiveness of HPV vaccine, M±SD (range)	
Before sexual experience	7.2±1.9 (0-10)
After sexual experience	5.1±2.0 (0-10)
Perceived barriers of HPV vaccination, M±SD (range)	
Not likely to have cervical cancer	1.8±1.8 (0-5)
Cost of vaccination	3.2±1.8 (0-5)
Not sure of effects	3.1±1.8 (0-5)
Afraid of side effects	3.1±1.8 (0-5)
Discouraged by others	0.9±1.1 (0-5)
Outcome measure	
HPV vaccination, n (%)	24 (9.7%)

Table 2: Factors Associated with HPV Vaccination among Hong Kong Female University Students

	HPV vaccination		
	Yes (n = 24) M±SD/ n (%)	No (n= 223) M±SD/ n (%)	Adjusted OR (95% CI)
Demographics			
Age	20.0±1.2	20.4±1.1	
Medical Sciences	9 (37.5)	57 (25.6)	
Had sexual experience	3 (12.5%)	33 (14.8%)	
HPV related variables			
Knowledge score	3.7±0.7	3.0±1.2	3.14 (1.31-7.49)*
Perceived susceptibility to cervical cancer	3.4±2.3	4.1±2.0	0.90 (0.71-1.14)
Perceived severity of cervical cancer	7.4±1.9	7.0±2.0	
Acceptability of HPV vaccine	8.3±1.6	6.9±2.0	1.66 (1.16-2.37)**
Perceived effectiveness of HPV vaccine			
Before sexual experience	7.7±2.0	7.1±1.9	1.14 (0.81-1.61)
After sexual experience	5.6±1.7	5.1±2.1	
Perceived barriers of HPV vaccination			
Not likely to have cervical cancer	2.4±1.9	1.7±1.8	1.39 (1.05-1.85)*
Cost of vaccination	2.5±1.9	3.3±1.8	0.65 (0.48-0.87)**
Not sure of effects	3.0±1.9	3.1±1.8	
Afraid of side effects	3.1±1.9	3.1±1.8	
Discouraged by others	0.8±1.6	0.9±1.2	
Nagelkerke R^2			0.34

*p<0.05; **p<0.01