

Analysis of cervical human papillomavirus infection in 2300 women in Urumqi, China

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Abstract

This study is to investigate the cervical human papillomavirus (HPV) infection rate in women of Urumqi, China.

The epidemiological questionnaire survey was used to study 2300 women in Urumqi with a prospective research method. The second-generation hybrid capture assay, cervical liquid-based cytology test, colposcopy, and cervical biopsy were used to screen CC.

In 2300 cases, HPV was detected in 385 cases with infection rate of 16.74%. The infection rates of Uygur and Han women were 20.08% and 13.39%, respectively, with significant differences ($P < .05$). Among all age groups, the infection rate was highest in the age group of 20 to 25 years (with infection rate of 22.22%), followed by the age group of 45 to 49 years (with infection rate of 18.78%). In 8 districts, the highest positive rate was in Saybagh District with infection rate of 24.79%, followed by Urumqi County with infection rate of 19.05%, and the lowest was in Toutunhe District with infection rate of 10.86%. There was no significant difference in HPV infection among all age groups or among 8 districts of Urumqi. HPV infection rates were 10.48%, 84.52%, 92.94%, 100% in chronic cervicitis, low grade and high-grade intraepithelial neoplasia and CC group, respectively. The difference was statistically significant ($P < .05$).

The HPV infection rate of Uygur is higher than that in Han ethnic in Urumqi. The infection rate of HPV increases with the severity of cervical lesions.

Abbreviations: CC = cervical cancer, HC II = hybrid capture experiment, HPV = human papillomavirus.

Keywords: cervical cancer, ethnic, human papillomavirus

1. Introduction

Cervical cancer (CC) is a common gynecological malignancy and a serious threat to women's life. There are about 466,000 new cases of CC each year around the world, which results in the death of 25 to 28 million women each year.^[1] Human papillomavirus (HPV) has been recognized as a major cause of CC and HPV persistent infection is closely related to the pathogenesis of CC.^[2] Medical records of Urumqi Cancer Hospital for 18 years show that the number of CC patients is the largest in all kinds of malignant tumor, with an average of more than 800 patients every year, indicating that CC is a serious threat to the health of women of all ethnic groups in Xinjiang.^[3]

HPV infection is the main risk factor for the incidence of CC. The peak age of HPV infection is less than 30 and 50 to 59 years old.^[4] In southern Xinjiang, the prevalence of HPV infection in Uigur is over 25.0%, and HPV can be detected in almost all CC specimens.^[4] The detection rate of HPV in women with low grade squamous intraepithelial neoplasia is 20% to 50%, and that can reach 70% to 90% in women with high-grade squamous intraepithelial neoplasia.^[5]

In this study, the prospective research method was used to analyze the status of HPV infection between Uygur and Han women in 7 districts and 1 county of Urumqi. The HPV infection database of Uygur and Han women in Urumqi area was established to understand the status of HPV infection in Urumqi.

2. Materials and methods

2.1. Subject enrollment

The prospective study method was used in this study. The Tianshan, Saybagh, High-tech, Midong, Shuimogou, Toutunhe, Dabancheng District and Urumqi County were investigated. A total of 2300 Han and Uygur women (1: 1 ratio distribution) were enrolled in this study. The inclusion criteria were as follows:

1. The age of subject was between 20 and 59 years;
2. Subjects were of sound mind and body;
3. Subjects were residents in the locality confirmed by ID card or account of this;
4. Subjects in monogamous heterosexual relationships.

The exclusion criteria were as follows:

1. Subjects had history of hysterectomy;
2. Subjects were pregnant;
3. Subjects had history of pelvic radiation therapy or recent history of cervical treatment;

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4. Subjects were women in menstrual period;
5. Subjects were patients with acute genital tract inflammation.

Prior written and informed consent were obtained from every subject and the study was approved by the ethics review board of Dongfang Hospital of Tongji University.

2.2. Data collection

In all 2300 women, a questionnaire survey was conducted to collect general information including ethnic, age, regions, and type of lesion. HPV and cervical liquid-based cytology test (TCT) specimens were collected and gynecological examinations were performed. The final results were organized into a database. HPV and TCT test of each case in different periods were tested by the same person.

2.3. Screening for HPV infection and CC

Vaginal speculum was used to expose cervix. After vaginal and cervical secretions were clear, the second generation hybrid capture experiment (HC II) special sampling brush was used to collect the cervical exfoliated cell. Gently remove the cervical brush, place it in a specimen tube, and screw the cap. The sample was tested immediately or stored at 4°C within 2 weeks and -20°C for a long time. The second generation hybrid capture assay and cervical liquid-based cytology test were used to screen HPV infection and CC, respectively. For those with positive HPV infection or cervical liquid-based cytology test \geq ASC, colposcopy, and cervical biopsy were performed. The tests were all conducted according to routine procedures.

2.4. Statistical analyses

The database was established by FoxPro 6.0 program. The data were input by a 2-input method, and timely proofed by logical proofreading. The data were analyzed using SPSS 17.0 software. Differences among groups were performed with Chi-square test. A *P* value less than .05 was considered statistically significant.

3. Results

3.1. Comparison of HPV infection rate between Uygur and Han Women

To understand cervical HPV infection, the incidence of cervical lesions and racial differences in Uygur and Han women in the Xinjiang Urumqi area, HC-II and TCT were used to carry out CC screening for women in Xinjiang to find an effective CC screening model. In this study, a total of 2300 Uygur and Han women in Urumqi were screened using the stratified random sampling method. As shown in Table 1, there were 385 cases with HPV positive infection and the total infection rate was 16.74%. Among them, 154 cases of HPV infection was Han with the infection rate of 13.39%. While 231 cases of HPV infection was Uygur with the infection rate of 20.08%. The infection rate of Uygur was higher than that of Han ethnic, and the difference was statistically significant ($P < .001$, $\chi^2 = 18.496$). These results show that the HPV infection rate of Uygur was higher than that of Han ethnic.

3.2. HPV infection rates in different ages

All subjects were grouped by age and the positive rates of HPV infection were compared in all age groups. As shown in Table 2, the highest infection rate was 22.22% (2/9) in the age group of 20

Table 1

Comparison of HPV infection rate between Uygur and Han women.

Number of cases	HPV positive cases	HPV positive rate (%)	χ^2	<i>P</i>
Total	2300	385	16.74	
Han	1150	154	13.39	
Uygur	1150	231	20.08	18.496 <.001

HPV = human papillomavirus.

to 24 years, followed by the age group of 45 to 49 years with the infection rate of 18.78% (108/575). The lowest infection rate was found in the group of 25 to 29 years with the infection rate of 13.04% (15/115) and in the group of 54 to 59 years with the infection rate of 13.33% (8/60). There was no significant difference in HPV infection rate between age groups ($P > .05$).

3.3. Distribution of HPV infection in 8 areas of Urumqi, China

HPV infection rates in 8 districts within Urumqi were analyzed. As shown in Table 3, the HPV infection rate was highest in Saybagh District (24.79%), second highest in Urumqi County (19.05%), and lowest in Toutunhe District (10.86%). There was no significant difference in HPV infection rate among the 8 Urumqi areas ($P > .05$).

3.4. The HPV infection rate in different cervical lesions

The cervical lesions of patients and the HPV infection rate in different cervical lesions were analyzed. Of the 2300 cases, there were 223 cases with histopathological results (9.70%). As shown in Table 4, there were 84 cases with low grade squamous intraepithelial lesions, among which 71 (84.52%) cases were positive for HPV. There were 85 cases with low grade squamous intraepithelial lesions, among which 79 (92.94%) cases were positive for HPV. The number of patients with CC was 13 and all of them were with positive HPV infection (100%). There were 41 cases with chronic cervicitis, with 8 HPV positive cases (19.51%). For those without histopathological results, there were 214 cases with positive HPV infection and 1863 cases with negative HPV infection. The difference of HPV infection rate between different grades of cervical lesions was statistically significant ($\chi^2 = 940.304$, $P < .001$). These results show that the rate of HPV infection increased with the severity of cervical lesions.

4. Discussion

CC is a common gynecological malignancy in women and according to the latest world cancer statistics, there are 528,000

Table 2

HPV infection rates in different ages of the 2300 women.

Ages	Total Cases	HPV positive cases	HPV positive rate (%)
20–24	9	2	22.22
25–29	115	15	13.04
30–34	239	38	15.90
35–39	426	69	16.20
40–44	640	104	16.25
45–49	575	108	18.78
50–54	236	41	17.37
54–59	60	8	13.33
Total	2300	385	16.74

HPV = human papillomavirus.

Table 3**Distribution of HPV infection in 8 areas of Urumqi, China.**

Areas	Cases (n)	HPV positive cases	HPV positive rate (%)
Tianshan District	274	41	14.96
Saybagh District	363	90	24.79
High-tech District	341	58	17.01
Urumqi County	315	60	19.05
Midong District	306	52	16.99
Shuimogou District	230	25	10.87
Toutunhe District	221	24	10.86
Dabancheng District	250	35	14.00

HPV = human papillomavirus.

Table 4**HPV infection in different cervical lesions.**

Lesions	HPV infection		Total	χ^2	P
	Positive (Rate)	Negative (Rate)			
Low grade squamous intraepithelial lesion	71 (84.52%)	13 (15.47%)	84	940.304	<.001
High grade squamous intraepithelial lesion	79 (92.94%)	6 (7.05%)	85		
Cervical cancer	13 (100%)	0 (0.00)	13		
Chronic cervicitis			41		
Cases without histopathological results			2077		

HPV = human papillomavirus.

new cases of CC every year.^[6] It is the fourth most common cancer for women worldwide and also the second fastest growing cancer,^[7] which is a serious threat to women's health and life and has attracted wide attention. It has been confirmed that HPV persistent infection has close relationship with the development of CC occurrence.^[8] At present, the primary method used for CC prevention is the promotion of HPV vaccine and the secondary method used is cervical HPV screening,^[9,10] which all tend to prevent, detect and control HPV infection. Therefore, understanding HPV infection in the population is an important prerequisite for making decisions. This study investigated the prevalence of HPV infection in Urumqi women in Xinjiang, China. The results showed that there were 385 women with HPV positive infection among 2300 women. The total infection rate was 16.74%, which was lower than that of the total infection rate of HPV in China (32.6%–38.09%).^[11–14] Among them, the number of HPV infection in the Han ethnic was 137 of 1150 cases with the infection rate of 11.91%. The number of Uygur HPV infection was 210 of 1150 cases with the infection rate of 18.25%, which was higher than that of the Han ethnic.

Zhao et al^[15] found that the total HPV infection rate was 19.30% in 12307 cases of Liaoning women, and HPV infection peaked in the age group of <30 years old and 50 to 59 years old. KAZUHIRO et al^[16] found that the age groups of 15 to 25 years and >55 years had the highest rate of HPV infection. Consistently, this study showed that the high HPV infection rate in Urumqi women in Xinjiang was found in the age groups of <25 years old (22.22%), 45 to 49 years old (18.78%), and 50 to 54 years old (17.37%). The high infection rate in women of <25 age group may be that they are in sexual activity with more exposure opportunities. Study has shown that the lifetime cumulative probability of cervix infected with at least 1 HPV was

up to 40% for sexually active women.^[17] However, most of the HPV virus infection in this age is a transient infection^[17] and the virus will soon be cleared by the body. The reason that 45 to 49 age group of menopausal women has re-emergence of the peak of infection may be the overall decline in women's immunity and reduced virus clearance capacity during this period. Most of the HPV infections at this period are persistent infection.^[18] Thus, it is necessary to screen the HPV infection for women of 50 to 59 age group.

The morbidity and mortality of CC exist significant national and regional differences.^[19] In this study, HPV infection rate in Urumqi women was high and regional HPV infection rates showed no significant difference. Therefore, the HPV and CC screening strategy should be actively promoted in each district of Urumqi, thereby reducing the incidence of CC and improving the quality of life of residents.

This study showed that the positive rates of HPV in different levels of cervical lesions were 10.48% (chronic cervicitis and negative HPV infection), 84.52% (low grade squamous intraepithelial lesion), 92.94% (high grade squamous intraepithelial lesion) and 100% (CC), respectively. With the increase of the lesion grade, the infection rate of HPV increased gradually. Clinical and epidemiological studies^[19,20] have found that HPV infection and the occurrence and development of CC are closely related. For example, HPV infection can induce cervical intraepithelial neoplasia and CC, and persistent infection of HPV is the most important factor in the promotion of CC.^[21] Therefore, the study of the relationship between HPV infection and CC is of great significance to the prevention and treatment of CC. In this study, the procedure used for HPV and CC screening was HPV detection- liquid-based cytology test-colposcopy-histological biopsy.

To conclude, this study shows that the HPV infection rate of Uygur was higher than that in Han ethnic in Urumqi. Women in 20 to 24-year-old age group and shayibake had higher infection rate. The infection rate of HPV increased with the severity of cervical lesions. By understanding the status of HPV infection among women in Urumqi, Xinjiang and, the HPV infection database of Uygur and Han women in Urumqi area was established, and the data of HPV infection rate of Uygur and Han women in this area were obtained.

Author contributions**Data curation:** Jianlin Yuan, Lipa Mei.**Formal analysis:** Ping Zhou.**Funding acquisition:** Jingxin Cheng.**Project administration:** Jingxin Cheng.**Writing – original draft:** Lili Yao, Min Yuan.**References**

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