

Knowledge and Attitudes Regarding HPV and Vaccination Among Chinese Women Aged 20 to 35 Years in Fujian Province: A Cross-Sectional Study

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Abstract

The use of the human papillomavirus (HPV) vaccine was recently approved in Mainland China. This study determined the knowledge and attitudes of young women aged 20 to 35 years in Fujian Province, China, with regard to HPV and vaccination and explored the potential factors influencing their attitudes toward HPV vaccination. This was a cross-sectional study that collected data regarding the knowledge on and attitudes toward HPV and vaccination using questionnaires. Furthermore, the prevalence of HPV was determined from the sampled participants. A total of 1001 young women were included in the survey. This study demonstrated that the HPV prevalence rate was 15.7% (157/1001). Among all patients, 44.9% (n = 449) had heard of HPV; however, detailed knowledge about HPV was lacking. The majority (83.7%) expressed a willingness to be vaccinated. Specifically, knowledge of the dangers of HPV infection was significantly associated with the willingness to be vaccinated. In this study, women cited some concerns and expressed high expectations for the HPV vaccine, but the costs of vaccination reduced their willingness to be vaccinated. This study found that most patients did not have a detailed knowledge of HPV. Thus, there is a need for continued HPV promotion and education efforts, especially on the dangers of HPV infection, among young women aged 20 to 35 years in Fujian Province, China. Furthermore, it is important to subsidize the costs of vaccination for promoting vaccination campaigns in China.

Keywords

knowledge, attitudes, human papillomavirus, HPV vaccination, young women

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Background

Cervical cancer is the third most frequent cancer among women globally, and its incidence is especially high in developing countries. Roughly, 528 000 new cervical cancer diagnoses are made per year, and 265 653 cervical cancer-related deaths occurred in 2012 alone.¹ Eighty-five percent of cases arise in developing countries due to the lack of cervical cancer prevention and control programs.² China, the largest developing country, has the highest number of patients with cervical cancer, with 98 900 new cases and 30 500 deaths in 2015.³ Persistent infection with one or more high-risk (HR) genotypes

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of human papilloma (HPV) is essential for the development of cervical cancer and its precursors.^{4,5} According to our previous study, the overall HPV prevalence rate was 20.57% and HPV-16, HPV-52, HPV-58, HPV-43, and HPV-18 were the top 5 prevalent genotypes in HPV-positive women, based on the hospital population in Fujian Province, China.⁶ In addition, Baloch et al revealed the prevalence and genotype distribution of HPV varied among different regions and HPV-16, HPV-52, HPV-58, and HPV-18 are the leading HR-HPV genotypes in Yunnan Province, China.⁷

The development of vaccines that provide protection against HPV is a major step toward reducing cervical cancer rates. Approximately 75% of sexually active people will be infected with HPV at some point during their lives. Moreover, vaccination prior to sexual debut, especially before the age of 18 years, is advised to ensure protection against target HPV types.⁸ Many countries have implemented HPV vaccination programs to reduce the burden of HPV-associated diseases.^{9,10} Mainland China has just approved Cervarix (GlaxoSmithKline, Wales), a 2-valent vaccine, for girls aged 9 to 25 years in 2016 and Gardasil (Merck Inc, Whitehouse Station), a 4-valent vaccine, for women aged 20 to 45 years in 2017. Studies on awareness regarding HPV and attitudes toward HPV vaccination have been conducted in many countries, including China.¹¹⁻¹³ However, in China, researchers have focused on college students and parents for their awareness of the HPV vaccine.¹⁴⁻¹⁷ As the HPV vaccine has only been recently introduced in China, studies exploring willingness to be vaccinated among the target population, women aged 20 to 35 years who are sexually active, are necessary. They are essential when developing policies on how HPV vaccination should be applied to the cervical cancer control program.

In Australia, the HPV vaccination program covered about 86% adolescent girls, aged 12 to 13 years, who received at least one vaccine dose, with 77% receiving all three doses in 2013, based on the data from the National HPV Vaccination Program Register.¹⁸ High vaccine coverage has also been achieved in some other programs internationally, for example, in the United Kingdom (school-based delivery)¹⁹ and Denmark (clinic-based delivery).²⁰ However, the HPV vaccination coverage is lower in Asian countries. In Hong Kong, 7.5% of adolescent girls are vaccinated, while a more recent study indicated the vaccination rate for girls younger than 18 years was even lower at 2.4%.²¹ Although adolescent girls in Hong Kong have generally favorable attitudes toward HPV vaccination and HPV programs are widely promoted through mass media, this rate is relatively low compared to that of other developed countries.^{22,23} Despite the numerous published studies focusing on HPV and vaccination in recent years, there are only a few studies focusing on awareness and attitudes toward HPV and vaccination among the women aged 20 to 35 years, considering that HPV prevalence is relatively higher in Mainland China.²⁴⁻²⁷

The purpose of this study was to examine the prevalence of HPV and the awareness and attitudes associated with HPV and vaccination among young women aged 20 to 35 years, who need to be protected by HPV vaccination and were of suitable

vaccination age in Fujian Province, China, and to provide recommendations for the promotion of HPV vaccination in Mainland China in the future.

Materials and Methods

Study Design and Population

Study design. This cross-sectional survey consisted of a self-administered questionnaire based on paper and data collection in a community population from different regions of Fujian Province, China, between December 2016 and March 2017.

Population. This study randomly selected 7 counties of the 68 counties, in Fujian Province, China. The research team first contacted each Maternity and Children's Health Hospital in the 7 regions to request their assistance in providing 2 gynecologists to help the patients complete the questionnaire and to obtain the cervical specimens. Women aged 20 to 35 years living in Fujian Province, China, were recruited for this study, through targeted advertisements posted on communities and streets in various regions or on the local social media website. The population should satisfy the following criteria: (1) young women living in the selected regions, (2) volunteered to join the study and comply with follow-up visits, (3) aged between 20 and 35 years with an active sexual life, (4) not pregnant or breast feeding, (5) no history of cervical treatment or surgery, and (6) no sexual activity 48 hours before cervical exfoliated cell sample collection. There were 1001 young women who volunteered to participate in the study.

Ethical Considerations

Before enrollment to the study, the participants were informed of the purpose and contents of the study. All participants provided written informed consent. They were also informed that their participation was totally voluntary and that they had the right and freedom to withdraw from the study at any time without providing a reason. This study was approved by the Fujian Provincial Maternity and Children's Hospital, affiliated hospital of Fujian Medical University (approval number: 2016-019).

Cervical Specimen Collection and Polymerase Chain Reaction–Reverse Dot Blot HPV Genotyping

Cervical cells were collected using dry swab samples, according to routine procedures, from the cervical canal of all participants and placed in a 20-mL standard test tube filled with ThinPrep PreservCyt solution (Hologic Inc, Waltham, Massachusetts) for HPV DNA testing. For HPV assays, 1 mL of the cell suspension was used for DNA extract and was stored at -20°C . The HPV testing was performed using the polymerase chain reaction–reverse dot blot Yaneng HPV Genotyping Kit (Yaneng Biotech, Shenzhen, China), which is capable of detecting 23 genotypes, including 18 HR-HPV types (16, 18, 31, 33, 35, 39, 45, 51, 52, 53, 56, 58, 59, 66, 68, 73, 82, and 83) and 5 low-risk (LR)-HPV types (6, 11, 42, 43, and 81).⁶

Instrument

The paper-based questionnaire used in this study was modified from a study conducted by a Chinese research team that also investigated similar issues in low-resource regions¹¹ and was designed in the Chinese language. The 3-page questionnaire was designed to collect data in 3 areas: (1) basic information on sociodemographic status (7 items), (2) knowledge of HPV (7 items), and (3) attitudes toward the HPV vaccine (6 items). Some questions had 3 possible options (Yes/No/Don't know); the option "Don't know" was considered an incorrect answer. The remaining questions were multiple-choice.

Data Collection

Overall, 1100 questionnaires were distributed, and 1001 participants responded. The questionnaire was self-administered, which were to be filled in individually by the participants under the strict vigilance of the research team which serves as investigators to monitor the participants. However, if the participants encountered any problems, a team from the Maternity and Children's Health Hospital staff in the 7 counties who received the rigorous training about the on-site questionnaire quality control were available for help, such as explaining the questions the participants found confusing, translating the questions into local language, and so on. Upon completion of the survey, we provided free HPV screening to thank them for their time and participation. A database was created using EpiData 3.1 (Odense, Denmark, in Danish: EpiData foreningen). To ensure accuracy, 2 different researchers entered the data separately.

Data Analysis

Data were analyzed using the SPSS version 23.0 (IBM Corp, Armonk, New York). Univariate analysis was used to generate frequencies and percentages for categorical variables. Descriptive statistics were used to identify the general demographics of the patients, along with their knowledge and attitudes regarding HPV and vaccination. To compare the patients' attitudes toward HPV vaccination, Pearson tests were used. A *P* value <.05 indicated statistical significance.

Results

Overall, 1001 young women were enrolled in the study, and all completed the questionnaires successfully; cervical swab specimens were obtained from all patients for the HPV DNA assay.

Prevalence of HPV Infection

The overall HPV infection in this population was 15.7% (157/1001); the positivity for HR-HPV and LR-HPV was 13.4% (134/1001) and 3.7% (37/1001), respectively. The HPV infection for the different age groups were 17.2% (aged: 20-25 years), 15.9% (aged: 26-30 years), and 15.2% (aged: 31-35 years; Figure 1).

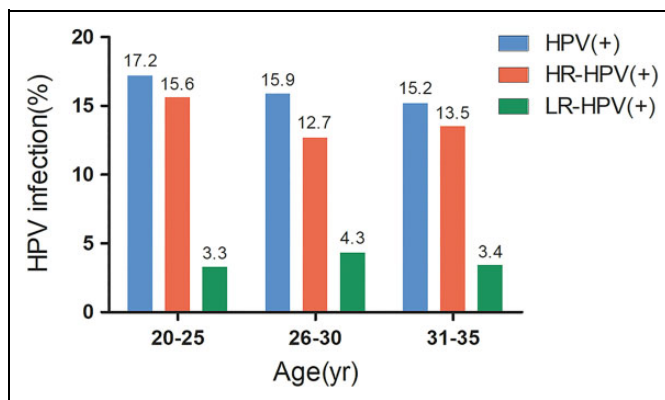


Figure 1. Prevalence of HPV infections among different age. Noted: Some people have double infection with high-risk HPV and low-risk HPV. LR-HPV, low-risk human papillomavirus; HPV indicates human papillomavirus; HR-HPV, high-risk human papillomavirus.

Table 1. Baseline Sociodemographic Characteristics of the Participants.

Characteristics	N = 1001 n (%)
Age range (year)	
20-25	122 (12.2)
25-30	433 (43.2)
31-35	446 (44.6)
Marital	
Married or previously married	948 (94.7)
Unmarried	46 (4.6)
Other	7 (0.7)
Education	
Junior school or under	254 (25.4)
High school	297 (29.7)
Undergraduate or higher	450 (44.9)
Occupation	
White-collar workers and civil servant	297 (29.7)
Professionals	245 (24.5)
Unemployed	220 (22.0)
Student	119 (11.9)
Laborers	112 (11.2)
Domestic works	3 (0.3)
Other	5 (0.5)
Residence	
City	596 (59.5)
Rural area	405 (40.5)
Monthly income*	
Under ¥3000 (US\$471.9)	223 (22.3)
¥3001-8000 (US\$472.1-US\$1258.4)	630 (63.0)
≥¥8001 (US\$1258.4)	148 (14.7)

*¥=Yuan(China), US\$=dollar(USA).

Participants' Demographics and Characteristics

A summary of the respondents' characteristics is provided in Table 1. The mean age of the 1001 participants was 29.5 ± 3.3 years. The majority (74.6%) had achieved at least high school education, including 44.9% with undergraduate degrees or

Table 2. Knowledge of HPV Among the Participants (N = 1001).^a

Item	n ^b = 449 (%)	Correctly Answered, n ^c (%)
Q2: Have you ever heard of the HPV (Yes)?	449 (44.9)	-
Sexually transmitted diseases	138 (30.7)	-
Genital warts	144 (32.4)	
Cervical cancer	346 (77.1)	
HIV	39 (8.7)	
No knowledge of HPV	59 (1.3)	
Q3: What are the risks of HPV infection?		
High risk	364 (81.1)	364 (81.1)
Low risk	22 (4.9)	
No risk	1 (0.2)	
Not clear	80 (17.8)	
Q4: How is the HPV transmitted?		
Sexual contact	185 (41.2)	176 (39.2)
Indirect contact	7 (1.6)	
Both	176 (39.2)	
Not clear	81 (18.0)	
Q5: What is the prevalence of the HPV in the population?		
More than 90%	10 (2.2)	73 (16.3)
70%-90%	29 (6.5)	
50%-70%	68 (15.1)	
30%-50%	83 (18.5)	
Less than 30%	73 (16.3)	
Not clear	186 (41.4)	
Q6: Do you think that infection with HPV causes discomfort?		
Yes	250 (55.7)	104 (23.2)
No	104 (23.2)	
Not clear	95 (21.1)	
Q7: Do you think that men can be infected by HPV?		
Yes	226 (50.3)	226 (50.3)
No	52 (11.6)	
Not clear	171 (38.1)	

Abbreviation: HPV, human papillomavirus.

^aN is the total number of participants.

^bn denotes the number of the participants who had heard of HPV.

^cn denotes the number of the participants who correctly answered the below questions.

higher and 25.4% went to junior school or under. There were 29.7% white-collar workers and civil servants, 24.5% professionals, 22.0% unemployed, 11.9% students, 11.2% laborers, 0.5% others, and 0.3% farmers, respectively. About 59.5% lived in the city, while the remainder lived in rural areas. The majority of patients had a monthly income of ¥3001 to 8000 (US\$472.1-1258.4; 63.0%), below ¥(China)3000 (US\$471.9; 22.3%), or above ¥8000 (US\$1258.4; 14.7%).

Knowledge and Attitudes Toward HPV

Details of the respondents' knowledge of HPV are reported in Table 2. Only 44.9% (n = 449) of respondents had heard of HPV, and the majority (77.1%) associated HPV with cervical cancer, followed by genital warts (32.4%), sexually transmitted

diseases (30.7%), and HIV (8.3%). Among those aware of the HPV, nearly 81.1% believed that the HPV infection is harmful. Furthermore, over half of the women (50.3%) knew that men could also be infected by the HPV. Unfortunately, only 39.2%, 16.3%, and 23.2% of the patients correctly responded to the questions on HPV transmission, prevalence, and symptoms, respectively. Those items were used to measure HPV awareness. When the patients were asked "To what extent is the HPV infection dangerous?" those who lived in the city, highly educated, and engaged in professional jobs, including white-collar workers and professionals, had a higher correct response rate ($P < 0.05$). There were no significant differences in terms of the percentage of correct answers within this group for the 2 questions: "How is HPV transmitted?" and "What is the prevalence of HPV in the population?" As shown in Table 3, the higher the respondent's education, the higher the percentage of correct answers to the following question: "Do you think that HPV infection can cause discomfort?" For the question "Do you think that men can be infected by HPV?" the respondent's place of residence, occupation, and education level were closely associated with the percentage of correct answers ($P < 0.05$).

Attitudes Toward HPV Vaccination

The majority (83.7%) of respondents expressed their willingness to be vaccinated. With regard to the reasons for the acceptance of HPV vaccination, almost 80.2% of the women said they believed HPV vaccination would be beneficial and feared having HPV infection (47.0%), cervical cancer (46.7%), and genital warts (26.5%), respectively. About 16.3% of respondents reported not consenting to HPV vaccination, and of these, over half (68.7%) cited they worried about the lack of sufficient evidence and recent experience with the vaccine. Over one-third (35.6%) reported concerns about HPV vaccine safety, and approximately 31.3% believed that they would not be in danger of HPV infection. Only 16.6% and 11.7% commented that the source of the HPV vaccine was not very trustworthy and being vaccinated did not constitute an advantage (Table 3).

Expectations for HPV Vaccination

Regarding the respondents' expectation for the efficacy of HPV vaccination, nearly half the participants expected to achieve a high benefit. Approximately one-third selected the option with "some benefit," whereas only 1.0% of the respondents thought vaccination had no benefit. When asked "How much are you willing to pay for HPV vaccination?" most respondents chose the lowest price option (<¥200, <US\$31.5), and 38.0% indicated that a price of ¥200 to ¥500 (US\$31.5-78.7) was acceptable, while 13.0% thought they could afford to pay ¥500 to ¥1000 (US\$78.7-157) for HPV vaccination. Only 8.0% reported that they would vaccinate themselves even at a cost of over ¥1000 (US\$157; Table 4).

Table 3. Factors Associated With the Knowledge of HPV (N = 1001, n = 449).^{a,b}

Factors	Q3, n ¹ = 346	Q4, n ² = 176	Q5, n ³ = 73	Q6, n ⁴ = 104	Q7, n ⁵ = 226
Education					
Junior school or lower	42 (12.1%)	20 (11.4%)	11 (15.1%)	11 (10.6%)	18 (8.0%)
High school	94 (27.2%)	50 (14.5%)	11 (15.1%)	20 (19.2%)	60 (26.5%)
Undergraduate or higher	210 (60.7%)	106 (60.2%)	51 (69.2%)	73 (70.2%)	148 (65.5%)
χ^2	17.104	4.764	6.462	8.746	23.301
P	<0.001	0.092	0.04	0.013	<0.001
Occupation					
Unemployed	43 (12.4%)	21 (11.9%)	8 (11.0%)	12 (11.5%)	33 (14.6%)
Laborer	18 (5.2%)	7 (4.0%)	3 (4.1%)	4 (3.8%)	18 (8.0%)
White-collar workers and civil servants	126 (36.4%)	66 (37.5%)	25 (34.2%)	34 (32.7%)	77 (34.1%)
Professional	120 (34.7%)	66 (37.5%)	31 (42.5%)	45 (43.3%)	89 (39.4%)
Farmer	3 (0.9%)	0 (0%)	0 (0%)	1 (1.0%)	1 (0.4%)
Student	35 (10.1%)	16 (9.1%)	6 (8.2%)	8 (7.7%)	18 (8.0%)
Others	1 (0.3%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
χ^2	15.413	10.894	4.959	7.931	17.612
P	0.017	0.092	0.549	0.243	0.007
Residence					
City	250 (72.3%)	129 (73.3%)	52 (71.2%)	79 (76.0%)	164 (72.6%)
Countryside	96 (27.7%)	47 (26.7%)	21 (28.8%)	25 (24.0%)	62 (27.4%)
χ^2	11.698	3.529	0.381	3.804	4.086
P	0.001	0.06	0.437	0.051	0.043
Monthly income					
Under ¥3000 (US\$471.9)	58 (16.8%)	23 (13.1%)	7 (9.6%)	12 (11.5%)	30 (13.3%)
¥3001-8000 (US\$472.1-1258.4)	228 (65.9%)	125 (71.0%)	51 (69.9%)	74 (71.2%)	153 (67.7%)
≥¥8001 (US\$1258.4)	60 (17.3%)	28 (15.9%)	15 (20.5%)	18 (17.3%)	43 (19.0%)
χ^2	2.285	6.178	4.610	4.203	7.972
P	0.319	0.046	0.100	0.122	0.019

Abbreviation: HPV, human papillomavirus.

^aN is the total number of participants. n denotes the number of the participants who had heard of HPV. n¹, n², n³, n⁴, n⁵ denote the number of the participants who correctly answered the Q3, Q4, Q5, Q6, Q7, respectively.

^bQ3: What are the risks of HPV infection? Q4: How is HPV transmitted? Q5: What is the prevalence of HPV in the population? Q6: Do you think that infection with HPV causes discomfort? Q7: Do you think that men can be infected by HPV? χ^2 : differences in the correct answers of Q3, Q4, Q5, Q6, Q7 stratified according to education, profession, place of residence, and monthly income, respectively. *P* < .05 indicates statistically significant differences.

Predictors of the Participants' Attitudes Toward HPV Vaccination

Table 5 presents the associations between predictor variables and attitudes toward HPV vaccination. In the univariate analysis, the respondents with higher education and higher monthly income were significantly more likely to consent to vaccination (*P* = .002 and *P* = .001). Moreover, respondents who lived in the city and were engaged in professional jobs were more willing to be vaccinated (*P* < 0.001). Only those who thought that it is dangerous to have HPV infection were significantly associated with consenting to vaccination (*P* < .001), whereas the remaining questions were not significantly associated with vaccination consent.

Discussion

There are a few studies simultaneously evaluating HPV prevalence, HPV awareness, and attitudes toward HPV vaccination among women aged 20 to 35 years in Mainland China. To the best of our knowledge, only one previous study has investigated the HPV prevalence, HPV awareness, and attitudes toward HPV vaccination among women aged 14 to 59 years,

but this study was conducted 9 years ago. However, previous population-based studies have described HPV prevalence,²⁸⁻³⁴ knowledge, and attitudes regarding HPV and vaccination in women <25 years.^{35,27} In this study, the population consisted of women aged 20 to 35 years, and the cervical samples showed that these women had a relatively high prevalence of HPV positivity, although the rate of abnormal cervical lesions was low³⁶; thus, vaccination would have a stronger impact on this age group in China wherein the HPV vaccine has only been recently introduced, although it is well acknowledged the best stage to get vaccinated is before sexual debut. In addition, this age group in China is sexually active, which means that these women would also be more exposed to the HPV; furthermore, they are within the recommended vaccination age. The World Health Organization has published guidelines for cervical cancer screening and care. These guidelines are mindful of the limited resources in poor regions and are pragmatically focused on women aged 30 to 50 years.³⁷ Furthermore, cervical cancer mortality among young urban females has been increasing by 4.1% per year.³⁸ Thus, the missed rate of cervical cancer in young women <30 years should warrant greater attention.

Table 4. Reasons for Refusal/Acceptance of HPV Vaccination and the Expectation and Accepted Cost.

Variables	N = 1001 n (%)
Have you ever heard of HPV vaccination (Yes)?	280 (28.0)
Are you willing to receive HPV vaccination (Yes)?	838 (83.7)
Reasons for refusal n = 163	
I do not believe that I will be in danger of HPV	51 (31.3)
There is no difference in being vaccinated or not	19 (11.7)
HPV vaccines have not yet been promoted in large areas	112 (68.7)
HPV vaccination is associated with different degrees of risk	58 (35.6)
The source of the HPV vaccine is not very trustworthy	27 (16.6)
Reasons for acceptance n = 838	
I will benefit from it	671 (80.2)
I fear of infection with HPV	391 (46.7)
I fear of getting cervical cancer	393 (47.0)
I fear of getting genital warts	222 (26.5)
Expectations	
High benefit	517 (51.6)
More or less benefit	359 (35.9)
A little benefit	42 (4.2)
No benefit	11 (1.1)
Do not know	72 (7.2)
Accepted costs	
<¥200 (<US\$31.5)	416 (41.6)
¥200-500 (US\$31.5-78.7)	382 (38.2)
¥500-1000 (US\$78.7-157)	126 (12.6)
>¥1000 (US\$157)	77 (7.7)

Abbreviation: HPV, human papillomavirus.

Primary screening for cervical cancer has been limited to women >30 years, so HPV vaccination in younger women aged 20 to 30 years could be more relevant as HPV vaccines may have potential for a higher-than-average impact on this age group in China. Thus, it is important to assess the knowledge and attitudes regarding HPV and vaccination among Chinese women aged 20 to 35 years.

Our findings demonstrated that the rate of HPV infection among our sample of young women aged 20 to 35 years was 15.7%, which is consistent with previous studies. A survey based on 13 Chinese medical centers with 30 207 cases reported an HPV infection rate of 17.7%, while the age-standardized prevalence rate has been reported to be 16.8%.²⁴ Reports from different regions of Mainland China have stated that the HPV prevalence rate was 18.4% in Shenzhen city,²⁵ 13.3% in Zhejiang Province, and 14.8% in Shanxi Province²⁶; however, the prevalence is higher than that in neighboring countries (6.2% in Southeast Asia, 6.6% in South Central Asia, and 8.0% in other Asian countries).^{39,40} The reasons for the higher prevalence may be that China is a developing country with low economic levels and that HPV vaccination has more recently been approved in China compared with the other countries. In our study, nearly 44.9% of the patients were aware of HPV, which is slightly higher than the rates reported by another study from China, according to which

Table 5. Factors Associated With Consent.^a

Sociodemographic	Consent, Nonconsent, n n		χ^2	P
Education				
Junior school or under	199	55	15.305	<.001
High school	240	57		
Undergraduate or higher	399	51		
Profession				
Unemployed	184	36	29.186	<.001
Laborers	76	36		
White-collar workers and civil servants	260	38		
Professionals	213	32		
Domestic workers	3	0		
Others	2	2		
Residence				
City	530	66	29.330	<.001
Countryside	308	97		
Monthly income				
Under ¥3000 (US\$471.9)	165	58	20.467	<.001
¥3001-8000 (US\$472.1-1258.4)	548	82		
≥¥8001 (US\$1258.4)	125	23		
Knowledge of HPV ^b				
Q3				
Correct	318	28	19.958	<.001
Incorrect	78	25		
Q4				
Correct	157	18	0.635	.426
Incorrect	239	35		
Q5				
Correct	66	7	0.411	.522
Incorrect	330	46		
Q6				
Correct	96	300	2.198	.134
Incorrect	8	45		
Q7				
Correct	202	194	0.613	.434
Incorrect	24	29		

Abbreviation: HPV, human papillomavirus.

^aP < .05 indicates statistically significant differences.

^bQ3: What are the risks of HPV infection? Q4: How is HPV transmitted? Q5: What is the prevalence of HPV in the population? Q6: Do you think that infection with HPV will cause discomfort? Q7: Do you think that men can be infected by HPV?

39.6% of patients had heard of HPV.⁴¹ In contrast, a multi-center survey revealed that only 24% had previous knowledge of HPV.⁴² Moreover, in a similar study among university students, only 10.3% of women had previously heard of HPV.¹² Possible reasons for this inconsistency include different study populations. For example, in our study, we selected sexually active women aged 20 to 35 years who may be more sensitive to information regarding sexually transmitted diseases. It is also possible that the recent promotion of cervical cancer screening programs may have increased HPV awareness. Knowledge of HPV varies widely depending on the region of residence, sociodemographic factors, and education levels.^{11,12} Unfortunately, it was also clear from our study that accurate,

detailed knowledge about HPV was lacking. Although almost half of the study population had heard of HPV, knowledge gaps existed regarding transmission, risks, whether or not HPV could infect male individuals and especially in terms of the HPV prevalence and symptoms of HPV infection.

Our survey found low levels of HPV-related knowledge among young women, but their high acceptance (83.7%) of HPV vaccination was promising. Zou et al surveyed the knowledge and attitudes toward HPV and vaccination among university students in Jinan, China, and found only 10.3% had previously heard of HPV, but male and female students were equally likely to accept HPV vaccination (71.8% vs 69.4%).¹⁵ In our study, the first 3 reasons for not consenting to vaccination were the limited experience with the vaccine to date (68.7%), safety concerns (35.6%), and the belief that they were in no danger of HPV infection (31.3%). Another study targeting urban employed women and female undergraduate students in China demonstrated concerns with the safety of the HPV vaccine (40.1%), its efficacy (28.9%), and the limited experience in its use to date (22.5%).¹³

What factors influenced attitudes toward HPV vaccination? Previous studies have indicated that an effective HPV education program addressing specific knowledge gaps and common questions among women of different regions, education levels, and cultures increased the success of large-scale vaccination programs.⁴³ However, it is unclear what aspect in the knowledge of education programs should be addressed. Studies from the United States have indicated that educational programs should emphasize vaccine effectiveness and the high likelihood of HPV infection and address barriers to vaccination.¹² In this study, education levels, different professions, different residences, monthly income levels, the knowledge of HPV, and awareness of the dangers of HPV infection seriously affected the vaccination rate among the women. Except for the knowledge of HPV, it is difficult to address the other factors in such a short period of time.

Our results confirm the importance of health education on the safety and efficacy of vaccination. Above all, the content of health education should focus on the dangers of HPV infection. Moreover, our study found that the price that women were willing to pay for the vaccine was lower than the current price of the vaccine in China (¥580/dose). There is a requirement of 3 doses, which means that the price is a strong barrier for the promotion of HPV vaccinations. In Hong Kong, Chiang et al determined that the majority of women were inclined to pay the lowest available option (<US\$500) and the price of the vaccine should be set at an affordable level in relation to its efficacy.⁴³ This study simultaneously evaluated HPV prevalence, HPV knowledge, and attitudes toward HPV vaccination among women aged 20 to 35 years from the general population in Mainland China. Of note, we investigated current knowledge regarding HPV among women to identify specific gaps in information on HPV and what HPV information would most strongly impact women's willingness

to be vaccinated. The majority of the survey questions herein had been used several times before in China,¹⁹ and the new questions allowed gathering unique and invaluable information.

Limitations

Patients were given self-administered questionnaires, and some respondents may not have fully understood the questions, resulting in potential bias, although we provided assistance via professional staff if they required help. Regrettably, we did not investigate the form of educational programs they preferred and where they would be willing to get the vaccine. What is more, the possibility of misclassification and lack of comparability of results to those from prior relevant studies due to the use of a nonstandard instrument. Further studies should be carried out to address these issues.

Conclusions

In our study, the HPV prevalence is relatively high among women aged 20 to 35 years in Fujian Province, China. Despite 44.9% of these women being aware of HPV, detailed knowledge about HPV was lacking when compared to women from the United States and Hong Kong. The potential implications of our study are far reaching during this pivotal time of HPV vaccine being available in China. Though the introduction of the HPV prophylactic vaccine would prevent cervical cancer among Chinese women, to ensure the effectiveness of vaccination campaigns, the government and some relevant departments must first develop appropriate educational interventions for women aged 20 to 35 years, especially to emphasize the risk between HPV and cervical cancer or other related diseases, as well as determine how to subsidize the vaccine costs. Lastly, follow-up studies must be performed to determine whether increased HPV and HPV vaccine knowledge translates into higher vaccination rates and vaccine compliance within China.

Authors' Note

Pengming Sun contributed as study coordinator and contributed to data analysis, funding acquisition, supervision, writing—review, editing, and manuscript; Yiyi Song contributed as study coordinator and contributed to funding acquisition and draft of the manuscript; Lihua Chen contributed to data analysis and drafted the manuscript; Guanyu Ruan, Qiaoyu Zhang, and Fen Li contributed to data collection and validation. Jian An and Binhua Dong contributed to data collection. Jun Zhang and Ting Wu contributed as study coordinator and contributed to data curation. All authors were involved in the critical review and approval of the manuscript. Lihua Chen and Yiyi Song contributed equally in this work.

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