Original Article

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Knowledge and attitudes regarding human papillomavirus vaccination and cervical cancer screening among pregnant women in Hong Kong: a cross-sectional study

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Objectives: To evaluate the knowledge and attitudes regarding human papillomavirus (HPV) vaccination and cervical cancer screening among pregnant women in Hong Kong and to determine their associated factors. By identifying misconceptions and barriers, our findings could help formulate preventive strategies against HPV-related cancers.
Methods: Pregnant women who attended antenatal clinics at Tuen Mun Hospital between June 2021 and May 2024 were invited to complete a questionnaire. The questionnaire explored pregnant women's knowledge about HPV (8 items) and cervical cancer (8 items), attitudes towards HPV vaccination and cervical cancer screening (15 items), experience and plan for HPV vaccination and cervical cancer screening (5 items), and demographic information (8 items). Responses to the knowledge questions were yes-or-no answers; obtaining >80% correct answers was defined as sufficient knowledge.
Results: In total, 364 pregnant women completed the questionnaire. Of these, 126 (34.6%) had sufficient knowledge about HPV, and 82 (22.5%) had sufficient knowledge about cervical cancer. Among non-Chinese women, the percentages were 12.1% and 12.1%, respectively. Planning to receive HPV vaccination and to have regular cervical screening after pregnancy was more likely in pregnant women of Chinese ethnicity, with a family history of gynaecological malignancy, with cervical screening within 3 years, and with sufficient HPV knowledge.
Conclusion: To increase the uptake of HPV vaccine and cervical screening, enhancement of knowledge and removal of misconceptions and stigma are crucial for health-seeking behaviours of both the mothers and their children.

Keywords: Health knowledge, attitudes, practice; Papillomavirus vaccines; Pregnant people; Uterine cervical neoplasms

Introduction

Cervical cancer is the ninth most common cancer and cause of cancer death among women in Hong Kong, accounting for 2.9% of new cancer cases in women in 2022[1]. Persistent infections with high-risk human papillomavirus (HPV) can cause precancerous intraepithelial neoplasia and invasive cervical cancer[2]. HPV also can cause cancers and warts in the vagina, vulva, and anus. Therefore, prevention of HPV infection and cervical cancer remains an important public health initiative.

In 2004, the Department of Health in Hong Kong initiated a cervical screening programme (CSP) for women aged 25 to 64 years[3]. However, the CSP does not proactively include all eligible women but functions only as a database for women who have presented for screening. In 2008, a telephone survey in Hong Kong reported that 64% of eligible women had received cervical screening shortly after the CSP[4]. However, the 2023 annual report of the CSP showed that only 21.1% of women aged 25 to 64 years had registered with the CSP[5], suggesting inadequate screening coverage. Nonetheless, not all women who have received cervical screening are registered with the CSP because it is not mandatory.

HPV vaccination is a safe and effective preventive intervention for reducing the burden of HPV-related complications, and even women who have been exposed to some types of HPV can still benefit from sustained immunogenicity against other HPV types after vaccination[4,6]. A meta-analysis of prediction models suggests that high-risk HPV infection will be eliminated when 80% vaccination coverage is achieved[7]. However, the HPV vaccination coverage in Hong Kong remains low.

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Only 2.2% to 9.1% of schoolgirls and 0.6% of schoolboys had been vaccinated before the introduction of the no-cost Hong Kong Childhood Immunisation Programme in 2019/20, which provides HPV vaccine for girls in primary years 5 and 6[4,8]. In 2023, the HPV vaccination rate among schoolgirls rose to >80%[9], but uptake remained low among boys, because of barriers to acceptance of opportunistic vaccination among parents[4,10].

Women of reproductive age are most susceptible to HPV infections, and pregnant women represent the young, sexually active, female population. The awareness and attitudes of pregnant women regarding health issues can affect the health-seeking behaviour of their children. Parental awareness of HPV is closely related to HPV vaccine coverage in their children[4,11,12]. Pregnancy is often the first point of contact with regular health services, hence a good opportunity to promote health intervention. The postpartum period, in particular, is suitable for promoting opportunistic HPV vaccination, given the high acceptance of vaccines in the puerperium[6]. This study aimed to evaluate the knowledge and attitudes regarding HPV vaccination and cervical cancer screening among pregnant women in Hong Kong and to determine their associated factors. By identifying misconceptions and barriers, our findings could help formulate preventive strategies against HPV-related cancers.

Methods

Pregnant women who attended antenatal clinics at Tuen Mun Hospital between June 2021 and May 2024 were invited to complete a questionnaire. There is no validated questionnaire to assess the knowledge and attitudes regarding cervical cancer and HPV vaccination. Thus, we designed the questionnaire based on findings in the literature, focusing on knowledge, attitudes, and practice (KAP) regarding cervical cancer and HPV vaccination in non-pregnant women[4,10,13,14]. The Chinese and English versions of the questionnaire were back translated, verified by an independent interpreter, and then compared with the original version. There were no significant discrepancies between the original and the back-translated versions.

The questionnaire explored pregnant women's knowledge about HPV (8 items) and cervical cancer (8 items), attitudes towards HPV vaccination and cervical cancer screening (15 items), experience and plan for HPV vaccination and cervical cancer screening (5 items), and demographic information (8 items). Responses to the knowledge questions were yes-or-no answers; obtaining >80% correct answers was defined as sufficient knowledge, consistent with most KAP studies on knowledge of health issues[15]. Attitude was assessed on a five-point Likert scale ranging from strongly agree to strongly disagree. The questionnaire was pilot-tested with the first 10% of participants for clarity, and necessary modifications were made.

According to a study in the United States, 37.3% of pregnant women were found to be willing to receive the HPV vaccine[16]. Using the Cochran's formula and assuming a 37% positive response to the questions, a 5% margin of error, and a 95% confidence interval, a sample size of 359 women would be required for an infinite population[17]. Factors associated with planning to receive HPV vaccination after pregnancy and planning to have regular cervical screening after pregnancy were determined using univariable and multivariable logistic regression. A p value of <0.05 was considered statistically significant. Statistical analysis was performed using SPSS (Windows version 25.0; IBM Corp, Armonk [NY], US).

Results

In total, 364 pregnant women completed the questionnaire (Table 1). Among these, 26.9% had completed HPV vaccination before pregnancy; and 25.0% (of those who had not completed HPV vaccination) planned to have HPV vaccination after pregnancy. In addition, 62.4% had received cervical screening within the previous 3 years; and 52.4% planned to have regular cervical screening after pregnancy.

Of the participants, 126 (34.6%) had sufficient knowledge about HPV, and 82 (22.5%) had sufficient knowledge about cervical cancer. The mean percentages of correct answers were 60.1% and 61.1% for knowledge about HPV and cervical cancer, respectively (Table 2).

Compared with non-Chinese women, Chinese women were more likely to have sufficient knowledge about HPV (40.1% vs 12.1%, p<0.001) and cervical cancer (26.5% vs 12.1%, p=0.018) [Table 3]. Sufficient knowledge about HPV was also associated with being married (p=0.005), being employed (p=0.002), higher education levels (p<0.001), higher monthly household income p<0.001), having a family history of gynaecological malignancy (p=0.002), having completed HPV vaccination before pregnancy (p=0.001), and having cervical screening within 3 years (p<0.001), whereas sufficient knowledge about cervical cancer was also associated with higher education levels (p=0.002) and having cervical screening within 3 years (p<0.001).

Table 1. Characteristics of participants (n=364)

Characteristic	No. (%) of participants
Age, y (n=314)	
<35	209 (66.6)
≥35	105 (33.4)
Parity (n=314)	
Nulliparous	113 (36.0)
Multiparous	201 (64.0)
Ethnicity (n=337)	
Chinese	279 (82.8)
Caucasian	0
Filipino	13 (3.9)
Indian	2 (0.6)
Nepalese	13 (3.9)
Pakistani	20 (5.9)
Others	10 (3.0)
Marital status (n=331)	
Married	299 (90.3)
Single/divorced/widowed	32 (9.7)
Employment status (n=324)	
Employed	157 (48.5)
Unemployed	167 (51.5)
Education level (n=325)	
Primary	11 (3.4)
Secondary	188 (57.8)
Tertiary or above	126 (38.8)
Monthly household income, HK$ (n=326)	
<10 000	14 (4.3)
10 000-30 000	78 (23.9)
30 001-50 000	67 (20.6)
50 001-70 000	72 (22.1)
≥70 001	15 (4.6)
Unknown	80 (24.5)
Family history of gynaecological malignancy (n=344)	
Yes	49 (14.2)
No	226 (65.7)
Unsure	69 (20.1)
Completed human papillomavirus vaccination before pregnancy (n=360)	
Yes	97 (26.9)
No	263 (73.1)
Experience of cervical screening (n=362)	
Never	92 (25.4)
Within 3 years	226 (62.4)
Beyond 3 years	44 (12.2)
Plan to have human papillomavirus vaccination after pregnancy (excluding those who completed vaccination) [n=257]	
Yes	66 (25.7)
No/unsure	191 (74.3)
Plan to have cervical screening after pregnancy (n=359)	
Yes	188 (52.4)
No/unsure	171 (47.6)

Among the pregnant women, about one-third had negative attitudes towards HPV vaccination and cervical cancer screening. For example, 27.7% were worried that having cervical screening would affect relationship with their partner; 37.6% were embarrassed to have cervical screening; 36.5% needed more time and information to decide because the HPV vaccine was too new to them; 34.6% and 33.8% were worried that HPV vaccine would affect their potential to conceive and their breastfeeding, respectively; 29.4% preferred to have cervical screening alone without HPV vaccination; 27.5% thought that HPV vaccine was not necessary if their partner had been vaccinated; and 31.3% and 47.8% considered that cervical screening and HPV vaccine, respectively, were too expensive (Table 4).

Planning to receive HPV vaccination after pregnancy was more likely in pregnant women of Chinese ethnicity (aOR=4.78, p=0.014), with a family history of gynaecological malignancy (aOR=2.54, p=0.007), with cervical screening within 3 years (aOR=2.27, p=0.014), and with sufficient HPV knowledge (aOR=2.07, p=0.038), whereas planning to have regular cervical screening after pregnancy was more likely in pregnant women of Chinese ethnicity (aOR=3.45, p<0.001), having married (aOR=3.53, p=0.019), with secondary education (aOR=5.39, p=0.018) or tertiary education or above (aOR=1.98, p=0.008), with a family history of gynaecological malignancy (aOR=3.63, p=0.007), having completed HPV vaccination (aOR=2.90, p<0.001), with cervical screening within 3 years (aOR=3.72, p=0.014), with sufficient HPV knowledge (aOR=2.15, p<0.001), and with sufficient cervical cancer knowledge (aOR=2.28, p=0.004) [Table 5].

Pregnant women preferred multiple channels to obtain information about HPV vaccination including discussion with healthcare professionals during consultation (29.8%), internet or social media platforms (29.6%), and television or radio (25.7%), information pamphlets or letters (14.2%), and through friends (0.7%).

Discussion

HPV vaccination and cervical screening can be very cost-effective in diminishing the HPV-related healthcare burden in areas where screening coverage is low[4,18-21]. Vaccination coverage is a crucial element and hinges on parental acceptance and practice. In Hong Kong, the uptake of HPV vaccination by female adolescents has been surveyed among mothers and their adolescent children[4,10]. However, factors associated with mothers' practice to

Table 2. Knowledge about human papillomavirus (HPV) and cervical cancer among participants (n=364)

Knowledge	Correct answer	No. (%) of participants with correct response
HPV		
Is HPV a sexually transmissible infection?	Yes	239 (65.7)
Can HPV cause cervical cancer?	Yes	243 (66.8)
Can HPV cause genital warts?	Yes	209 (57.4)
Can HPV infection cause abnormal cervical smear (pap smear)?	Yes	243 (66.8)
Can HPV infection occur without visible symptoms?	Yes	199 (54.7)
Do only women acquire HPV infection?	No	226 (62.1)
Do only those with multiple sexual partners acquire HPV infection?	No	217 (59.6)
Can HPV vaccination cure HPV infection?	No	173 (47.5)
Cervical cancer		
Is cervical cancer rare in Hong Kong?	No	192 (52.7)
Would infection with high-risk HPV increase the risk of cervical cancer?	Yes	252 (69.2)
Is cervical screening (pap smear) advised after sexual exposure?	Yes	277 (76.1)
Is cervical cancer curable in early stage?	Yes	262 (72.0)
Does HPV vaccine protect against all types of HPV infection?	No	134 (36.8)
Is HPV vaccine included in the government routine vaccination programme?	Yes	153 (42.0)
Can HPV vaccine still offer protection for women with previous sexual exposure?	Yes	249 (68.4)
Is regular screening with cervical smear (pap smear) still advised after vaccination against HPV?	Yes	260 (71.4)

prevent HPV and cervical cancer have not been well evaluated. Our study targeted pregnant women and explored factors associated with higher rates of HPV vaccine uptake and cervical screening. Raising HPV awareness is essential, particularly among parents, to increase vaccine uptake[10]. Under the Hong Kong Childhood Immunisation Programme, HPV vaccination is provided via schools for girls in primary years 5 and 6, rather than via healthcare clinics for all eligible women. Thus, information about HPV vaccine and misconceptions may not be directly addressed. Promoting HPV and cervical cancer education to pregnant women during the antepartum and postpartum periods could increase the vaccine uptake of both the mothers and their children.

Knowledge about HPV and cervical cancer was insufficient among pregnant women in Hong Kong, particularly among non-Chinese, of whom only 12.1% had sufficient knowledge about HPV and cervical cancer. Possible explanations include a language barrier, a lack of awareness of services, and cultural stigmas over gynaecological check-ups. Most information leaflets in Hong Kong are in Chinese or English, which may not be comprehensible for some ethnic minorities. The language barrier also impedes communication with healthcare professionals or access to healthcare services. Cultural stigmas may lead to embarrassment when receiving HPV vaccine or cervical screening. Therefore, resources should be made more accessible to women of all ethnicities.

In our study, higher education levels were associated with better knowledge about HPV and cervical cancer. A possible explanation is that more educated parents would be more willing to support HPV vaccination and cervical screening for their children. Promoting HPV and cervical cancer education to pregnant women would influence health-seeking practices in their children. Having a family history of gynaecological malignancy was also associated with better knowledge about HPV. These women may have higher health awareness and are more likely to learn about gynaecological malignancies.

Pregnant women with better knowledge about HPV were more likely to plan for both HPV vaccination and cervical screening in the future. However, having better knowledge about cervical cancer increased the likelihood

Table 3. Stratified distribution of different bacterial species in subjects with uncomplicated urinary tract infection

Characteristic	Insufficient HPV knowledge (n=238)	Sufficient HPV knowledge (n=126)	p Value	Insufficient cervical cancer knowledge (n=282)	Sufficient cervical cancer knowledge (n=82)	p Value
Age, y (n=314)			0.762			0.154
<35 (n=209)	135 (64.6)	74 (35.4)		154 (73.7)	55 (26.3)	
≥35 (n=105)	66 (62.9)	39 (37.1)		85 (81.0)	20 (19.1)	
Parity (n=314)			0.224			0.573
Nulliparous (n=113)	78 (69.0)	35 (31.0)		87 (77.0)	26 (23.0)	
Multiparous (n=201)	125 (62.2)	76 (37.8)		149 (74.1)	52 (25.9)	
Ethnicity (n=337)			<0.001			0.018
Chinese (n=279)	167 (59.9)	112 (40.1)		205 (73.5)	74 (26.5)	
Non-Chinese (n=58)	51 (87.9)	7 (12.1)		51 (87.9)	7 (12.1)	
Marital status (n=331)			0.005			0.097
Married (n=299)	188 (62.9)	111 (37.1)		222 (74.3)	77 (25.8)	
Single/divorced/widowed (n=32)	28 (87.5)	4 (12.5)		28 (87.5)	4 (12.5)	
Employment status (n=324)			0.002			0.107
Employed (n=157)	89 (56.7)	68 (43.3)		113 (72.0)	44 (28.0)	
Unemployed (n=167)	122 (73.1)	45 (27.0)		133 (79.6)	34 (20.4)	
Education level (n=325)			<0.001			0.002
Primary (n=11)	11 (100.0)	0		9 (81.8)	2 (18.2)	
Secondary (n=188)	140 (74.5)	48 (25.5)		156 (83.0)	32 (17.0)	
Tertiary or above (n=126)	59 (46.8)	67 (53.2)		83 (65.9)	43 (34.1)	
Monthly household income, HK$ (n=246)			<0.001			0.357
<10 000 (n=14)	12 (85.7)	2 (14.3)		12 (85.7)	2 (14.3)	
10 000-30 000 (n=78)	62 (79.5)	16 (20.5)		61 (78.2)	17 (21.8)	
30 001-50 000 (n=67)	42 (62.7)	25 (37.3)		48 (71.6)	19 (28.4)	
50 001-70 000 (n=72)	34 (47.2)	38 (52.8)		49 (68.1)	23 (31.9)	
≥70 001 (n=15)	4 (26.7)	11 (73.3)		9 (60.0)	6 (40.0)	
Family history of gynaecological malignancy (n=344)			0.002			0.208
Yes (n=49)	22 (44.9)	27 (55.1)		34 (69.4)	15 (30.6)	
No/unsure (n=295)	201 (68.1)	94 (31.9)		229 (77.6)	66 (22.4)	
Completed HPV vaccination before pregnancy (n=360)			0.001			0.757
Yes (n=97)	50 (51.6)	47 (48.5)		76 (78.4)	21 (21.7)	
No (n=263)	184 (70.0)	79 (30.0)		202 (76.8)	61 (23.2)	
Cervical screening within 3 years (n=362)			<0.001			<0.001
Yes (n=226)	126 (55.8)	100 (44.3)		161 (71.2)	65 (28.8)	
No (n=136)	111 (81.6)	25 (18.4)		119 (87.5)	17 (12.5)	

Table 4. Attitude towards human papillomavirus (HPV) vaccination and cervical cancer screening among participants (n=364)

Attitude	No. (%) of participants (n=364)					
	Strongly agree	Agree	Neutral or not sure	Disagree	Strongly disagree	No response
HPV infection is a serious disease	13 (3.6)	207 (56.9)	111 (30.5)	22 (6.0)	1 (0.3)	10 (2.7)
Preventing cervical cancer is better than treating it	92 (25.3)	200 (54.9)	34 (9.3)	10 (2.7)	1 (0.3)	27 (7.4)
Regular cervical screening (pap smears) is an important health practice for all women	76 (20.9)	213 (58.5)	40 (11.0)	9 (2.5)	4 (1.1)	22 (6.0)
Only high-risk women need regular cervical screening (pap smear)	11 (3.0)	99 (27.2)	53 (14.6)	134 (36.8)	53 (14.6)	14 (3.8)
Cervical smear (pap smear) is too expensive for me	17 (4.7)	97 (26.6)	130 (35.7)	101 (27.7)	7 (1.9)	12 (3.3)
Cervical smear is effective in prevention of cervical cancer	25 (6.9)	175 (48.1)	92 (25.3)	47 (12.9)	1 (0.3)	24 (6.6)
HPV vaccine is safe and effective	29 (8.0)	198 (54.4)	91 (25.0)	33 (9.1)	0	13 (3.6)
HPV vaccine is too expensive for me	22 (6.0)	152 (41.8)	123 (33.8)	45 (12.4)	2 (0.5)	20 (5.5)
I am embarrassed to have cervical screening (pap smear)	16 (4.4)	121 (33.2)	90 (24.7)	102 (28.0)	18 (4.9)	17 (4.7)
Having cervical screening will affect my relationship with my partner	12 (3.3)	89 (24.5)	70 (19.2)	132 (36.3)	48 (13.2)	13 (3.6)
I need more time and information before making a decision because the HPV vaccine is too new to me	20 (5.5)	113 (31.0)	98 (26.9)	110 (30.2)	16 (4.4)	7 (1.9)
I prefer to have cervical screening only rather than HPV vaccination	11 (3.0)	96 (26.4)	117 (32.1)	116 (31.9)	16 (4.4)	8 (2.2)
I am worried that HPV vaccine will affect my potential for conceiving	13 (3.6)	113 (31.0)	83 (22.8)	115 (31.6)	33 (9.1)	7 (1.9)
I am worried that HPV vaccine will affect my breastfeeding	13 (3.6)	110 (30.2)	93 (25.5)	106 (29.1)	28 (7.7)	14 (3.8)
HPV vaccine is not necessary if my partner has been vaccinated	12 (3.3)	88 (24.2)	70 (19.2)	139 (38.2)	39 (10.7)	16 (4.4)

to plan for cervical screening only. This finding suggests that the prevention of cervical cancer by HPV vaccination may not be fully understood by these women, when 36.6% considered the HPV vaccine too new and 29.4% preferred cervical screening alone rather than together with HPV vaccination. Education on the role of the HPV vaccine in cervical cancer prevention should be enhanced among pregnant women.

To eliminate cervical cancer, the World Health Organization proposed that 90% of girls be fully vaccinated with HPV vaccines by the age of 15 years and 70% of women undergo cervical screening by age 35 years and again by age 45 years[22]. In our cohort, rates of HPV vaccine and cervical screening uptake were low at the time of survey (26.9% and 62.4%, respectively) and in future planning (25.7% and 52.4%, respectively). Misconceptions, incorrect attitudes, and possible social stigma should be addressed. Among our participants, 27.7% considered that having cervical screening would affect their relationship with their partner, and 27.5% considered that HPV vaccination was not needed if their partner had been vaccinated. These misconceptions could have a negative impact on cervical cancer prevention. Furthermore, pregnant women should be educated on the safety of the HPV vaccine during breastfeeding[23]. Although 62.4% agreed that the HPV vaccine was safe and effective, 34.6% and 33.8% were worried about any impact on conception and breastfeeding, respectively. Worries and embarrassment lower the likelihood of receiving cervical

Table 5. Factors associated with planning to receive human papillomavirus (HPV) vaccination and to have regular cervical screening after pregnancy

Factors	Plan to receive HPV vaccination after pregnancy (excluding those who completed HPV vaccination)				Plan to have regular cervical screening after pregnancy			
	Crude odds ratio (95% confidence interval)	p Value	Adjusted odds ratio (95% confidence interval)	p Value	Crude odds ratio (95% confidence interval)	p Value	Adjusted odds ratio (95% confidence interval)	p Value
Age, y								
<35	Reference		-		Reference		-	
≥35	0.70 (0.37-1.34)	0.287	-	-	1.03 (0.62-1.71)	0.635	-	-
Parity								
Nulliparous	Reference		-		Reference		-	
Multiparous	0.67 (0.31-1.47)	0.242	-	-	0.91 (0.57-1.47)	0.624	-	-
Ethnicity								
Chinese	3.89 (1.13-13.33)	0.024	4.78 (1.37-16.67)	0.014	3.50 (1.88-6.55)	<0.001	3.45 (1.81-6.56)	<0.001
Non-Chinese	Reference		Reference		Reference		Reference	
Marital status								
Married	0.64 (0.15-2.81)	0.246	-	-	4.16 (1.81-9.57)	0.001	3.53 (1.42-8.82)	0.019
Single/divorced/widowed	Reference		-		Reference		Reference	
Employment status								
Employed	0.81 (0.38-1.76)	0.357	-	-	0.50 (0.32-0.78)	0.003	0.86 (0.50-1.48)	0.582
Unemployed	Reference		-		Reference		Reference	
Education level								
Primary	Reference		-		Reference		Reference	
Secondary	0.99 (0.21-4.81)	0.785	-	-	5.60 (1.41-22.24)	0.014	5.39 (1.34-21.70)	0.018
Tertiary or above	0.80 (0.16-3.99)	0.486	-	-	2.31 (1.44-3.71)	0.001	1.98 (1.20-3.27)	0.008
Monthly household income, HK$								
<10 000	Reference		-		Reference		Reference	
10 000-30 000	0.72 (0.17-3.01)	0.814	-	-	0.31 (0.16-0.61)	<0.001	0.45 (0.05-4.03)	0.452
30 001-50 000	1.05 (0.26-4.22)	0.211	-	-	0.21 (0.10-0.42)	0.001	0.50 (0.41-1.48)	0.476
50 001-70 000	0.92 (0.15-5.53)	0.712	-	-	0.18 (0.09-0.36)	<0.001	0.73 (0.45-1.71)	0.388
≥70 001	0.85 (0.21-3.41)	0.596	-	-	0.14 (0.04-0.49)	<0.001	0.37 (0.10-1.79)	0.058
Family history of gynaecological malignancy								
Yes	3.78 (1.46-9.83)	0.002	2.54 (1.28-5.01)	0.007	3.48 (1.71-7.07)	0.001	3.63 (1.67-7.88)	0.007
No/unsure	Reference		Reference		Reference		Reference	
Completed HPV vaccination before pregnancy								
Yes	-	-	-	-	4.54 (2.41-8.56)	<0.001	2.90 (1.83-4.50)	<0.001
No	-		-		Reference		Reference	
Cervical screening within 3 years								
Yes	2.60 (1.38-4.91)	0.003	2.27 (1.18-4.35)	0.014	7.14 (4.03-12.50)	<0.001	3.72 (1.89-7.30)	0.014
No	Reference		Reference		Reference		Reference	
Sufficient HPV knowledge								
Yes	2.59 (1.15-5.83)	0.010	2.07 (1.14-3.74)	0.038	2.51 (1.59-3.95)	<0.001	2.15 (1.32-3.49)	<0.001
No	Reference		Reference		Reference		Reference	
Sufficient cervical cancer knowledge								
Yes	1.05 (0.46-2.40)	0.180	-	-	2.08 (1.21-3.58)	0.001	2.28 (1.30-4.01)	0.004
No	Reference		-		Reference		Reference	

screening.[24-26]. The procedure of cervical screening should be elaborated, and worries and embarrassment sensitively addressed. Of the participants, 31.4% and 47.8% considered that the prices of cervical screening and the HPV vaccine, respectively, were too expensive, consistent with findings from other studies[4,27-29]. Organisations that provide affordable cervical screening services and HPV vaccination should be introduced to these women.

Nowadays, health information can be acquired via the internet and social media platforms. Government agencies can help raise mothers' awareness about HPV vaccination and cervical screening through online resources, because these were preferred channels among our participants. Online platforms allow updates and translations more easily, and the latest evidence can be made easily available to all ethnicities. The vaccine uptake may remain low if preventive measures for cervical cancer in Hong Kong remain opportunistic. Campaigns to promote prevention should involve proactive initiation. Information pamphlets for HPV vaccination and cervical screening should be distributed to pregnant women during antenatal and postnatal check-ups, during which women should discuss their concerns with healthcare professionals. Interactions with health professionals may help eliminate patients' misinformation as well as social and cultural stigma, which have a negative impact on cervical cancer prevention.[14]

This study had some limitations. First, it was a cross-sectional study, which is less effective than a longitudinal survey in assessing the temporal association between acceptance and practice of HPV vaccination and cervical cancer prevention. Second, it was conducted in a single centre, and the sample size was small; our results may not be generalised to all pregnant women in Hong Kong. Third, our questionnaire has not been validated, but it incorporated various KAP studies about HPV and was adequately pilot-tested. We followed most KAP studies to use 80% as the cut-off for sufficient knowledge[15]. Last, ethnic minorities were under-represented, and non-participants were not assessed (participation bias). Nonetheless, our study had several strengths. The proportion of missing responses was relatively small. Pregnant women represent the young, sexually active, female population in Hong Kong; thus, our findings may be generalised to this population. Our results can help inform policy makers and healthcare providers to formulate preventive strategies.

Conclusion

Among pregnant women in Hong Kong, 34.6% had sufficient knowledge about HPV and 22.5% had sufficient knowledge about cervical cancer. Among non-Chinese women, the percentages were 12.1% and 12.1%, respectively. To increase the uptake of HPV vaccine and cervical screening, enhancement of knowledge and removal of misconceptions and stigma are crucial for health-seeking behaviours of both the mothers and their children.

Contributors

All authors designed the study, acquired the data, analysed the data, drafted the manuscript, and critically revised the manuscript for important intellectual content. All authors had full access to the data, contributed to the study, approved the final version for publication, and take responsibility for its accuracy and integrity.

Conflicts of interest

All authors have disclosed no conflicts of interest.

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Data availability

All data generated or analysed during the present study are available from the corresponding author on reasonable request.

Ethics approval

This study was approved by the Central Institutional Review Board of Hospital Authority, Hong Kong (reference: NTWC/REC/21032). Participants were treated in accordance with the Declaration of Helsinki. All participants provided written informed consent for all treatments and procedures and for publication.

References

1. Hong Kong Cancer Registry. Overview of Hong Kong Cancer Statistics of 2022. Accessed 19 March 2025. Available from: https://www3.ha.org.hk/cancereg/pdf/overview/Overview%20of%20HK%20Cancer%20Stat%202022.pdf

2. Schiffman M, Wentzensen N. Human papillomavirus infection and the multistage carcinogenesis of cervical cancer. Cancer Epidemiol Biomarkers Prev 2013;22:553-60.
3. Centre for Health Protection. Cervical Screening Programme. Accessed 19 March 2025. Available from: https://www.chp.gov.hk/files/pdf/3_booklet_english.pdf
4. Choi HC, Leung GM, Woo PP, Jit M, Wu JT. Acceptability and uptake of female adolescent HPV vaccination in Hong Kong: a survey of mothers and adolescents. Vaccine 2013;32:78-84.
5. Centre for Health Protection. Cervical Screening Programme Annual Statistics Report 2023. Accessed 19 March 2025. Available from: https://www.cervicalscreening.gov.hk/en/files/sr_statistics_stat.pdf
6. Schwarz TF, Galaj A, Spaczynski M, et al. Ten-year immune persistence and safety of the HPV-16/18 AS04-adjuvanted vaccine in females vaccinated at 15-55 years of age. Cancer Med 2017;6:2723-31.
7. Brisson M, Bénard É, Drolet M, et al. Population-level impact, herd immunity, and elimination after human papillomavirus vaccination: a systematic review and meta-analysis of predictions from transmission-dynamic models. Lancet Public Health 2016;1:e8-e17.
8. Wang Z, Wang J, Fang Y, et al. Parental acceptability of HPV vaccination for boys and girls aged 9-13 years in China: a population-based study. Vaccine 2018;36:2657-65.
9. Hong Kong SAR Government. LCQ12: Human papillomavirus vaccination. Accessed 19 March 2025. Available from: https://www.info.gov.hk/gia/general/202307/05/P2023070500270.htm
10. Lam EWH, Ngan HYS, Kun KY, Li DFH, Wan WY, Chan PKS. Awareness, perceptions, and acceptance of human papillomavirus vaccination among parents in Hong Kong. Hong Kong Med J 2023;29:287-94.
11. Fielding R, Lam WWT, Wu JTK, Wang LDL, Liao QY. Chinese parental decision making on HPV vaccination for adolescent girls: a longitudinal study. Hong Kong Med J 2019;25 Suppl 7(5):9-12.
12. Loke AY, Kwan ML, Wong YT, Wong AKY. The uptake of human papillomavirus vaccination and its associated factors among adolescents: a systematic review. J Prim Care Community Health 2017;8:349-62.
13. Cheung T, Lau JTF, Wang JZ, et al. The acceptability of HPV vaccines and perceptions of vaccination against HPV among physicians and nurses in Hong Kong. Int J Environ Res Public Health 2019;16:1700.
14. Sherman SM, Bartholomew K, Denison HJ, et al. Knowledge, attitudes and awareness of the human papillomavirus among health professionals in New Zealand. PLoS One 2018;13:e0197648.
15. Khumalo PG, Carey M, Mackenzie L, Sanson-Fisher R. Cervical cancer screening knowledge and associated factors among Eswatini women: a cross-sectional study. PLoS One 2024;19:e0300763.
16. Heyman KP, Worley MJ Jr, Frey MK, Kessler RT, Bodurka DC, Slomovitz BM. Willingness of pregnant women to vaccinate themselves and their newborns with the HPV vaccine. Vaccine 2011;29:4618-22.
17. Cochran WG. Sampling Techniques. 2nd ed. New York: John Wiley and Sons; 1963.
18. Choi CW, Jit M, Leung GM, Wu JTK. Public health impact and economic evaluation of organized HPV vaccination program in Hong Kong. Proceeding: Research Postgraduate Symposium. Hong Kong; 2012.
19. Goldie SJ, Diaz M, Kim SY, Levin CE, Van Minh H, Kim JJ. Mathematical models of cervical cancer prevention in the Asia Pacific region. Vaccine 2008;26(Suppl 12):M17-M29.
20. Gakidou E, Nordhagen S, Obermeyer Z. Coverage of cervical cancer screening in 57 countries: low average levels and large inequalities. PLoS Med 2008;5:e132.
21. Lee A, Ho M, Cheung CK, Keung VM. Factors influencing adolescent girls' decision in initiation for human papillomavirus vaccination: a cross-sectional study in Hong Kong. BMC Public Health 2014;14:925.
22. World Health Organization. Cervical Cancer Elimination Initiative. Accessed 28 December 2024. Available from: https://www.who.int/initiatives/cervical-cancer-elimination-initiative
23. Cox JT, Palefsky JM. Human Papillomavirus Vaccination. Wolters Kluwer; 2024.
24. Bennett KF, Waller J, Chorley AJ, Ferrer RA, Haddrell JB, Marlow LA. Barriers to cervical screening and interest in self-sampling among women who actively decline screening. J Med Screen 2018;25:211-7.
25. Waller J, Bartoszek M, Marlow L, Wardle J. Barriers to cervical cancer screening attendance in England: a population-based survey. J Med Screen 2009;16:199-204.
26. Marlow LA, Waller J, Wardle J. Barriers to cervical cancer screening among ethnic minority women: a qualitative study. J Fam Plann Reprod Health Care 2015;41:248-54.
27. Kwan TT, Chan KK, Yip AM, et al. Barriers and facilitators to human papillomavirus vaccination among Chinese adolescent girls in Hong Kong: a qualitative-quantitative study. Sex Transm Infect 2008;84:227-32.
28. Chan KK, Kwan TT, Yao TJ, Tam KF, Cheung AN, Ngan HY. Human papillomavirus vaccine: what are women most concerned about? J Obstet Gynaecol Res 2012;38:23-30.
29. Lee A, Chan KS, Lau CH, Chan TN. How would family physicians facilitate the uptake of HPV vaccination: focus group study on parents and single women in Hong Kong. J Hong Kong Coll Fam Physicians 2011;33:107-14.