


Cervical Cancer, Human Papillomavirus Infection, and Vaccine-Related Knowledge: Awareness in Chinese Women

Li Yuanyue, PhD^{1,*}, Zulqarnain Baloch, PhD², Li Shanshan, MSc^{3,*},
Nafeesa Yasmeen, MPhil⁴, Wu Xiaomei, PhD⁵,
Jamal Muhammad Khan, PhD⁶, and Xia Xueshan, PhD¹

Abstract

Cervical cancer (CC) has a high incidence and mortality and is accompanied by lack of organized CC screening programs, lack of health-care facilities, and a lack of human papillomavirus (HPV) vaccination among female population in the world, particularly China. We recruited 487 females who visited the outpatient department of the First People's Hospital of Yunnan Province from November 2015 to January 2016 to complete a standardized-designed questionnaire. We found that only 39.6% of the females knew about the role of HPVs in the development of cervical cancer. Moreover, none of the females knew that HPV could cause penile carcinomas, perianal carcinomas, and head and neck carcinomas. The majority of the participants acquired information about cervical cancer, HPV, and the HPV vaccine from medical workers. Only 15.6% of the recruited females had heard about the HPV vaccine. The overall HPV vaccine acceptance rate was higher (91.2%) if the vaccine was available free of cost. In this study, we found high acceptability of the HPV vaccine in Chinese women and high awareness about cervical cancer. However, very low levels of knowledge about HPVs and their role in cancer development among the recruited women is alarming. Therefore, it is very important to initiate educational programs to raise awareness and knowledge about cervical cancer, HPV, and the HPV vaccine in this region.

Keywords

cervical cancer, HPV, vaccine, Yunnan

Received March 26, 2018. Received revised July 10, 2018. Accepted for publication August 3, 2018.

Background

The human papillomavirus (HPV) is one of the most common sexually transmitted infections of the reproductive tract in the world.¹ The roles of high-risk HPVs (HR-HPVs) in different cancers, including oropharyngeal, anal, cervical, vaginal, vulvar, and penile, have been established.² The incidence of HPV-associated cancers has increased over the last 50 years, and the predominance has shifted from a female to a male cancer.²⁻⁴ Cervical cancer is one of the most preventable human cancers; its prevention is based on early diagnosis and treatment.^{4,5} The prevalence and mortality of cervical cancer have significantly decreased in developed nations due to widespread applications of Pap smear tests and vaccination. However, developing countries lack well-organized screening programs, which results in greater mortalities in these countries.⁶

According to the World Health Organization and the estimates of different published studies, there are 3 leading causes

¹ Faculty of Environmental Science and Engineering and Faculty of Life Science and Technology, Kunming University of Science and Technology, Kunming, People's Republic of China

² College of Veterinary Medicine, South China Agricultural University, Guangzhou, People's Republic of China

³ School of Humanities and Law, South China Agricultural University, Guangzhou, People's Republic of China

⁴ Faculty of Veterinary Medicine, Agriculture University, Faisalabad, Pakistan

⁵ Department of Gynecology, the First People's Hospital of Yunnan Province, Kunming, People's Republic of China

⁶ Department of Path-Biology, College of Animal Sciences, The Islamia University of Bahawalpur, Pakistan

* Li YuanYue and Li Shanshan contributed equally

Corresponding Authors:

Zulqarnain Baloch, College of Veterinary Medicine, South China Agricultural University, Guangzhou 510642, People's Republic of China.

Email: znbalooch@yahoo.com

Xia Xueshan, Faculty of Life Science and Technology, Kunming University of Science and Technology, Kunming 650500, People's Republic of China.

Email: oliverxia2000@aliyun.com



of the increased cervical cancer prevalence and mortality in developing countries of the world: (1) a lack of well-organized cervical cancer screening programs, (2) a lack of health-care facilities, and (3) a lack of HPV vaccination among female population in the world particularly China.⁷⁻⁹

Knowledge and awareness about cervical cancer, HPV, and the efficacy of the HPV vaccine in the prevention of cervical cancer are very low in the world, especially in China. Some studies have demonstrated that awareness about cervical cancer and HPV is substantially different among different populations in China.¹⁰⁻¹² Moreover, previously reported studies from various well-developed areas in China with high levels of social and economic disparity make the findings less applicable to all of China.¹² Therefore, the current study was designed to assess the following: (1) knowledge in HPV positive versus HPV negative women about cervical cancer, HPV and the HPV vaccine among Chinese women in the Yunnan province, (2) the factors associated with knowledge about HPV, the HPV vaccine, and HPV-associated cancers.

Methodology

Type of Study

This is a cross-sectional descriptive study. The questionnaires were administered by an interviewer; every women who had an appointment was invited to participate. A standardized questionnaire was designed based on previously published study.¹³

Ethical Approval

All the participants voluntarily signed the documented consent prior to their participation, and the security, anonymity, and the privacy of participants were respected rigorously in this study. The ethics committee of the Kunming University of Science and Technology formally reviewed and approved our study.

Study Population

This survey was conducted by the Faculty of Life Science and Technology of Kunming University of Science and Technology in partnership with the First Peoples' Hospital of Yunnan Province. Women who visited the outpatient department of the First Peoples' Hospital of Yunnan Province were recruited from November 2015 to January 2016.

A copy of the questionnaire was sent to a gynecologist who worked in the outpatient department of the Yunnan First Peoples' Hospital. She agreed to appoint female doctors for the collection of data from the patients. Before beginning the interview, a cover letter that described the aim of the study, conveyed a guarantee of secrecy, and highlighted that the patient's decision to participate would not affect her medical checkup was given to the patient. The overall response rate was 74.9% (487/675).

All women were interviewed by a trained interviewer in their local Chinese dialect in an isolated room using a

standardized questionnaire to elicit information about the subjects' demographic and social variables, sexual behavior, medical and reproductive histories, and smoking and drinking habits. After questioner process, a qualified gynecologist did the pelvic examination and sample collection process. One cervical sample was collected with a cyto-brush (HybriBio) for HPV diagnosis.

DNA Extractions and HPV Testing

The DNA extraction process was completed through the DNA Extraction Kit (Qiagen, Valencia, California) by following the recommendation of manufacturer. Samples that tested positive for β -globin were analyzed by polymerase chain reaction (PCR) amplification of HPV DNA. The HPV-positive samples were confirmed by PCR with universal L1 primer MY09/11 and GP5/6 systems; DNA from HeLa and Caski cell lines was used as positive controls, and mixtures without sample DNA were used as negative controls. The HPV genotypes were determined using an HPV GenoArray Test Kit (HybriBio, Chaozhou, China), according to the manufacturer's instructions. Geno-Array is an L1 consensus primer-based PCR assay that is capable of amplifying 23 HPV genotypes, including 13 HR-HPV genotypes (HPV-16, 18, 31, 33, 35, 39, 45, 51, 52, 56, 58, 59, and 68), 3 Potential High-Risk (PHR)-HPV genotypes (HPV-53, 66, and 81), and 7 low-risk HPV genotypes (HPV-6, 11, 42, 43, 44, and 61).

Data Analysis

The data collected from the participants were transferred into a database, and descriptive and inferential statistics were applied using SPSS version 20.0 (SPSS Inc, Chicago, Illinois, for Windows). The participants were divided into HPV-positive and HPV-negative subgroups to examine the relationships of cervical cancer with the HPV-related knowledge, attitudes, behaviors, and intentions of the participants. We applied the χ^2 test to examine differences between the groups. Awareness and knowledge about HPV, cervical cancer, and the HPV-vaccine are presented as percentages. The associations of various variables with the knowledge and awareness about cervical cancer, HPV, and the HPV vaccine were calculated with a logistic regression model. All statistical tests were 2-sided, and P values $<.05$ were considered statistically significant.

Results

A total of 487 women were included in this study. Among them, 92 were found to be HPV DNA-positive (18.9%, 92/487), and 395 were HPV-negative. The mean age of the 487 women was 38.3 years (38.3 ± 9.0 , confidence interval [CI]: 37.4-39.1), and there was no significant difference in age between the HPV-negative (38.3 years [median = 38], standard deviation [SD] = 9.1, CI: 37.4-39.2) and HPV-positive groups

(38.1 years [median = 38], SD = 9.4, CI: 36.1-40.0; $P = .81$). The sociodemographic characteristics are presented in Table 1.

A total of 78.6% (383/487) women had heard about cervical cancer. Knowledge about cervical cancer prevention through screening was significantly higher among the HPV-negative group (55.9%) than the HPV-positive group (67.4%). Fifty-eight percentage (251/487) of the participants had acquired information about cervical cancer from medical workers. Medical workers acted as a source of knowledge about cervical cancer for significantly more of the HPV-positive women (66.7%) than the HPV-negative women (58.9%). Similarly, the levels of knowledge about HPV and its role in cervical cancer were higher among the HPV-negative women (HPV: 53.2, role in cervical cancer [CC] 38.7%) than the HPV-positive women (HPV: 42.4, role in CC 43.5%). The level of knowledge about the role of HPV in other related cancers was significantly higher among the HPV-positive women (20.6%) than the HPV-negative women (9.1%; Table 2).

The overall levels of awareness and knowledge about the HPV vaccine were very low among both groups. The levels of knowledge about the HPV vaccine and its role in cervical cancer prevention were significantly higher among the HPV-positive (25.0%, role in CC prevention: 20.6%) women than the HPV-negative women (13.8%, role in CC prevention: 9.1%). The level of willingness to receive the HPV vaccine was high in both groups. Surprisingly, none of the women knew that HPV vaccine could also be used for men (0%, 0/487).

We also collected data regarding the participants' high or low levels of knowledge and awareness about the risk factors for cervical cancer (Table 3), HPV (Table 4) and the HPV vaccine (Table 5). The levels of knowledge and awareness about cervical cancer and HPV were significantly higher among populations with higher education levels, higher income, and higher job status (Tables 3 and 4). Furthermore, migrant women ($P = .004$), women of other ethnicities ($P = .028$), older women, and married women had significantly higher levels of knowledge about cervical cancer and HPV (Tables 3 and 4). The levels of knowledge and awareness about the HPV vaccine were low among all groups and were significantly lower among the illiterate ($P = .001$) and agricultural workers ($P = .004$; Table 5).

Discussion

Vaccination against HPV is a possible long-term solution for eradicating cervical cancer in developing countries, particularly in China, where a prophylactic HPV vaccine has already been approved. Yunnan province has a unique geographical location, highly complex topography, and large variations in elevation. Yunnan Province is a land of 26 Chinese ethnic groups. The health-care facilities in this region are inadequate, and there is a lack of well-organized cancer registries and gynaecological screening and HPV testing programs. In 2014, our group took initiative and reported HPV prevalence and its genotype distribution among various ethnic groups in

Table 1. Demographic Characteristics of the Participants.

Characteristic	Frequency	Percent
Ethnicity		
Han	406	83.4
Other	81	16.6
Region		
East	281	57.7
other region	98	20.1
Other province	108	22.2
Age		
≤29	63	12.9
30-39	154	31.6
40-49	180	37.0
≥50	90	18.5
Religious beliefs		
Yes	22	4.5
No	465	95.5
Education		
Illiterate and primary school	84	19.3
Secondary school	255	52.4
College and above	138	28.3
Occupation		
Farmer	71	14.6
Staff	128	26.2
Self-employed and service	154	31.6
Other	134	27.5
Marital status		
Married	458	94.0
Single	29	6.0
Monthly Income		
<3000	208	42.7
3000-5000	116	23.8
5100-8000	85	17.5
>5000	78	16.0
Smoking		
Yes	10	2.1
No	477	97.9
Drinking		
Yes	36	7.4
No	451	92.6
Contraceptive methods		
Condom	193	39.6
Intrauterine Device (IUD)	120	24.6
Others	57	11.7
None	117	24.1
Number of sexual partners		
1	381	78.2
2	77	15.8
≥3	29	6.0
The age of first sex		
≤20	157	32.2
21-23	176	36.1
≥24	154	31.7
Sexual frequency		
≥1/week	278	57.1
>1/week	209	42.9
Childbearing history		
0	75	15.4
1	239	49.1
≥2	173	35.5

Table 2. Levels of Knowledge About HPV and Its Vaccination Among the HPV-Positive and HPV-Negative Groups.^a

Variable	Total	HPV Positive (n = 92)	HPV Negative (n = 395)	P Value
Do you know about cervical cancer?	416 (85.4)	75 (81.5)	341 (86.3)	.239
Do you know that cancer can be prevented with cervical cancer screening tests?	383 (78.6)	68 (73.9)	315 (79.7)	.26
Have you undergone a cervical cancer screening?	283 (58.1)	62 (67.4)	221 (55.9)	.045
Is your main source of information about cervical cancer a medical worker?	251 (51.5)	50 (66.7)	201 (58.9)	.005
Do you know about HPV?	249 (51.1)	39 (42.4)	210 (53.2)	.063
Do you know that HPV can transmit through sex?	150 (30.8)	30 (32.6)	120 (30.4)	.257
Do you know that HPV infection can lead to cervical cancer?	193 (39.6)	40 (43.5)	153 (38.7)	.402
Do you know that HPV can cause other related cancers?	55 (11.3)	19 (20.6)	36 (9.1)	.002
Is your main source of information about HPV a medical worker?	183 (37.6)	25 (64.1)	158 (75.2)	.300
Do you know about the HPV vaccine?	75 (15.4)	23 (25.0)	53 (13.8)	.006
Do you know that the HPV vaccine can prevent cervical cancer and other related cancers?	55 (11.3)	19 (20.6)	36 (9.1)	.002
Is the HPV vaccine only for women?	487	92 (100)	395 (100)	-
Are you willing to be vaccinated if the vaccine is free of charge?	444 (91.2)	86 (93.5)	358 (90.6)	.687

Abbreviation: HPV, human papillomavirus.

^aThe variables indicate significant differences ($P = .05$); n = number of participants.

Yunnan province.¹⁴⁻¹⁶ Recently, cervical cancer screening test is available in almost all public hospitals. The current study is the first to assess the levels of awareness and knowledge about cervical cancer, HPV, and the HPV vaccine among women in the Yunnan province, which is a developing area located in the southwest of China. Considering the substantial differences in the levels of knowledge and awareness about HPV-related cancer, HPV, and HPV vaccine acceptance among women across the world, and especially in China, this survey will be helpful for designing strategies for cervical cancer control via HPV screening and vaccination in Yunnan province, China.

The findings indicate a good level of knowledge and awareness about cervical cancer (85.4%); however, the level of knowledge and awareness about HPV was moderate (51.1%), and the level of knowledge and awareness about the HPV vaccine was very low (15.4%). Numerous previously reported surveys have demonstrated that 50% to 85% of women know about cervical cancer in Asia,^{17,18} which is in accordance with the observations of our study. Human papillomavirus awareness was higher in Denmark (75.8%) and Sweden (74.8%) compared with Norway (62.4%) and Senegal (63%),^{19,20} while studies from Yunnan, China (52.6%), Xinjiang, China (0.14%, 10 out of 7100), and Brazil (37%) have reported low levels of knowledge and awareness about HPV that are consistent with the findings of this study.^{13,21,22} However, the levels of knowledge and awareness about HPV observed in the present study are higher than those in previously reported studies^{13,23} but are still low. A low level of knowledge about HPV is recognized as a major hurdle for the implementation HPV vaccination programs. Therefore, it is very important that persistent public education efforts be initiated to communicate the information to the population through printed, electronic and social media, and debates with medical doctors and workers to raise awareness about HPV infection and the HPV vaccine.

Yunnan province is located at the threshold of the Himalayas in the south of the People's Republic of China and has a

unique geographic location, a highly complex topography, and large variations in elevation. Different regions of Yunnan province have distinct topographical features. Northwestern Yunnan is a sparsely populated area with large mountains, a dry landscape, and cold weather. The southeast region is highly populated, the land is flat, and the weather is hot. We determined the levels of knowledge and awareness about HPV-related cancer, HPV, and the HPV vaccine among HPV-positive and -negative women. We found that knowledge about cervical cancer was higher among HPV-negative than HPV-positive women. However, knowledge about HPV and its vaccine was substantially higher among the HPV-positive than the HPV-negative women. It is well-established that the levels of knowledge and awareness about HPV and its vaccine are very heterogeneous among the general population and specific target groups.²⁴⁻²⁶ Some studies have revealed very low levels of awareness,^{27,28} eg, the level of knowledge and awareness about HPV and its vaccine among Danish women is 10%,²⁹ which is very low compared with the observations of the present study. This difference might be due to the massive HPV and HPV vaccination awareness campaign organized by the Ministry of Health and implemented through electronic and print media during cervical cancer screenings.

In the present study, the level of knowledge about the HPV vaccine was very low (15.1%), and a similar level has been reported in Brazil.²² We suggest the prioritization of the initiation of a high-level public education campaign regarding the HPV vaccine that will explicitly address knowledge deficits among general populations. Most of the participants stated that they would be vaccinated if the vaccine was available free of cost. Many studies have reported favorable attitudes toward vaccination in China^{13,21,23} and other countries.^{17,22} Yunnan is an underdeveloped province of China, and the poverty level is slightly higher than that of the rest of China; thus, many people in this province do not have enough money to pay for the HPV vaccine. Based on these observations, we suggest that

Table 3. Logistic Regression Analysis of the Levels of Knowledge About Cervical Cancer.

Characteristic	Total	Knowledge	OR (95%CI)	P Value
Residence				.040
East	281	250 (89.0%)	1	
Another region	98	75 (76.5%)	2.56 (1.17-5.60)	
Other province	108	92 (85.2%)	1.06 (0.48-2.32)	
Ethnicity				.028
Han	406	352 (86.7%)	1	
Other	81	65 (80.2%)	2.59 (1.11-6.05)	
Age				.074
≤29	63	46 (73.0%)	1	
30-39	154	128 (83.1%)	0.49 (0.17-1.34)	
40-49	180	162 (90%)	0.94 (0.32-2.76)	
≥50	90	81 (90%)	1.72 (0.51-5.81)	
Occupation				.374
Farmer	71	48 (67.6%)	1	
Staff	128	116 (90.6%)	1.06 (0.37-3.06)	
Self-employed	154	138 (89.6%)	0.64 (0.24 -1.66)	
Other	134	115 (86.8%)	0.53 (0.22 -1.25)	
Education				.480
Illiterate and primary	84	63 (75%)	1	
Secondary school	255	216 (84.7%)	0.64 (0.24-1.66)	
College and above	138	117 (84.8%)	0.00 (0.00-)	
Monthly income				.620
<3000	208	180 (86.5%)	1	
3000-5000	116	98 (84.5%)	1.36 (0.61-3.06)	
5100-8000	85	70 (82.4%)	1.63 (0.69-3.85)	
>8000	78	69 (88.5%)	0.53 (0.22 -1.25)	
Religious belief				.606
Yes	22	20 (90.9%)	1	
No	465	397 (85.4%)	0.64 (0.12-3.42)	
Marital status				.924
Married	458	390 (85.2%)	1	
Single	29	22 (75.9%)	0.93 (0.19-4.44)	
Childbearing history				.262
0	75	73 (97.3%)	1	
1	239	216 (90.4%)	0.94 (0.40-2.20)	
>2	173	127 (73.4%)	1.10 (0.36-3.42)	
Age at first sexual experience				.007
≤20	157	125 (79.6%)	1	
21-23	176	142 (80.7%)	1.05 (0.53-2.08)	
≥24	154	149 (96.8%)	0.18 (0.06-0.57)	
Number of sexual partners				.325
1	381	323 (84.8%)	1	
2	77	66 (85.7%)	2.03 (0.72-5.75)	
≥3	29	27 (93.1%)	0.73 (0.11-5.00)	
Sexual frequency				.034
≥1/week	278	245 (88.1%)	1	
<1/week	209	171 (81.8%)	1.98 (1.05-3.73)	
Contraceptive method				.131
Condom	193	184 (95.3%)	1	
IUD	120	100 (83.3%)	2.53 (0.96-6.70)	
Other	57	42 (73.7%)	2.10 (0.72-5.75)	
None	117	90 (77.0%)	3.10 (1.17-8.11)	
Smoking				.893
Yes	10	8 (80.0%)	1	
No	477	408 (85.5%)	0.85 (0.08-8.94)	
Drinking				.662
Yes	36	31 (86.1%)	1	
No	451	385 (85.4%)	0.74 (0.19-2.89)	

Abbreviations: CI confidence interval; IUD, intrauterine device; OR, odds ratio.

Table 4. Logistic Regression Analysis of the Levels of Knowledge about HPV.

Characteristic	Total	Knowledge	OR (95%CI)	P Value
Residence				.696
East	281	151 (53.7%)	1	
Other region	98	50 (51.0%)	0.79 (0.45-1.38)	
Other province	108	48 (44.4%)	0.90 (0.53 -1.55)	
Ethnicity				.151
Han	406	209 (51.5%)	1	
Other	81	40 (49.4%)	1.55 (0.85-2.82)	
Age				.416
≤29	63	53 (84.1%)	1	
30-39	154	91 (59.1%)	1.75 (0.90-3.22)	
40-49	180	79 (43.9%)	1.41 (0.70-2.83)	
≥50	90	26 (28.9%)	1.65 (0.67-3.91)	
Occupation				.278
Farmer	71	20 (28.2%)	1	
Staff	128	86 (67.2%)	0.57 (0.25-1.27)	
Self-employed and service	154	89 (57.8%)	0.63 (0.29-1.33)	
Other	134	54 (40.3%)	0.94 (0.46-1.93)	
Education				.002
Illiterate and primary	84	49 (58.3%)	1	
Secondary school	255	137 (53.7%)	0.67 (0.36-1.23)	
College and above	138	63 (45.7%)	0.25 (0.11-0.57)	
Monthly income				.461
<3000	208	116 (55.8%)	1	
3000-5000	116	60 (51.7%)	1.02 (0.60-1.73)	
5100-8000	85	39 (45.9%)	1.26 (0.70-2.23)	
>8000	78	34 (43.6%)	1.58 (0.86-2.91)	
Religious belief				.585
Yes	22	12 (54.5%)	1	
No	465	237 (51.0%)	1.35 (0.47-3.90)	
Marital status				.327
Married	458	242 (52.8%)	1	
Single	29	7 (24.1%)	0.63 (0.25-1.60)	
Childbearing history				.002
0	75	40 (53.3%)	1	
1	239	153 (64.0%)	0.33 (0.16-0.67)	
≥2	173	56 (32.4%)	0.58 (0.25-1.33)	
Age at first sexual experience				.082
≤20	157	61 (38.9%)	1	
21-23	176	84 (47.7%)	0.76 (0.45-1.28)	
≥24	154	104 (67.5%)	0.51 (0.28-0.92)	
Number of sexual partners				.285
1	381	172 (45.1%)	1	
2	77	59 (76.6%)	0.75 (0.16-0.76)	
≥3	29	17 (58.6%)	0.49 (0.20=-1.25)	
Sexual frequency				.454
≥1/week	278	147 (52.9%)	1	
<1/week	209	102 (48.8%)	1.18 (0.76-1.83)	
Contraceptive methods				.019
Condom	193	129 (66.8%)	1	
IUD	120	58 (48.3%)	1.77 (1.01-3.08)	
Other	57	18 (31.6%)	1.90 (0.91-3.99)	
None	117	44 (37.6%)	2.43 (1.36-4.35)	
Smoking				.543
Yes	10	4 (40.0%)	1	
No	477	245 (51.4%)	0.60 (0.12-3.10)	
Drinking				.895
Yes	36	18 (50.0%)	1	
No	451	231 (51.2%)	0.90 (0.37-2.17)	

Abbreviations: CI, confidence interval; IUD, intrauterine device; OR, odds ratio.

Table 5. Logistic Regression Analysis of the Levels of Knowledge About the HPV Vaccine.

Characteristic	Total	Knowledge	OR (95%CI)	P Value
Residence				.145
East	281	41 (14.6%)	1	
Other region	98	8 (8.2%)	1.87 (0.76-4.60)	
Other province	108	15 (13.9%)	0.66 (0.31-1.41)	
Ethnicity				.351
Han	406	43 (10.6%)	1	
Other	81	21 (26.0%)	0.69 (0.32-1.50)	
Age				.662
≤29	63	12 (19.0%)	1	
30-39	154	15 (9.7%)	0.93 (0.40-2.12)	
40-49	180	19 (10.6%)	0.88 (0.34-2.23)	
≥50	90	18 (20.0%)	2.13 (0.45-9.97)	
Occupation				.044
Farmer	71	7 (9.60%)	1	
Staff	128	20 (15.6%)	3.98 (1.12-14.01)	
Self-employed and service	154	19 (12.3%)	4.60 (1.37-15.50)	
Other	134	17 (12.7%)	1.77 (0.58-5.40)	
Education				.001
Illiterate and primary	84	12 (14.3%)	1	
Secondary school	255	19 (7.5%)	0.21 (0.05-0.80)	
College and above	138	33 (23.9%)	0.06 (0.01-0.27)	
Monthly income				.170
<3000	208	23 (11.6%)	1	
3000-5000	116	6 (5.2%)	2.23 (0.93-5.50)	
5100-8000	85	17 (20.0%)	1.02 (0.46-2.30)	
>8000	78	18 (23.1%)	0.73 (0.33-1.64)	
Religious belief				.507
Yes	22	2 (9.1%)	1	
No	465	62 (13.3%)	1.75 (0.34-9.09)	
Marital status				.358
Married	458	57 (12.4%)	1	
Single	29	7 (24.1%)	1.69 (0.55-5.16)	
Childbearing history				.929
0	75	16 (21.3%)	1	
1	239	35 (14.6%)	0.94 (0.40-2.20)	
≥2	173	13 (7.5%)	1.10 (0.36-3.42)	
Sexual partners				.027
1	381	40 (10.5%)	1	
2	77	20 (26.0%)	0.35 (0.16-0.76)	
≥3	29	4 (13.8%)	0.70 (0.19-2.58)	
Sexual frequency				.662
≥1/week	278	38 (13.7%)	1	
<1/week	209	26 (12.4%)	1.15 (0.61-2.15)	
Contraceptive methods				.716
Condom	193	35 (18.1%)	1	
IUD	120	15 (12.5%)	0.97 (0.45-2.10)	
Other	57	6 (10.5%)	0.68 (0.22-2.08)	
None	117	8 (6.8%)	1.43 (0.56-3.62)	
Smoking				.666
Yes	10	1 (10%)	1	
No	477	63 (13.2%)	0.59 (0.05-6.66)	
Drinking				.766
Yes	36	6 (16.7%)	1	
No	451	58 (12.9%)	1.20 (0.37-3.80)	

Abbreviations: CI, confidence interval; IUD, intrauterine device; OR, odds ratio.

the HPV vaccine must be introduced in Yunnan province under a government-subsidized program rather than by the private sector. Another main barrier to vaccination acceptance is concern about side effects. A lack of knowledge about HPV may make it difficult for women to make appropriate decisions. Therefore, clear and sustained educational programs may be needed in both rural and urban areas before the initiation of an HPV vaccination campaign.

The limitations of this study include the fact that the sample was not representative of the general Yunnan population because recruitment was limited to one region of the province. Further extended quantitative and qualitative research involving other areas of the country will provide more relevant information on this issue.

Conclusion

In this study, we found high acceptability of the HPV vaccine in Chinese women and high awareness about cervical cancer. However, very low levels of knowledge about HPVs and their role in cancer development among the recruited women is alarming. Therefore, it is very important to initiate educational programs to raise awareness and knowledge about cervical cancer, HPV, and the HPV vaccine in this region.

Authors' Note

The protocol of this study accorded with the principles of the Declaration of Helsinki and was approved by the Ethics Committee at Kunming University of Science and Technology and the Centers for Disease Control and Prevention (CDC) in Yunnan Province, China (2015RA012). Written consent was individually obtained from each participant. The aggregate data supporting findings contained within this manuscript will be shared upon request submitted to the corresponding author. Identifying patient data will not be shared. Li Yuanyue, and Li Shanshan equally contributed to the work and should be regarded as co-first authors; Zulqarnain Baloch and Wu xiaomei designed the study, Li Yuanyue and Li Shanshan performed the data analysis and wrote the paper. Jamal Khan, and Li Shanshan contributed to the collection of the data from the participants. Zulqarnain Baloch and Xia Xueshan supervised the study. All of the authors have read and approved the final manuscript.

Acknowledgments

We sincerely thank Dr Songmei Shan for her assistance during the data collection.

Declaration of Conflicting Interests


The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Funding

The author(s) disclosed receipt of the following financial support for the research, authorship, and/or publication of this article: This study was supported by research grants from the Natural Science Foundation of China (81260248), the Scientific and Technological Innovation Talent Support Project (2015HC030), and the Key and New Product Development Project of Yunnan Province and the Science and

Technology Agency of Yunnan Province, China (2014FB090). The funders played no role in the study design, data collection and analysis, the decision to publish, or the preparation of the manuscript.

ORCID iD

Zulqarnain Baloch  <http://orcid.org/0000-0002-7873-1343>

References

- Vaidakis D, Moustaki I, Zervas I, et al. Knowledge of Greek adolescents on human papilloma virus (HPV) and vaccination: a national epidemiologic study. *Medicine*. 2017;96(1):e5287.
- Dunne EF, Markowitz LE, Saraiya M, et al, Centers for disease control and prevention (CDC). CDC grand rounds: reducing the burden of HPV-associated cancer and disease. *MMWR Morb Mortal Wkly Rep*. 2014;63(4):69-72.
- Palefsky JM. Human papillomavirus-related disease in men: not just a women's issue. *J Adolesc Health*. 2010;46(4 suppl):S12-S19.
- Saraiya M, Unger ER, Thompson TD, et al, HPV Typing of Cancers Workgroup. US assessment of HPV types in cancers: implications for current and 9-valent HPV vaccines. *J Natl Cancer Inst*. 2015;107(6):djv086.
- Akers AY, Newmann SJ, Smith JS. Factors underlying disparities in cervical cancer incidence, screening, and treatment in the United States. *Curr Probl Cancer*. 2007;31(3):157-181.
- Chaturvedi AK, Engels EA, Pfeiffer RM, et al. Human papillomavirus and rising oropharyngeal cancer incidence in the United States. *J Clin Oncol*. 2011;29(32):4294-4301.
- Young D, Xiao CC, Murphy B, Moore M, Fakhry C, Day TA. Increase in head and neck cancer in younger patients due to human papillomavirus (HPV). *Oral Oncol*. 2015;51(8):727-730.
- Johnson LG, Madeleine MM, Newcomer LM, Schwartz SM, Dalring JR. Anal cancer incidence and survival: the surveillance, epidemiology, and end results experience, 1973-2000. *Cancer*. 2004;101(2):281-288.
- Shiels MS, Kreimer AR, Coghill AE, Darragh TM, Devesa SS. Anal cancer incidence in the United States, 1977-2011: distinct patterns by histology and behavior. *Cancer Epidemiol Biomarkers Prev*. 2015;24(10):1548-1556
- Abudukadeer A, Azam S, Mutailipu AZ, Qun L, Guilin G, Mijiti S. Knowledge and attitude of Uyghur women in Xinjiang province of China related to the prevention and early detection of cervical cancer. *World J Surg Oncol*. 2015;13:110.
- Hong Y, Zhang C, Li X, Lin D, Liu Y. HPV and cervical cancer related knowledge, awareness and testing behaviors in a community sample of female sex workers in China. *BMC Public Health*. 2013;13:696.
- Wang SM, Zhang SK, Pan XF, et al. Human papillomavirus vaccine awareness, acceptability, and decision-making factors among chinese college students. *Asian Pac J Cancer Prev*. 2014;15(7):3239-3245.
- Baloch Z, Yasmeen N, Li Y, et al. Knowledge and awareness of cervical cancer, human papillomavirus (HPV), and HPV vaccine among HPV-infected chinese women. *Med Sci Monit*. 2017;23:4269-4277.
- Yuanyue L, Baloch Z, Yasmeen N, Tao Y, Xiaomei W, Xueshan X. The distribution of human papillomavirus genotypes in cervical cancer and intraepithelial neoplasia lesions among Chinese women in Yunnan province. *J Infect Public Health*. 2018;11(1):105-110.
- Baloch Z, Li Y, Yuan T, et al. Epidemiologic characterization of human papillomavirus (HPV) infection in various regions of Yunnan province of China. *BMC Infect Dis*. 2016;16:228.
- Baloch Z, Yue L, Yuan T, et al. Status of human papillomavirus infection in ethnic population in Yunnan province, China. *Biomed Res Int*. 2015;2015:314815.
- Joy T, Sathian B, Bhattarai C, Chacko J. Awareness of cervix cancer risk factors in educated youth: a cross-sectional, questionnaire based survey in India, Nepal, and Sri Lanka. *Asian Pac J Cancer Prev*. 2011;12(7):1707-1712.
- Johnson DC, Bhatta MP, Gurung S, Aryal S, Lhaki P, Shrestha S. Knowledge and awareness of human papillomavirus (HPV), cervical cancer and HPV vaccine among women in two Distinct Nepali communities. *Asian Pac J Cancer Prev*. 2014;15(19):8287-8293.
- Thomsen LT, Nygård M, Stensen S, et al. Awareness of human papillomavirus after introduction of HPV vaccination: a large population-based survey of Scandinavian women. *Eur J Cancer Prev*. 2017;26(2):170-178.
- Massey PM, Boansi RK, Gipson JD, et al. Human papillomavirus (HPV) awareness and vaccine receptivity among Senegalese adolescents. *Trop Med Int Health*. 2017;22(1):113-121.
- Abulizi G, Abulimiti T, Li H, et al. Knowledge of cervical cancer and Pap Smear among Uyghur women from Xinjiang, China. *BMC Womens Health*. 2018;18(1):21.
- Rama CH, Villa LL, Pagliusi S, et al. Awareness and knowledge of HPV, cervical cancer, and vaccines in young women after first delivery in São Paulo, Brazil—a cross-sectional study. *BMC Women's Health*. 2010;10:35.
- Li J, Li LK, Ma JF, et al. Knowledge and attitudes about human papillomavirus (HPV) and HPV vaccines among women living in metropolitan and rural regions of China. *Vaccine*. 2009;27(8):1210-1215.
- Christian WJ, Christian A, Hopenhayn C. Acceptance of the HPV vaccine for adolescent girls: analysis of state-added questions from the BRFS. *J Adolesc Health*. 2009;44(5):437-445.
- Glenn BA, Tsui J, Singhal R, et al. Factors associated with HPV awareness among mothers of low-income ethnic minority adolescent girls in Los Angeles. *Vaccine*. 2015;33(2):289-293
- Grigore M, Teleman SI, Pristavu A, Matei M. Awareness and knowledge about HPV and HPV vaccine among romanian women. *J Cancer Educ*. 2018;33(1):154-159.
- Mouallif M, Bowyer HL, Festali S, et al. Cervical cancer and HPV: Awareness and vaccine acceptability among parents in Morocco. *Vaccine*. 2014;32(3):409-416.
- Osazuwa-Peters N, Boakye EA, Mohammed KA, Tobo BB, Genes CJ, Schootman M. Not just a woman's business! understanding men and women's knowledge of HPV, the HPV vaccine, and HPV-associated cancers. *Prev Med*. 2017;99:299-304.
- Nielsen A, Munk C, Liaw KL, Kjaer SK. Awareness of human papillomavirus in 23 000 Danish men from the general male population. *Eur J Cancer Prev*. 2009;18(3):236-239.