

ANALYSIS OF FREE CERVICAL CANCER SCREENING RESULTS IN URAL AREAS
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ABSTRACT

Objective: The aim of this study is to explore the completion status and screening results of free cervical cancer screening in Xinfeng, Shaoguan City, in ural areas of South China, and to provide a basis for the cervical cancer prevention and control strategies. **Methods:** A retrospective analysis was conducted on the gynecological examination, HPV infection, liquid based thin layer cytology (TCT), colposcopy, tissue biopsy, and pathological examination results of married women aged 35-64 in Xinfeng, Shaoguan City, South China from 2019 to 2022. **Results:** Over the past four years, 9042 women in Xinfeng have completed free cervical cancer screening. 1036 women (11.46%) had bacterial vaginitis, and 1273 women (14.08%) tested positive for HPV. The positive rate of HPV testing in 2019 was 18.4%, significantly higher than the positive rates in the other three years (11.6%, 10.4%, 12.9%). 272 women (3.01%) were TCT positive (ASC-US and above), all from HPV positive individuals. The positive rates of ASC-US, ASC-H, LSIL, and HSIL were 1.90%, 0.55%, 0.27%, and 0.28%, respectively. The proportion of TCT positive women among HPV positive women was 21.37%, with the positive rates of ASC-US, ASC-H, LSIL, and HSIL being 13.5%, 3.93%, 1.89%, and 2.04%, respectively. A total of 340 women underwent cervical tissue pathology testing, of which 55 (16.18%) had low-grade lesions, 62 (18.25%) had high-grade precancerous lesions, and 2 each had minimal invasive cancer and invasive cancer. The incidence of advanced precancerous lesions has decreased at the past four years. **Conclusions:** The free cervical cancer screening has been successfully completed in ural of South China. The HPV infection rate among women is higher than the average level in Guangdong Province China, while the level of precancerous lesions in cervical cancer screening is similar to the average level in Guangdong Province China. The incidence of advanced precancerous lesions has decreased over the past four years. The early diagnosis and early diagnosis of cervical cancer should be continued to strengthen in ural of South China

KEYWORDS: Women, Cervical cancer, Screening, Cervical liquid based thin layer cytology examination.

1. INTRODUCTION

Cervical cancer is a malignant tumor with a clear etiology among human malignancies. Research has shown that human papilloma virus (HPV) infection is the main cause of cervical cancer. By receiving HPV vaccine, conducting cervical cancer screening, early detection of cervical cancer and precancerous lesions, and timely treatment, the occurrence of cervical cancer can be effectively prevented. However, despite this, cervical cancer remains the main global public health problem. At present, the incidence rate and mortality of cervical cancer among women in the world are still high, and it is still one of the most common neoplasms among women in the world.^[2]

Data showed that in 2020, approximately 604000 people worldwide were newly diagnosed with cervical cancer, and 342000 people died from cervical cancer. In the past decades, in most regions of the world, the incidence rate

and mortality of cervical cancer have declined, but the regional differences in cervical cancer prevention and control are huge. The incidence rate of cervical cancer in different regions and countries around the world ranges from 2/100000 to 75/100000.^[4] Although the world has been vigorously promoting HPV vaccination among eligible women in recent years and implementing secondary prevention strategies for cervical cancer screening, the forms of prevention and control remain severe, especially in countries and regions such as Antarctica, Melanesia, South America, and Southeast Asia. According to the national cancer statistics report released by the National Cancer Center of China, the incidence rate of cervical cancer ranked second in the incidence rate of malignant tumors in the female reproductive system, second only to breast cancer. There were 130000 new cases every year, accounting for 28% of the world's total new cases of cervical cancer every year. There were 53000 deaths every year, accounting

for 18.4% of all female deaths from malignant tumors. Research showed that women of any age may develop cervical cancer, but it was rare for women under the age of 20, and the peak incidence of cervical cancer was between 40 and 60 years old, with a decreasing trend after 60 years old. Research showed that the burden of cervical cancer in China accounts for 20.2% of the global burden of cervical cancer, and its incidence rate increased significantly at a rate of up to 10.5% every year. According to the latest data of Global Cancer Observatory (GCO) in 2020, the world age standardized incidence rate of cervical cancer in China was 10.7/100000, accounting for 5.2% of the total incidence of cancer in Chinese women. The world age standardized mortality rate is 5.3/100000, accounting for 5% of the total tumor deaths in Chinese women.

At present, various regions in China are actively promoting cervical cancer screening and HPV vaccination for eligible women, but the overall effect is still far from the goal of the WHO action plan to eliminate cervical cancer. It remained one of the most common gynecological tumors among women in the world today, and cervical cancer remains a major public health problem worldwide. Cervical cancer screening is the main way of secondary prevention of cervical cancer. The goal of cervical cancer screening is to identify precursor lesions that may develop into invasive cancer, so as to reduce the incidence rate and mortality of cervical cancer. Therefore, effectively conducting cervical cancer screening for women and taking effective prevention and control measures is of great practical significance for China to effectively control cervical cancer and achieve the goal of eliminating cervical cancer as soon as possible.

2. OBJECT AND METHOD

2.1 Study subjects: Retrospective analysis of cervical cancer screening data of women (aged 35-64) residing in Xinfeng, Shaoguan City south China from 2019 to 2022. Inclusion criteria: Resident women aged 35-64 in Xinfeng. Screening should be conducted during non menstrual periods. Avoid sexual activity two days before screening. Did not rinse the vagina or use vaginal medication. Did not undergo gynecological internal diagnosis or transvaginal ultrasound examination within 48 hours before sampling. If you have vaginitis, it was recommended to seek treatment first and then undergo screening. Exclusion criteria: ① Women who had undergone cervical cancer screening in the current year at the time of screening. ② Women aged <35 years old or >64 years old. ③ Pregnant women; ④ A confirmed patient with cervical cancer. All tested subjects undergo an examination after obtaining informed consent and signing an informed consent form.

2.2 Detection of lower reproductive tract microbiota: Sterile cotton swabs was used to rotate and wipe

secretions from the posterior position or posterior fornix of the vagina for the detection of lower reproductive tract microbiota, and used Antu Biological Five Joint Test Kit for testing. Observation of infection indicators included trichomonas vaginitis, vulvovaginal candidiasis, bacterial vaginosis, and cervicitis. Cervicitis includes mucopurulent cervicitis, cervical vegetation, and chronic cervicitis.

2.3 Thinprep Cytologic Test(TCT)^[6]: The diagnostic criteria were based on the TBS classification: negative (no epithelial lesions or malignant cells) and positive, ranging from low to high as atypical squamous epithelial cells (ASCUS) with no clear significance, atypical squamous epithelial cells-excluding high squamous intraepithelial lesions (ASCH), low squamous intraepithelial lesions (LSIL), high squamous intraepithelial lesions (HSIL), squamous cell carcinoma, and atypical glandular epithelial cells (AGC) Atypical cervical glandular cells tend to undergo neoplasia and adenocarcinoma.

2.4 Colposcopy examination and cervical biopsy^[6]: Patients with positive cytology and/or abnormal reproductive tract colposcopy examination should avoid the menstrual period for one week. Wiped off the surface of the cervix and vaginal secretions with a cotton swab, observed the squamous columnar junction epithelium and blood vessels, applied 3% acetic acid solution to the surface of the cervix for 1 minute, and observed the appearance of white epithelium, inlaid, punctate blood vessels, and various atypical blood vessels. Then, performed iodine solution test, and did not stain as a positive area. Performed cervical biopsy at 2-5 locations under colposcopy. For those with normal images under colposcopy, cervical biopsies were taken at points 3, 6, 9, and 12. Biopsy specimens were classified into low-grade and high-grade cervical intraepithelial lesions, including adenocarcinoma in situ, minimally invasive carcinoma, and invasive carcinoma, based on routine pathological registration, sampling, fixation, dehydration, embedding, sectioning, staining, sealing, and pathological diagnosis.

2.5 Statistical analysis: SPSS 25.0 statistical software was used to establish a database and conducted statistical analysis on the data. Measurement data was represented by mean \pm standard deviation (mean \pm standard deviation), counting data was represented by use case (%), and comparison was made using χ^2 test. The test level $\alpha = 0.05$.

3. RESULTS

3.1 Demographic characteristics: According to the free cervical cancer screening task for women, the number of screening tasks in Xinfeng was 5000 in

2019 and 1893 per year from 2020 to 2022. From 2019 to 2022, a total of 9042 women aged 35-64 participated in cervical cancer screening in Xinfeng County, with an annual completion rate of 3230, 1896, 1898, and 2018, with an average age of 51.12 ± 6.80 years. Among them, 2177 (24.08%) had a primary school education or below, 4460 (89.00%) had a junior high school education, and 561 (6.20%) had a high school or vocational school education. 4007 women (44.32%) reported menopause.

6261 (69.24%) used ligation for contraception, and 530 (5.86%) used intrauterine devices for contraception. Their pregnancies and deliveries were 2.80±1.25 and 2.41±1.06, respectively. 4630(51.21) women have previously undergone cervical cancer testing. 122 women (1.35%) had other tumors. 71 (0.85%) and 301 (3.33%) women had sexual bleeding and abnormal vaginal discharge within the two weeks prior to screening, respectively. The above indicators showed no significant trend of change from 2019 to 2022(P>0.05), as shown in Table 1.

3.2 Pregnancy and Related medical history: Among the 9042 women who participated in this screening,

Table 1: Marriage and childbirth related medical history of women participating in cervical cancer screening in Xinfeng from 2019 to 2022.

Items	2019 (N=3230)	2020 (N=1896)	2021 (N=1898)	2022 (N=2018)	Total (N=9042)
Contraceptive methods					
Condom	222 (6.9)	175 (9.2)	119 (6.3)	212 (10.5)	728(8.05)
contraceptive	6 (0.2)	21 (1.1)	14 (0.7)	20 (1.0)	61(0.67)
Intrauterine device	166 (5.1)	118 (6.2)	74 (3.9)	172 (8.5)	530(5.86)
ligation	2364 (73.2)	1240 (65.4)	1506 (79.3)	1151 (57.0)	6261(69.24)
Pregnancy and childbirth history: number of pregnancies	2.76±1.36	2.79±1.23	2.87±1.22	2.88±1.24	2.80±1.25
Pregnancy and childbirth history: delivery times	2.47±1.09	2.31±0.96	2.47±1.19	2.33±0.89	2.41±1.06
Previously underwent cervical cancer examination	1843 (57.06)	647 (34.12)	1047 (55.23)	1093 (54.16)	4630(51.21)
Previous history: Other tumors	22 (0.68)	28 (1.48)	5 (0.26)	67 (3.32)	122(1.35)
Family history of tumors	14 (0.43)	22 (1.16)	12 (0.63)	55 (2.73)	103(1.14)
Symptoms: Bleeding during sexual intercourse	24 (0.74)	19 (1.00)	7 (0.37)	21 (1.04)	71(0.85)
Symptoms: Abnormal vaginal discharge	63 (1.95)	46 (2.43)	71 (3.74)	121 (6.00)	301(3.33)

3.3 Routine gynecological examination results: All of the 9042 women underwent routine gynecological examinations. The results showed that 258 (2.85%) of vaginal secretions had a foul odor, and 20 (0.22%) had soy residue like secretions. The number of the women with secretion cleanliness levels of I, II, III, and IV was 1985 (22.0%), 4348 (48.09%), 2081 (23.01%), and 488 (5.40%), respectively. 219

women (2.42%) and 256 women (2.83%) respectively detected Gardnerella and clue cells in their secretions. The number of cases of cervical bleeding, polyps, and erosion was 4 (0.04%), 150 (1.66%), and 11 (0.12%), respectively. Uterine prolapse was found in 38 (0.42%) and uterine mass in 3 (0.03%), as shown in Table 2.

Table 2: The results of free cervical cancer screening in Xinfeng from 2019 to 2022.

Items	2019 (N=3230)	2020 (N=1896)	2021 (N=1898)	2022 (N=2018)	Total (N=9042)
Secretion: Odor	184 (5.70)	7 (0.36)	1 (0.05)	66 (3.27)	258(2.85)
Secretion: With blood	1 (0.03)	2 (0.11)	3 (0.16)	1 (0.05)	7(0.08)
Secretion: purulent	0 (0.00)	2 (0.11)	0 (0.00)	0 (0.00)	2(0.02)
Secretion: foam like	0 (0.00)	4 (0.21)	0 (0.00)	0 (0.00)	4(0.04)
Secretion: Soy residue like	0 (0.00)	17 (0.90)	3 (0.16)	0 (0.00)	20(0.22)
Abnormal secretion: Other	2 (0.06)	2 (0.11)	0 (0.00)	1 (0.05)	4(0.04)
Cleanliness of secretions Degree I	582 (18.0)	212 (11.18)	915 (48.21)	276 (13.68)	1985(22.0)
Degree III	1987 (61.52)	1161 (61.23)	637 (33.56)	563 (27.90)	4348(48.09)

Degree II	547 (16.93)	445 (23.47)	295 (15.54)	794 (39.35)	2081(23.01)
Degree IV	36 (1.11)	16 (0.84)	51 (2.69)	385 (19.08)	488(5.40)
Secretion:Trichomonas	9 (0.27)	2 (0.11)	3 (0.16)	8 (0.40)	22(0.24)
Secretion: Candida	4 (0.12)	0 (0.00)	0 (0.00)	90 (4.50)	94(10.40)
Secretion: Gardnerella	2 (0.06)	19 (1.00)	2 (0.11)	296 (14.67)	219(2.42)
Secretion: clue cells	1 (0.03)	0 (0.00)	3 (0.16)	252 (12.49)	256(2.83)
Cervix: contact bleeding	0 (0.00)	2 (0.11)	0 (0.00)	2 (0.10)	4(0.04)
Cervix: Polyp	63 (1.95)	16 (0.84)	33 (1.74)	35 (1.73)	150(1.66)
Cervix: erosion	2 (0.06)	2 (0.11)	1 (0.05)	6 (0.30)	11(0.12)
Cervix: Other	14 (0.43)	2 (0.11)	7 (0.37)	16 (0.79)	39(0.43)
Uterine mass	0 (0.00)	1 (0.05)	1 (0.05)	1 (0.05)	3(0.03)
Uterine prolapse	5 (0.15)	3 (0.16)	16 (0.84)	14 (0.69)	38(0.42)

3.4 Detection of lower reproductive tract microbiota:

From 2020 to 2022, 9042 women who participated in the screening showed that the proportion of bacterial vaginitis (11.46%) was the highest, significantly higher than other infections (P<0.05),

and 70 people (0.77%) had vulvovaginal candidiasis. The detection rate in 2022 was significantly higher than that in other years (P<0.05), as shown in Table 3.

Table 3: Results of microecological testing of the lower reproductive tract in women in Xinfeng from 2020 to 2022

Year	N	trichomonas vaginitis	vulvovaginal candidiasis	Bacterial vaginitis	genital warts	mucopurulent cervicitis
2019	3230	2 (0.06)	7 (0.22)	25 (0.77)	0 (0.00)	1 (0.03)
2020	1896	0 (0.00)	3 (0.16)	1 (0.05)	0 (0.00)	0 (0.00)
2021	1898	1 (0.05)	0 (0.00)	51 (2.69)	0 (0.00)	0 (0.00)
2022	2018	17 (0.84)	60 (2.97)	959 (47.5)	0 (0.00)	0 (0.00)
合计	9042	20 (0.22)	70 (0.77)	1036 (11.46)	0 (0.00)	1 (0.01)

3.5 HPV infection status: Among 9042 tested individuals, 1273 (14.08%) tested positive for HPV infection. Among them, 3230 women tested for HPV infection in 2019, with a positive rate of 18.4%, significantly higher than the positive rates in other three years, 11.6%, 10.4%, and 12.9%. There was statistical different (P<0.001), as shown in Table 4.

3.6 Detection of cervical cytology: Cervical cytology examination showed that 272 women (3.01%) were TCT positive (ASC-US and above) in Xinfeng, Shaoguan City from 2019 to 2022. Among them, the positive rates of ASC-US, ASC-H, LSIL, and HSIL were 1.90%, 0.55%, 0.27%, and 0.28%, respectively. The positive rate in 2022 (3.67%) was higher than in other years (P<0.05), as shown in Table 5. TCT positive individuals were all from HPV positive individuals, and the TBS positive rate of these women was 21.37%. The positive rates of ASC-US, ASC-H, LSIL, and HSIL were 13.5%, 3.93%, 1.89%, and 2.04%, respectively.

Table 4: HPV detection results for women in Xinfeng from 2020 to 2022.

Years	N	HPV test Positive
2019	3230	594 (18.4)
2020	1896	220 (11.6)
2021	1898	198 (10.4)
2022	2018	261 (12.9)
Total	9042	1273 (14.08)

Table 5: TBS grading of cervical cytology screening for women in Xinfeng from 2019 to 2022.

Year	N	ASC-US	ASC-H	LSIL	HSIL	Total
2019	3230	72 (2.23)	18 (0.56)	2 (0.25)	8 (0.25)	100 (3.10)
2020	1896	32 (1.69)	6 (0.32)	2 (0.11)	6 (0.32)	46 (2.43)
2021	1898	29 (1.53)	15 (0.79)	2 (0.11)	6 (0.32)	52 (2.74)
2022	2018	39 (1.93)	11 (0.55)	18 (0.89)	6 (0.30)	74 (3.67)
Total	9042	172 (1.90)	50(0.55)	24(0.27)	26(0.28)	272 (3.01)

3.7 Cervical histological detection results Between 2019 and 2022, a total of 340 women who participated in cervical cancer screening underwent cervical tissue pathology testing. Among them, 55 (16.18%) had low-grade lesions, 62 (18.25%) had high-grade precancerous lesions, and 2 each had minimal invasive cancer and invasive cancer. The

incidence of advanced precancerous lesions has decreased over the past four years, as shown in Table 6. For all screened women, the proportion of high-grade and above precancerous lesions is $67/9042=741.0/100000$, and the incidence rate of cervical cancer is $2/9042=22.12/100000$.

Table 6: Cervical Pathological detection Results of the Women's Cervical Cancer Screening Project in Xinfeng from 2019 to 2022.

Pathological test results	2019 (n=153)	2020 (n=73)	2021 (n=86)	2022 (n=28)	Total (n=340)
Low grade lesions	22(14.38)	15(20.55)	15(17.44)	3(10.71)	55(16.18)
Advanced precancerous lesions	28(18.30)	13(17.81)	17(19.77)	4(14.29)	62(18.25)
Adenocarcinoma in situ	0(0.00)	0(0.00)	0(0.00)	1(3.57)	1(0.29)
Minimally invasive carcinoma	0(0.00)	1(1.37)	1(1.16)	0(0.00)	2(0.59)
Infiltrating carcinoma	0(0.00)	1(1.37)	1(1.16)	0(0.00)	2(0.59)

4 DISCUSSION

Research showed that the detection rate of cervical precancerous lesions is 40%-50% in developed countries. Due to their effective cervical cancer screening and early prevention and treatment work, the mortality rate of cervical cancer has decreased by nearly 50%. However, in developing countries, the detection rate of cervical cancer was only 5%, and about 95% of women had never received cervical cancer screening or screening was insufficient. Research showed that over 70% of women in China had not undergone cervical cancer screening.^[6,8] This poses great difficulties for the early onset and early treatment of cervical cancer in China. Therefore, the global strategy to eliminate cervical cancer proposed by WHO had set new goals and development momentum for cervical screening and diagnosis and treatment in China.^[9,10]

The occurrence and development of cervical cancer is a long-term gradual process, with the vast majority of low-grade cervical lesions and some high grade lesions able to resolve on their own, and only a few progressing to cervical cancer.^[8] From this perspective, cervical cancer was not terrifying. The key lies in how physicians conduct early and effective screening and adopt correct management and treatment methods for high-risk patients with HR-HPV infection. At present, the commonly used screening methods for cervical cancer include TCT, HPV testing, DNA ploidy quantitative analysis, colposcopy, cervical biopsy, etc. However, sensitivity and specificity are greatly influenced by film making and film reading techniques, so they are often combined with other detection methods.^[11] TCT is currently the most widely used cervical screening method. The principle of TCT examination is based on changes in cell morphology, which has the characteristics of convenient and non-invasive sampling. However, cytological diagnosis is morphological detection, and there is a lack of objective judgment criteria for morphological changes. The diagnostic

results are influenced by subjective factors of doctors. Therefore, currently, China adopts joint screening methods such as HPV testing, gynecological routine physical examination, colposcopy, and cervical biopsy Cervical cancer.^[12,13] In recent years, various regions in China have been carrying out comprehensive screening and early diagnosis and treatment of cervical cancer, and have achieved significant results. However, due to cultural differences, varying levels of emphasis on cervical cancer screening, and insufficient awareness of cervical cancer among the general public, China's cervical cancer screening and diagnosis level still falls far short of the global strategy for eliminating cervical cancer proposed by the WHO.^[14-15]

This study retrospectively analyzed the gynecological examination, HPV infection, liquid based thin layer cytology (TCT), colposcopy, tissue biopsy, and pathological examination results of married women aged 35-64 in Xinfeng County, south of China from 2019 to 2022. Data showed that in the past 10 years, Xinfeng has successfully completed the task of cervical cancer screening and intervention for rural women, with a total of 9042 women completing free cervical cancer screening.

The positive rate of HPV testing among women participating in the screening was 14.08%, with the highest positive rate in 2019 and a decrease in other years. 3.01% of women screened for TCT positive (ASC-US and above) were from HPV positive individuals. The proportion of TCT positive individuals among HPV positive women was 21.37%. Cervical tissue pathology tests showed that 18.25% were advanced precancerous lesions, while there were 2 cases of micro invasive cancer and 2 cases of invasive cancer each. There was no significant trend in the incidence of cervical cancer over the past four years. Compared with historical data,^[16] in 2012, the total HPV infection rate among women screened for cervical cancer was 23.19%,

and the positive rate of liquid based cytology diagnosis was 4.87%. The current cervical cancer screening results in Xinfeng have significantly improved. The results indicated that Xinfeng has successfully completed the task of free cervical cancer screening every year, and has effectively implemented the early diagnosis and treatment of women's cervical cancer. Compared with the results of cervical cancer screening in Guangdong Province.^[17-21] the positive rate of HPV testing among women in Xinfeng was slightly higher than the average level in Guangdong Province (9.13%), while the incidence of advanced precancerous lesions in cervical cancer screening is similar to the average level in Guangdong Province, and is also consistent with the main research results in China.

Based on the results of this study, we draw the following conclusions that the free cervical cancer screening has been successfully completed in Xinfeng, Shaoguan City. The HPV infection rate among women is higher than the average level in Guangdong Province, while the level of precancerous lesions in cervical cancer screening is similar to the average level in Guangdong Province. The incidence of advanced precancerous lesions has decreased over the past four years. In the future, we should continue to strengthen the early diagnosis and early diagnosis of cervical cancer.

Conflict of interest

The authors have declared that no competing interests exist.

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