

## RESEARCH ARTICLE

# Combined Screening of Cervical Cancer, Breast Cancer and Reproductive Tract Infections in Rural China

Zhi-fang Li<sup>1&</sup>, Shao-Ming Wang<sup>2&</sup>, Ju-Fang Shi<sup>2,3</sup>, Fang-Hui Zhao<sup>2</sup>, Jun-Fei Ma<sup>4</sup>, You-Lin Qiao<sup>2</sup>, Xiang-Xian Feng<sup>1\*</sup>

## Abstract

**Objectives:** To investigate the current prevalence and knowledge of cervical cancer, breast cancer and reproductive tract infections (RTIs) in rural Chinese women, and to explore the acceptance and feasibility of implementing a combined screening program in rural China. **Methods:** A population-based, cross-sectional study was conducted among women aged 30 to 59 years old in Xiangyuan County, Shanxi Province from 2009 to 2010. Socio-demographic characteristics, knowledge of cervical cancer, breast cancer and RTIs, and the attitude toward single or combined screening were collected by an interview questionnaire. Each participant received a clinical examination of the cervix, breast and reproductive tract. Examinations included visual inspection, mammography, laboratory tests and pathological diagnosis. **Results:** A total of 1,530 women were enrolled in this study. The prevalence of cervical precancerous lesions, suspicious breast cancer, suspicious benign breast disease and RTIs was 1.4%, 0.2%, 14.0% and 54.3%, respectively. Cervicitis, trichomonas vaginitis, and bacterial vaginitis were the three most common RTIs among our participants. Television, radio broadcast, and public education during screening were the major source of healthcare knowledge in rural China. Moreover 99.7% of women expressed great interest in participating in a combined screening project. The affordable limit for combined screening project was only 50 RMB for more than half of the rural women. **Conclusion:** A combined screening program would be more effective and popular than single disease screening projects, while appropriate accompanied education and a co-pay model for its successful implementation need to be explored, especially in low-resource settings.

**Keywords:** Cervical cancer - breast cancer - reproductive tract infections - combined screening - rural China

*Asian Pacific J Cancer Prev*, 13, 3529-3533

## Introduction

Breast cancer, cervical cancer, and reproductive tract infections are the major female diseases affected women in the world. As the most common cancer for Chinese females (Moy et al., 2010), breast cancer showed a high incidence and mortality of 21.6/100,000 and 5.7/100,000 in China according to GLOBOCAN 2008 (Ferlay et al., 2010). Cervical cancer, known as the second most common cancer, also showed high mortality of 7.0/100,000 in high-risk areas in rural China such as Xiangyuan County in Shanxi Province (Shi et al., 2012). Reproductive tract infections (RTIs) were also common benign diseases in low resource areas, showing a high prevalence of 70% among married Chinese women (WHO, 1999), with a wide range of 35.8-85.1% across China, and 68.0% among rural women in Shanxi province (Zhang et al., 2001; Dong et al., 2010; Sun et al., 2010).

As we know, thousands of screening projects were conducted globally in the past decades to help reduce disease burdens in a more effective way compared to

late-period treatment. China also conducted lots of screening projects while most of which only focused on single disease. Though screening projects can provide great benefits to the participants, compliance rate and the associate cost still are big concerns when single disease screening projects come together in a short period. How to conduct multiple diseases screening in a more cost-effectively and acceptable way becomes a tough challenge for decision makers. Combined screening project could be a potential solution to this problem.

We then conducted a study to investigate the current prevalence and knowledge of cervical cancer, breast cancer and RTIs in rural Chinese women. The acceptance and feasibility of implementing combined screening program was also explored in this study.

## Materials and Methods

### Study Population

This study was conducted through a national project titled: "Early Detection and Early Treatment for Cervical

<sup>1</sup>Department of Preventive Medicine, Changzhi Medical College, <sup>4</sup>Maternal and Child Health Hospital of Xiangyuan County, Changzhi, <sup>2</sup>Department of Cancer Epidemiology, Cancer Institute of Chinese Academy of Medical Sciences, Peking Union Medical College, Beijing, China, <sup>3</sup>Cancer Epidemiology Research Unit, Cancer Council New South Wales, Australia <sup>&</sup>Equal contributions  
\*For correspondence: [xfeng66@163.com](mailto:xfeng66@163.com)

Cancer”, from April of 2009 to April 2010 in Xiangyuan County, Shanxi Province. A convenient sampling method was used to enroll eligible participants. Local female residents aged 30-59 years old, without history of hysterectomy or mastectomy, and not currently suffering from any other serious diseases were eligible for this study. Group introductions for this project and personalized communication were used to obtain written informed consent.

*Questionnaire interview*

Each participant was interviewed by a well-trained study investigator (in a private room of the local Maternal and Child Health Hospital). Consultation and healthcare lectures were provided when getting the informed consent and during the screening procedures. Knowledge about screening of cervical cancer, breast cancer, and RTIs before and after the education was investigated by questionnaires. Variables including socio-demographic characteristics, the attitude toward single or combined screening, the affordability limit for screening, and the main reasons affecting women to participate the screening project were also investigated by questionnaires.

*Combined Screening Procedures:*

Each participant received screening according to the standard clinical guidelines for the three specific diseases of interest. All the participants were screened for RTIs by both clinical examination and laboratory testing. For cervical cancer, after clinical inspection of the vagina and cervix, cervical exfoliated cells were collected by the gynecologists for Pap smear screening testing (Moy et al., 2010). Vaginal and cervical secretions were also collected (Fei et al., 2011) for laboratory testing. Specifically, vaginal secretion was examined by PH testing strips, the amine test, and via the “Pendant drop method” for microscopy inspection. For laboratory testing, both vaginal and cervical samples were examined with a microscope after the “Gram Method.”

Each woman also underwent cervical cancer screening by visual inspection with acetic acid (VIA). Those with normal VIA results were re-examined by visual inspection with Lugol’s iodine (VILI) (Zhang et al., 2010). Results were categorized by negative, positive and suspicious cancer. Women with any visual abnormalities underwent colposcopic examination. All the lesions under colposcopic examination were biopsied for pathological confirmation (Moy et al., 2010). Regular follow-up or suggestions for therapy were provided for those with lesions found by screening.

All women then underwent breast cancer screening by clinical breast examination (Kang et al., 2010) and results were divided into the following three categories: normal, suspicious benign (including mastitis, ductectasia, cystic hyperplasia, fibroma, fibroadenoma, mild intraductal papillomatosis etc.) and suspicious malignant. Participants with suspicious malignant results were provided an ultrasound examination for further diagnosis. Women were also referred to the tertiary level of hospitals for mammography or biopsy for pathological confirmation (Huang et al., 2010)

*Quality Control*

Prior to this study, formal training was provided to establish the uniform standard for interviewing, clinical examination, sampling, and data collection. A pilot study was also conducted prior to this study to help optimize the procedures and protocol (Xiang et. al., 2009).

*Statistical analysis*

The software package EpiData 3.1 was used to create the uniform database for this study, with limited password access to data entry personnel. Data double entry and logic check were used to verify the consistency and the accuracy of the data according to the original questionnaires. The statistical software package SPSS 15.0 was used for data analysis. Socio-demographic characteristics and knowledge of relative diseases were described by frequencies and proportions. Difference of awareness rate for related disease pre and post-education was calculated using the Chi-square test. All statistical tests were two-sided and the level of significance was set at P=0.05.

**Results**

*Demographic Information*

A total of 1,530 women participated in this study, with a response rate of 98.5%. The average age for the participants was 42.4± 7.4 years old. More than half the women (57.6%) completed a junior high school education. Most of participants (93.1%) were covered by the New Rural Cooperative Medical Care System. The median family income was 15,000 RenMinBi (RMB) per year in this area with an average of four members per family.

*Prevalence of Diseases*

We found the prevalence of precancerous cervical lesions, breast cancer, suspicious benign breast disease and RTIs was 1.4% (21/1530), 0.2% (3/1530), 14.0% (214/1530), and 54.3% (831/1530), respectively. Dividing the cervical lesions by histopathology stage, the prevalence of cervical intraepithelial neoplasia (CIN) grade 1 (CIN1), CIN grade 2 (CIN2) and CIN grade 3 (CIN3) was 1.1% (17/1530), 0.2% (3/1530), and 0.1% (1/1530) for the participants. Moreover, cervicitis, trichomonas vaginitis, and bacterial vaginitis were the three most common RTIs among our participants (Table 1).

*Knowledge of Risk Factors*

The most commonly perceived cervical cancer risk factors among participants were: the number of sexual partners (67.9%), the number of abortions (60.6%), the number of pregnancies (59.0%), and the age of sexual

**Table 1. Results of the Combined Screening of Cervical Cancer, Breast Cancer and RTIs in Shanxi Province**

Disease	Results of the combined screening n(%)			
Cervix	Normal	CIN1	CIN2	CIN3
	1509 (98.6)	17 (1.1)	3 (0.2)	1 (0.1)
Breast	Normal	Suspicious benign		Suspicious cancer
	1313 (85.8)	214 (14)		3 (0.2)
RTIs	Normal	1 only	2	3 or more
	699 (45.7)	570 (37.3)	183 (12.0)	78 (5.1)

**Table 1. Knowledge of Risk Factors for Cervical Cancer, Breast Cancer and RTIs in Shanxi Province n(%)**

Cervical cancer	No. sexual partners	No. abortions	No. pregnancies	Age sexual debut	Smoking & drinking	Occupational hazards	Diet	Family history	HPV infection	No idea
	1039 (67.9)	927 (60.6)	903 (59.0)	760 (49.7)	693 (45.3)	640 (41.8)	635 (41.5)	575 (37.6)	320 (20.9)	401 (26.2)
Breast cancer	Personal characteristics	Smoking & drinking	Age	Obesity	Breastfeeding	Diet	Emergency	Family history	Sexual behavior	No idea
	666 (43.5)	662 (43.3)	660 (43.1)	649 (42.4)	644 (42.1)	612 (40.0)	581 (38.0)	470 (30.7)	326 (21.3)	578 (37.8)
RTIs	No. sexual partners	No. abortions	Frequency vaginal cleaning	Vagina-specific basin and towels	No. deliveries	Age sexual debut	No. husband's sexual partners	Condom use	Family history	No idea
	1050 (68.6)	944 (61.7)	864 (56.5)	831 (54.3)	794 (51.9)	777 (50.8)	673 (44.0)	436 (28.5)	372 (24.3)	399 (26.1)

debut (49.7%). Infection with high risk HPV was identified as a cervical cancer risk factor by 20.9% of the participants (Table 2).

For breast cancer, the most commonly perceived risk factors were: personal characteristics (43.5%), smoking and drinking (43.3%), age (43.1%), obesity (43.1%), and breastfeeding (42.1%). More than one-third (37.8%) of women could not list any breast cancer risk factors at the beginning of the study.

For risk factors of reproductive tract infections, multiple sexual partners (68.6%) and multiple abortions (61.7%) gain the highest perceived rate. In addition, the frequency of vaginal cleaning (56.5%) and vagina-specific cleaning basin and towels (54.3%) were also recognized as common perceived risk factors by more than half of women.

#### Effect of Health Education

Assessing the education intervention, we found that 42.4% of women learned that "early detection and early treatment can cure about 1/3 of cancers" (pre- vs. post-education: 20.4% vs. 62.8%,  $P < 0.01$ ). We also found that 35.1% of women learned that "most RTIs are preventable and curable" (pre- vs. post-education: 18.7% vs. 53.8%,  $P < 0.01$ ) and 30.6% of women learned the meaning of "precancerous lesion" through participating in our study (pre- vs. post-education: 12.7% vs. 43.3%,  $P < 0.01$ ). In addition, 35.4% of women thought that condoms are an effective way to prevent of RTIs, while only 13.5% of participants knew that "High-risk HPV infection is a necessary factor for developing cervical cancer".

#### Source of healthcare knowledge

Sixty-five percent of women reported television and radio broadcast as the major source of healthcare knowledge in rural China. Public screening and education (55.4%), experiences of illness among relatives and friends (39.7%), and books and newspaper (35.4%) were also commonly reported as sources of health information.

#### Attitude toward Screening Projects

The majority, about ninety-seven percent (96.9%) of women thought combined screening was better than single disease screening, and 99.7% of women showed great interest in participating in a combined screening program. The minority (12.0%) of women could afford to spend 100 RMB or more for screening, 32.8% of women could afford to spend 50-100 RMB, and the majority of women (55.2%) only could afford less than 50 RMB. In addition, 72.9% of women thought once a year is an acceptable frequency for a combined screening program.

The two major concerns of participating in the screening project were safety and efficacy, with a self-reported anxiety rate of 97.1% for safety and 93.1% for efficacy. In addition, more than half (53.0%) of the women worried about the discomfort or pain that may accompany screening. About one quarter (25.9%) of participants worried about time consumption for screening and its associated costs. Regarding reasons for participation, 98.9% of women reported their concerns about health status, and 84.8% of participants reported awareness of the potential benefit from the screening. Furthermore, peer pressure and the suggestions from local leaders were also cited as motivating factors for participation in screening by 63.1% and 50.4% of the participants, respectively. Pressure from husbands (29.8%) and the enticement of free screening (29.2%) was cited as motivating factors for participation of the screening project.

#### Discussion

The prevalence of precancerous cervical lesions, suspicious breast cancer, suspicious benign breast disease and RTIs was 1.4%, 0.2%, 14.0%, and 54.3%, respectively in Xiangyuan. Cervicitis, trichomoniasis, and bacterial vaginitis were the three most common RTIs affecting rural women. Television, radio broadcast, and public education during screening were the major source of healthcare knowledge in rural China. The vast majority of women prefer to participate in a combined screening program rather than multiple single screening projects, and the affordable limit was only 50 RMB for more than half of rural women.

Our data presented a similar prevalence of precancerous cervical lesions (0.3%) as that reported in 2009 (0.2%), but a lower prevalence than that reported in 2004 (Xiang et al., 2009), (Zhao et al., 2004). The differences may mainly due to the selection of different populations. This study used the callback population of the national screening project in 2008 other than the general unscreened population. Secondly, the combined screening project used VIA/VILI as the screening method while 2004 study used methods with higher sensitivity (i.e. HC2 and Thinprep) (Zhao et al., 2004). With regard to the suspicious benign breast disease, a similar prevalence as the 2009 study further showed that the rural area may have a lower prevalence compared to the metropolitan (Shanxi vs. Beijing: 14.0% vs. 30.5%) (Xiang et al., 2009), (Hu et al., 2011). This distribution may partly be attributed to the lifestyle and discrepancies of detection methods in the two areas studied. Furthermore, in light of the high prevalence

of RTIs reported in our study (54.3%) and other rural areas (68.0%) in Shanxi province (Dong et al., 2010), we confirmed the need for health promotion programs focused on preventable RTIs among low-income women in rural China. Moreover, regarding the knowledge about risk factors for cervical and breast cancer, urban areas consistently showed a higher awareness than rural areas (Lee et al., 2007), (Zhao et al., 2008), (Chen et al., 2007), (Li et al., 2008). Yet, we still found an improvement in the perceptive rate since 2007 in rural areas for the risk factors for cervical cancer (13.5% vs. 4.8%,  $P < 0.05$ ) (Xiang et al., 2009)

Based on the main disease we found affecting rural women and their self-reported important sources of health knowledge, we suggest that the government provide additional health related educational programming on television and radio broadcast targeting disease prevention. In addition, public lectures in villages, consultation during clinical visits, and accessible reading materials may be useful in reducing cervical and breast cancer prevalence through acting upon knowledge of modifiable risk factors and participation in a public screening project.

Our data also demonstrates that the vast majority of women prefers, and would like to participate in, a combined screening program rather than multiple single screening projects. This provides the foundation for the government to implement a combined screening program with good combination of healthcare outcomes, high compliance and cost-effective evaluation in rural China. However, considering the gap between the affordability limit (50 RMB) among the majority of rural women (55.2%) and the price of combined screening (140 RMB), a co-pay model for the cost of the combined screening project may be feasible. For example, the government or project pay for majority of the cost, and the participants afford the rest of the cost. Medical insurance could also act effectively in this co-pay model. Moreover, as most women accepted an annual screening project, the government needs to establish effective supportive systems and assign appropriate organizations to implement the combined screening. Maternal and Child Health Hospitals are potential candidates considering their proven abilities and extensive network throughout the nation. Moreover, comprehensive training throughout the project for responsible teams including gynecologists, pathologists, nurses, and data manager, et al. is also an important part for the success of the project.

As the preliminary exploration for the effect of, and attitude towards combined screening among Chinese rural women, this study casts light on the implementation of an appropriate model for the combined screening project in rural China. Successful implementation of a combined screening project in rural China may provide a model for women's health in other low resource areas as well.

This study also has some limitations. First, specific screening methods were assigned in this study, without parallel arms with other screening methods such as Pap smear or HPV detection for cervical cancer and X-ray for breast cancer. Second, although our study strictly complied with the 2009 Chinese national screening roadmap for breast cancer, lack of clinical experience and

the deficiency of pathological confirmation for the breast cancer screening may limit the accuracy of prevalence. However, when facing with a limited screening budget, this study still provides valuable information for the assessment of breast cancer.

In conclusion, compared to multiple single screening projects, a combined screening program is more feasible and acceptable in China. Yet, appropriate screening methods in different areas need to be further studied taking disease burden, health effect, and financial cost into consideration.

## Acknowledgements

All the authors declare they have no conflict of interest for this study.

## References

- Chen Y, Xia HO, Oakley D, et al (2007). Survey of cognition of breast cancer and its early screening by Shanghai women. *Shanghai Nursing J*, **7**, 3-16
- Dong Y, Bai JG, Shang GJ, et al (2010). A report of reproductive tract infection and cervical cancer screening in rural area of Shanxi. *China Cancer*, **19**, 647-50
- Ferlay J, Shin HR, Bray F, et al (2010). Estimates of worldwide burden of cancer in 2008: GLOBOCAN 2008. *Int J Cancer*, **127**, 2893-917
- Huang Y, Pang Y, Wang Q, et al (2010). Evaluation on the accuracy of high-frequency ultrasound being used in the breast cancer screening program in women from Asian countries: a systematic review. *Chinese J Epidemiol*, **31**, 1296-99.
- Kang M, Pang Y, Li JY, et al (2010). Accuracy evaluation of mammography in the breast cancer screening in Asian women: a community-based follow-up study and meta analysis. *Chinese J Epidemiol*, **32**, 212-16.
- Lee PW, Kwan TT, Tam KF, et al (2007). Beliefs about cervical cancer and human papillomavirus and acceptability of HPV vaccination among Chinese women in Hong Kong. *Division Clinical Hlth Psychology*, **45**, 130-4
- Li LY, Qiao ZQ, Zhang MF, et al (2007). Study on the value assessment of various screening programs regarding cervical cancer screening strategy in the rural areas of China. *Chinese J Epidemiol*, **28**, 964-7.
- Li Q, Liu ZH, Yao JL, et al (2008). A pretest about the screening method of cervical cancer in Chinese rural communities. *Maternal Child Health Care China*, **23**, 2416-18.
- Moy LM, Zhao FH, Li LY, et al (2010). Human papillomavirus testing and cervical cytology in primary screening for cervical cancer among women in rural China: comparison of sensitivity, specificity, and frequency of referral. *Int J Cancer*, **127**, 646-56.
- Sun ZC, Cui Y, Yang L, et al (2010). Study on the prevalence of reproductive tract infections and influencing factors on women in rural areas of the Middle and Western regions in China. *Chin J Epidemiol*, **31**, 961-64
- Shi JF, Karen Canfell, Lew JB, et al (2012). The burden of cervical cancer in China: Synthesis of the evidence. *Int J Cancer*, **130**, 641-52
- World Health Organization (1999). Interpreting reproductive health ICPD+5 Forum. Hague: 2-3.
- Xiang W, Zhao FH, Shi JF, et al (2009). Feasibility of packaging screening for cervical cancer, breast cancer and reproductive tract infection in a rural area in China. *Acta Acad Med Sin*, **31**, 616-19.

- Zhang KN, li XM, Shi L, et al(2001). Women's perception of quality of health services and its influence on their continuity of health care utilization for RTIs in rural Yunnan. *Chinese Primary Health Care*, **15**, 44-6
- Zhao FH, Ma JF, Qiao YL, et al(2004). Association between high-risk human papillomavirus DNA load and cervical intraepithelial lesion. *Chin J Epidemiol*, **25**, 921-4.
- Zhao L, Li SJ, Wang T (2008).Cross-sectional study on knowledge, attitude and behavior of breast cancer screening among women in BeiJing. *Chin J Public Health*, **24**, 658-9.
- Zhang YZ, Ma JF, Zhao FH, et al (2010). Three-year follow-up results of visual inspection with acetic acid/Lugol's iodine (VIA/VILI) used as an alternative screening method for cervical cancer in rural areas. *Chin J Cancer*, **29**, 4-8.