FACTORS INFLUENCING UPTAKE OF CERVICAL CANCER SCREENING AMONG WOMEN IN WENZHOU, CHINA

SIYUAN XIONG

A THESIS SUBMITTED IN PARTIAL FULFILLMENT OF
THE REQUIREMENTS FOR MASTER DEGREE OF NURSING SCIENCE
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IN ADULT NURSING PATHWAY
FACULTY OF NURSING
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วิทยานิพนธ์นี้เป็นส่วนหนึ่งของการศึกษาตามหลักสูตรพยาบาลศาสตรมหาบัณฑิต (หลักสูตรนานาชาติ)

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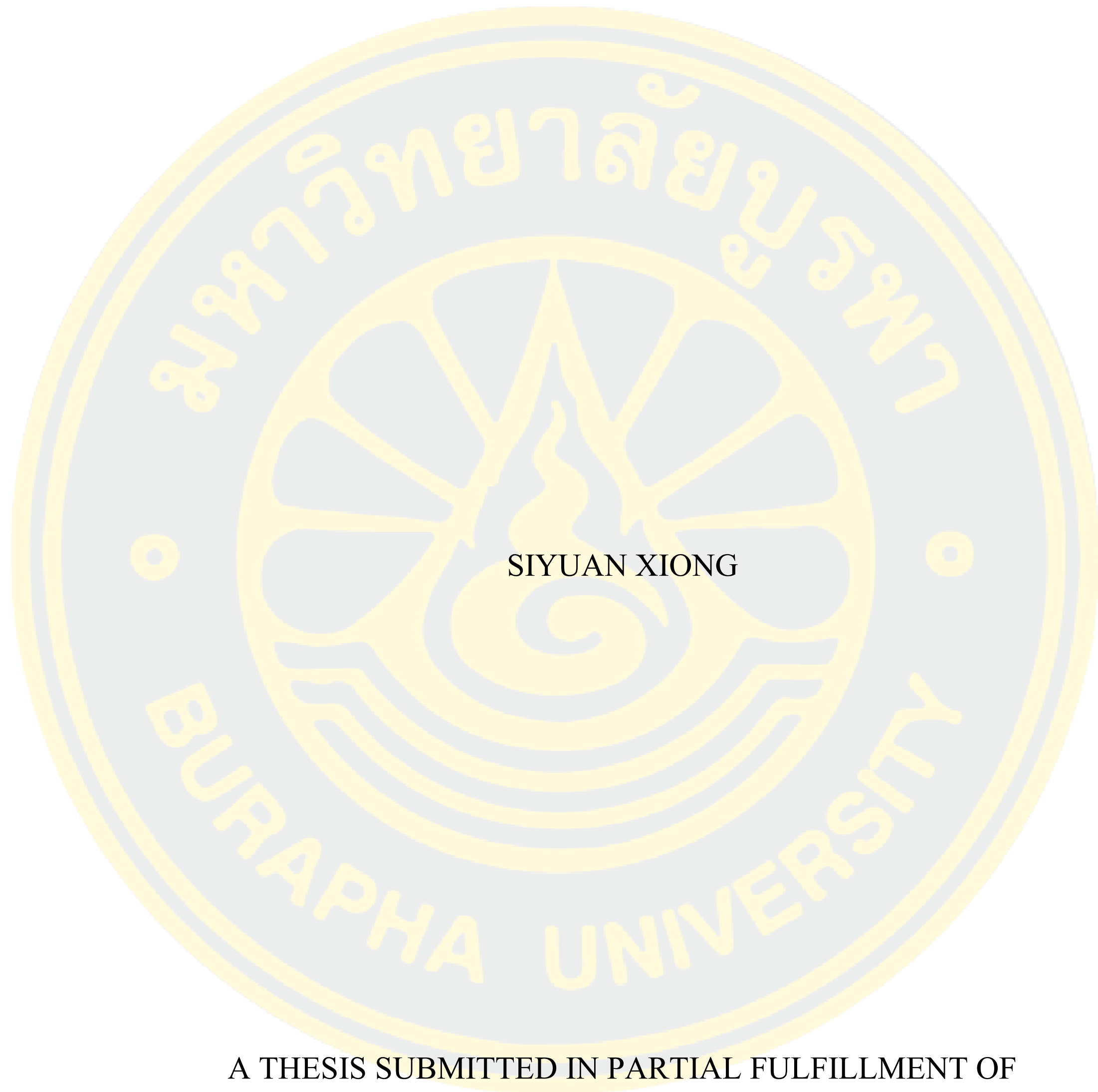

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The Thesis of Siyuan Xiong has been approved by the examining committee to be partial fulfillment of the requirements for the Master Degree of Nursing Science (International Program) in Adult Nursing Pathway of Burapha University

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SIYUAN XIONG : FACTORS INFLUENCING UPTAKE OF CERVICAL CANCER SCREENING AMONG WOMEN IN WENZHOU, CHINA. ADVISORY COMMITTEE: KHEMARADEE MASINGBOON, D.S.N. NIPHAWAN SAMARTKIT, Ph.D. 2025.

This study aimed to examine the uptake of cervical cancer screening and to determine if knowledge of cervical cancer, perceived threat of cervical cancer, perceived benefits of cervical cancer screening, perceived barriers to cervical cancer screening, and self-efficacy about the uptake of cervical cancer screening could predict the uptake of cervical cancer screening among women in Wenzhou, China. A simple random sampling technique was used to recruit 240 individuals, who came to check up on their health at two Physical Examination Centers of one hospital in Wenzhou, China. Research instruments included the demographic data questionnaire, the Chinese version of the cervical cancer prevention knowledge questionnaire with the KR 20 of .76, the Chinese version of the cervical cancer screening belief scale including perceived threat, perceived benefit, perceived barrier, and the Chinese version of the cervical cancer screening self-efficacy scale, with Cronbach's alpha values of .86, .72, .91, and .96 respectively. Descriptive statistics and binary logistic regression were used to analyze the data.

Results revealed that 63.3% of the participants had been screened for cervical cancer. The logistic regression model including all five independent variables explained approximately 27.2% of the variance in cervical cancer screening (Nagelkerke R2 = .272). Perceived barriers (Odds Ratio [OR] = 0.885, 95% Confidence Interval [CI]: 0.807-0.971, $p < .05$) and self-efficacy (OR = 1.060, 95% CI: 1.038-1.083, $p < .001$) were the strongest contributors to this prediction.

The results indicate that perceived barriers and self-efficacy are significant factors influencing the decision to undergo cervical cancer screening. These findings can be applied to develop strategies promoting cervical cancer screening among women in the future.

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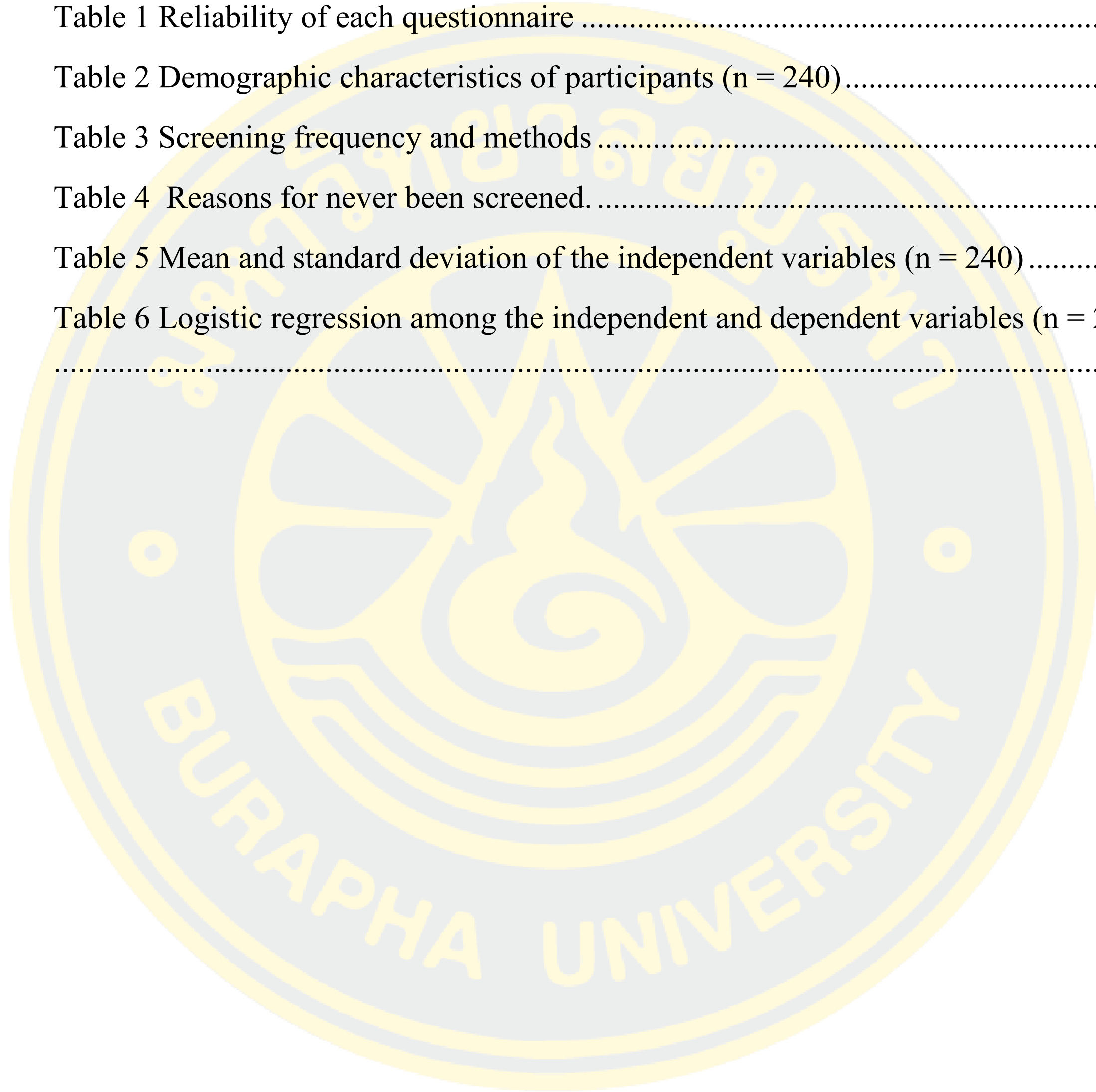

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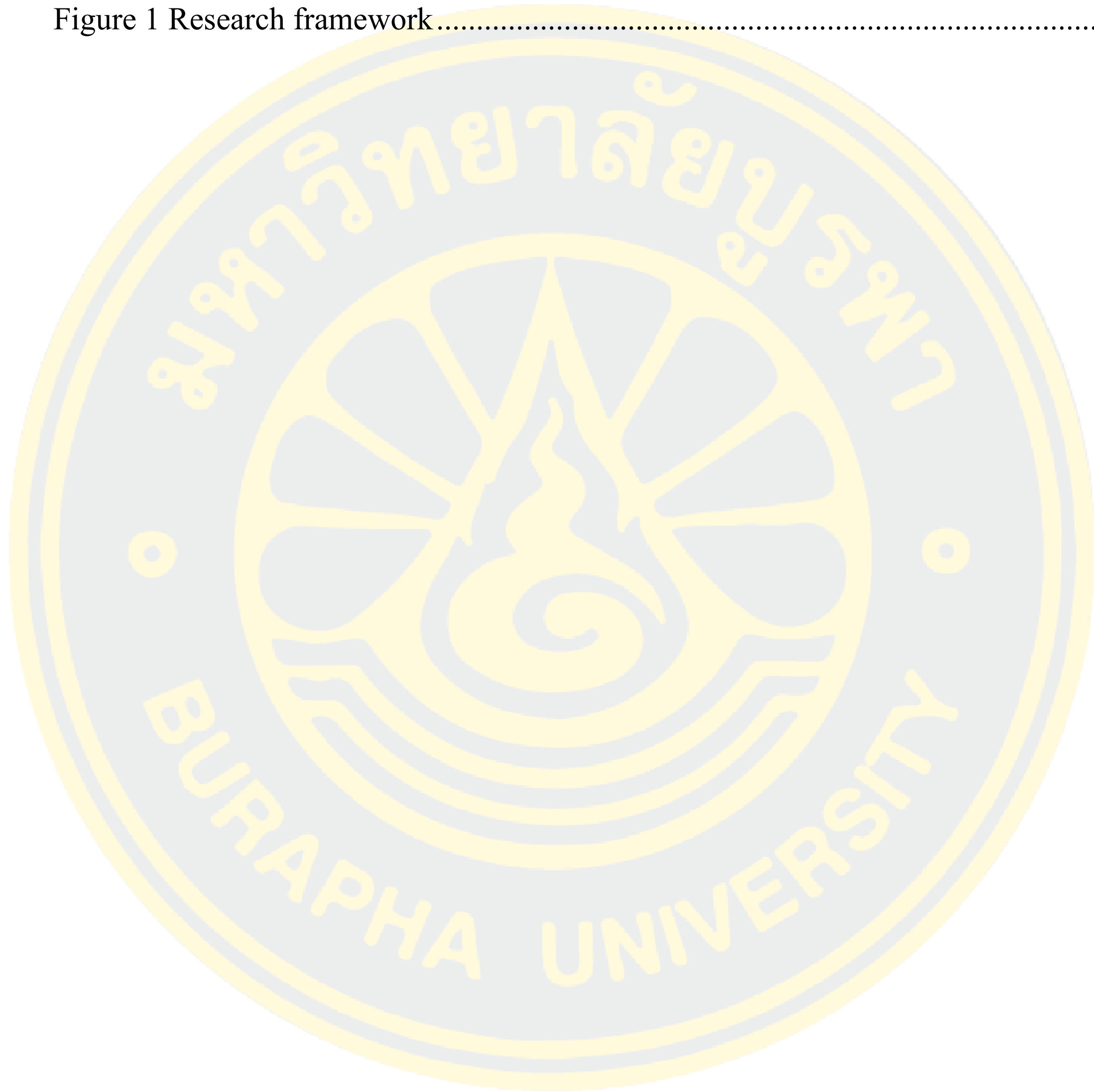


CHAPTER 1
INTRODUCTION

Background and significance of the study

Cervical cancer is a major public health problem affecting women and it was the fourth most common cancer in women (Arbyn et al., 2020). The absolute number of cases of cervical cancer worldwide estimated in Global Cancer Observatory (GLOBOCAN) increased over time. The number of cervical cancer cases was 471,000 in the year 2000 (Arbyn et al., 2011), by the year of 2008, the number of cervical cancer cases was 530,000 (Arbyn et al., 2011; Ferlay et al., 2008), and by the year of 2018, the number of cervical cancer cases was 570,000 (Arbyn et al., 2020). The number of new cases of cervical cancer is expected to increase from 570,000 to 700,000 annually over the next 12 years (2018-2030), and during the same period, the annual number of deaths will increase from 311,000 to 400,000 (Organization, 2020a).

The estimated global age-standardized incidence of cervical cancer in 2018 was 13.1 per 100 000 women, with wide variation among countries, ranging from 2 to 75 per 100 000 women (Arbyn et al., 2020). In a global analysis, Arbyn et al. (2018) used cancer data from the 2018 Global Cancer Observatory database from 185 countries and found that China had the highest number of cervical cancer cases at 106,000 (Arbyn et al., 2020). The prevalence of cervical cancer in China in 2018 was 45.2 cases per 100, 000 (China, 2020). The age-standardized incidence rate increased from 11.26/100 000 in 2003 to 13.73/100 000 in 2018 in China, and the age-standardized mortality rate also increased from 4.88/100 000 in 2003 to 5.89/100 000 in 2018 (Zhong-hua et al., 2022). Many cases of cervical cancer are detected at an advanced stage in China (Zheng, 2020). Cervical cancer is the leading cause of cancer death among women in developing countries (Bedell et al., 2020). Patients with cervical cancer have clinically significant social functioning, constipation, diarrhea, severe lymphedema, menopausal symptoms, decreased body image, sexual or vaginal function, and financial difficulties (Thapa et al., 2018). All this has a big impact on their quality of life (Thapa et al., 2018).

Cervical cancer is a preventable cancer. The cervical cancer screening allows for early detection of cervical cancer (Aldohaian et al., 2019). In high-income

countries, cervical cancer incidence and death rates have fallen by more than half over the past 30 years since formal screening program were introduced (Party, 2016). In developing countries, insufficient access to effective cervical cancer screening often leads to high morbidity and mortality from the disease (Ndejjo et al., 2016). A recent modelling study showed that secondary prevention (cervical cancer screening) was an important component of the cervical cancer elimination strategy (Simms et al., 2019).

Cervical cancer screening refers to the application of effective screening methods for women under the guidance of doctors, including gynecological examination, cytology examination, pap smear, HPV testing, Thin Prep cytology test (TCT), Vision inspection with acetic acid (VIA), colposcopy, cervical biopsy, and other related examinations. In China, Thin Prep cytology test (TCT) is often used as the screening method of choice for cervical cancer and pre-cervical lesions (Cheng, 2016; Lai et al., 2017). With an effective screening, the cervical lesions can be detected early, and it can prevent the occurrence of cervical cancer to prevent women suffering (Zheng, 2020). Therefore, cervical cancer screening is very important.

In 2019, The State Council issued the "Healthy China Action Plan (2019-2030)", which clearly stated that cervical cancer screening coverage needs to reach more than 80 percent by 2030. However, the coverage rate of cervical cancer screening in China was 19 percent in 2015 and 21.4 percent in 2019, up from 2015 but still very low (Di et al., 2015; Zhao & Qiao, 2019). By 2030, an additional 300 million women of eligible age need to be screened if the screening rate of cervical cancer among women in China is to reach the target of more than 80 percent. Many measures have been taken across China to increase cervical cancer screening rates. However, the cervical cancer screening rates are still very low.

In Wenzhou, China, the cervical cancer screening rate was 1.5 percent in 2017, 4.0 percent in 2019, and dropped to 2.2 percent in 2020 (Meteor, 2021a; Zheng, 2019, 2020). In developing countries, insufficient access to effective cervical cancer screening often leads to high morbidity and mortality from the disease. Therefore, it is important to promote the uptake of cervical cancer screening among women in Wenzhou, China.

The uptake of cervical cancer screening refers that whether women have been screened for cervical cancer in lifetime (Woldetsadik et al., 2020). By improving

uptake of the screening, it can help early detection of women with precancerous lesions of cervical cancer which can enable women to receive treatment as early as possible and also can help delay the progression of cancer to advanced stage, so as to improve survival rate (Aldohaian et al., 2019; Wright et al., 2019). Therefore, it is very important to study the factors influencing uptake of cervical cancer screening to improve the screening rate of cervical cancer.

According to the literature review, there are many factors influencing uptake of cervical cancer screening among women, which can be divided to demographic factors, individual factors, and environmental factors. Demographic factors include age, educational background, occupation, religion, income level, marital status, family history of cervical cancer, and so on (Gyamfua et al., 2019). Individual factors include knowledge of cervical cancer, attitudes towards cervical cancer screening and self-efficacy of uptake cervical cancer screening, perceived threat of cervical cancer, perceived barriers such as no time, embarrassed by the way the test was done and so on (Jia et al., 2013; Njuguna et al., 2017). Environmental factors include no usual source of health care, acculturation, and socioeconomic factors (Ackerson & Gretebeck, 2007; Nakalevu Susana, 2009; Weng et al., 2020). In addition, individual factors such as knowledge, perceived barriers, perceived benefits, perceived threat, self-efficacy are closely related to health preventive behaviors in the health belief model (HBM) (Champion & Skinner, 2008).

The health belief model aims to explain preventive health behaviors (Ben-Natan & Adir, 2009). The health belief model consists of several key concepts that predict why people take actions to prevent, screen for, or manage disease conditions. HBM proposed a person's motivation to undertake a health behavior can be divided into three categories: individual beliefs, modifying factors, and likelihood of action. Individual beliefs include perceived threat (combination of perceived susceptibility and perceived severity), perceived benefit and perceived barriers, and self-efficacy (Champion & Skinner, 2008). Modifying factors include knowledge and sociodemographic factors that may influence health perceptions. The likelihood of action includes individual behaviors and cues to action. Modifying factors affect these perceptions, as do cues to action. The combination of beliefs leads to behavior. In addition, cervical cancer screening is a preventive health behavior. Therefore, this

study used the health belief model to explain the relationship between these factors and uptake of cervical cancer screening.

Knowledge of cervical cancer (modifying factors) enables women to perceive the threat of cervical cancer to their health and are consecutively cued to action, and their perceived benefits of screening outweigh the perceived barriers, along with high self-efficacy for cervical cancer screening, then they are more likely to be screened for cervical cancer. Literature review found that women who scored higher in cervical cancer knowledge were more willing to participate in cervical cancer screening (OR= 4.322, 95% CI: 1.162, 16.078, $p < .05$) (Bai et al., 2018).

Perceived threat of cervical cancer refers to a women's perception of the likelihood that cervical cancer will affect them, and how bad it will be if that risk does. If women know their susceptibility to cervical cancer, fear of cervical cancer, and fear of being diagnosed with cervical cancer, these factors will affect their uptake of cervical cancer screening (Ampofo et al., 2020). A study showed that perceived threat was associated with uptake of cervical cancer screening ($p < .05$) (Ampofo et al., 2020). A study showed perceived threat (AOR = 1.08, 95% CI: 1.05-1.12) was a predictor of cervical cancer screening practice (Solomon et al., 2019). However, a result from one study showed that the perceived threat of cervical cancer was not a factor to predict the changing stage of cervical cancer screening ($\beta = .002$, $p > .05$) (Miri et al., 2018).

Perceived benefits of uptake of cervical cancer screening refer to women's belief in positive attributes of screening (Ibekwe et al., 2010). A study showed perceived benefits was associated with uptake of cervical cancer screening ($p < .05$) (Ampofo et al., 2020). However, a contrary report had it that perceived benefits was not a significant determinant of uptake of cervical cancer screening (OR = 1.291, $p > .05$) (Ibekwe et al., 2010).

Self-efficacy about uptake of cervical cancer screening refers to the women's confidence in their ability to be screened for cervical cancer. A cross-sectional study of the relationship between self-efficacy and timely pap smears in Iranian women found that there was a significant association between self-efficacy and Pap smear screening ($p < .01$) (Majdfar et al., 2016). In univariate analysis, there was a significant association between Pap smear uptake and level of self-efficacy (OR =

15.3 for intermediate and OR=7.4 for good level). In multivariate analysis, significant associations persisted between Pap smear uptake and self-efficacy (OR = 23.8; 95% CI: 8.7, 65.5). Another study showed that higher health literacy predicted high level of knowledge and high decisional balance score, and greater self-efficacy and then only decisional balance and self-efficacy affected Pap tests (Kim et al., 2018). A community study of breast and cervical cancer screening in women in the Ardabil region of northwestern Iran showed that females with high self-efficacy scores were more likely to perform Pap smears compared to females with low self-efficacy scores (Farzaneh et al., 2017).

Perceived barriers of cervical cancer screening refers to the obstacles that individuals may encounter in the process of cervical cancer screening (Lei, 2015), such as fear of screening due to concerns about excessive pain or bleeding (Marlow et al., 2015), lack of proper communication on screening procedures and long waiting time (Njuguna et al., 2017), anxious feeling once the disease was diagnosed, no symptoms / discomfort, do not know the benefit of cervical cancer screening (Jia et al., 2013). Ebu et al. (2015) found that failure to get pap smears was significantly associated with seven barriers, including personal barriers, negative belief barriers, fatalistic barriers, negative counteract barriers, financial barriers, social barriers and institutional barriers (Ebu et al., 2015).

Cues to action refer to the facilitating factors for people to take preventive measures, including publicity in media activities, reminders from medical staff, advice from others, and disease experience of relatives and friends. The concept of cues as trigger mechanisms is appealing, but action cues are difficult to study in explanatory investigations; A hint can be as fleeting as a sneeze or a poster (Champion & Skinner, 2008).

In the literature review, different conclusions were found on the relationship between perceived benefit, perceived threat, and uptake of cervical cancer screening. Therefore, this study focused on the relationship between uptake of cervical cancer screening and knowledge of cervical cancer, perceived threat, perceived benefits, perceived barriers, and self-efficacy.

Research objectives

1. To describe rate of the uptake of cervical cancer screening among women in Wenzhou, China.

2. To examine factors influencing uptake of cervical cancer screening among women in Wenzhou, China including knowledge of cervical cancer, perceived threat of cervical cancer, perceived benefits of uptake of cervical cancer screening, perceived barriers of uptake cervical cancer screening, self-efficacy about uptake of cervical cancer screening.

Research hypotheses

Knowledge of cervical cancer, perceived threat of cervical cancer, perceived benefits of uptake of cervical cancer screening, perceived barriers of uptake cervical cancer screening, self-efficacy about uptake of cervical cancer screening can predict the uptake of cervical cancer screening among women in Wenzhou, China.

Scope of the study

The purpose of this correlational predictive study was to describe rate of the uptake of cervical cancer screening and to examine whether the selected variables including knowledge of cervical cancer, perceived threat of cervical cancer, perceived benefits of uptake of cervical cancer screening, perceived barriers of uptake cervical cancer screening, self-efficacy about uptake of cervical cancer screening could predict the uptake of cervical cancer screening among women in Wenzhou, China. Data were collected in physical examination center of The First Affiliated Hospital of Wenzhou Medical University from June 13, 2022, through December 30, 2022.

Research framework

The study framework of this study was based on the Health Belief Model (HBM) (Champion & Skinner, 2008) and literature review. The HBM contains several primary concepts that predict why people will take action to prevent, to screen for, or to control illness conditions; these include perceived susceptibility, perceived severity, perceived threat, perceived benefits and perceived barriers to a behavior, cues to action, and most recently, self-efficacy (Champion & Skinner, 2008). Health belief model aims to explain preventive health behaviors rather than behavior during

illness (Ben-Natan & Adir, 2009). The model can be applied to a range of health behaviors and thus provides a framework for shaping behavior patterns relevant to public health and for training health professionals to work based on patients' subjective perceptions of illness and treatment (Abraham & Sheeran, 2015).

According to the HBM, it can show that if women regard themselves as susceptible to cervical cancer, believe that cervical cancer would have potentially serious consequences (such as pain, death), then they have perceived threat of cervical cancer, believe that cervical cancer screening available to them would be beneficial in reducing either their susceptibility to or severity of the condition, and believe the anticipated benefits of taking action (uptake of cervical cancer screening) outweigh the barriers to (or costs of) action, they are likely to take action (uptake of cervical cancer screening) that they believe will reduce their risks (Champion & Skinner, 2008).

Knowledge of cervical cancer in women can make them aware of the harm (perceived susceptibility, perceived severity, perceived threat) of cervical cancer and the benefits (Perceived benefits) of cervical cancer screening, which will encourage women to participate in cervical cancer screening (Glanz et al., 2008; Refaei et al., 2020). Self-efficacy refers to the confidence in one's ability to act. For behavior change to succeed, people must feel threatened by their current behavior patterns (perceived susceptibility and threat) and believe that a particular type of change will produce valuable outcomes at an acceptable cost (perceived benefits). Then they must also feel empowered (self-efficacy) to take action (uptake of cervical cancer screening) against perceived barriers (Champion & Skinner, 2008).

Therefore, if women have knowledge of cervical cancer, perceive the threat of cervical cancer, know that the benefits of cervical cancer screening outweigh the barriers, and have a high self-efficacy about uptake of cervical cancer screening, they will be likely to do uptake of cervical cancer screening. These variables together might be able to predict uptake of cervical cancer screening, as shown in Figure 1.

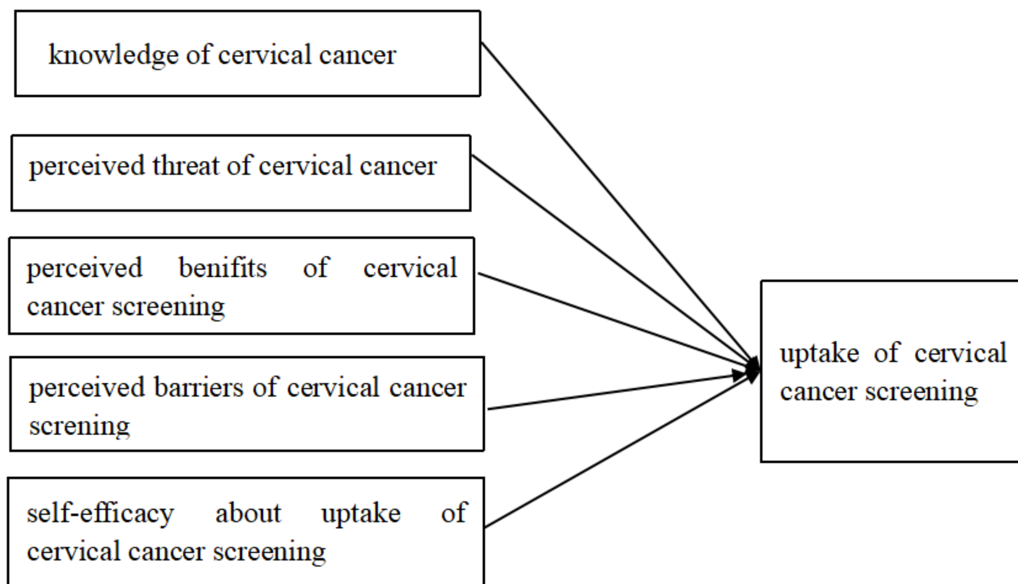


Figure 1 Research framework

Definition of terms

Uptake of cervical cancer screening refers that whether women have been screened for cervical cancer in lifetime (Woldetsadik et al., 2020).

Knowledge of cervical cancer refers to understanding of women about cervical cancer including disease of cervical cancer, its risk factors, symptoms of cervical cancer, and cervical cancer screening methods and treatment of cervical cancer. It was measured by the Chinese version of cervical cancer prevention knowledge questionnaire formulated by the Ministry of Health of China (Li et al., 2013).

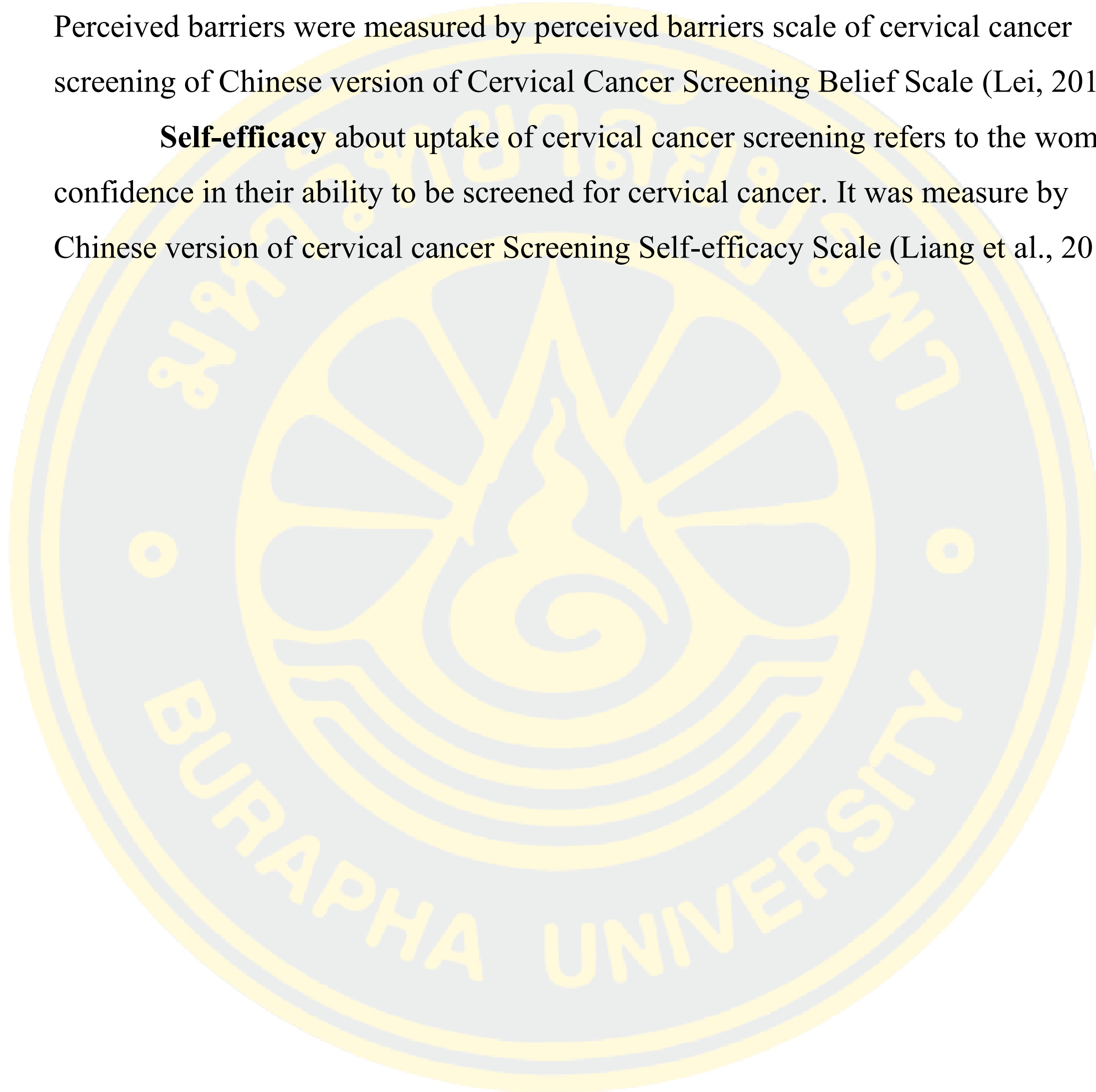
Perceived threat of cervical cancer refers to a women's perception of the likelihood that cervical cancer will affect them, and how bad it will be if that risk does. Perceived threat was measured by perceived severity scale of cervical cancer and perceived susceptibility scale of cervical cancer of Chinese version of Cervical Cancer Screening Belief Scale (Lei, 2015).

Perceived benefits of uptake of cervical cancer screening refers to the possible advantages that individuals believe to be brought to their physical and mental health by cervical cancer screening, including alleviating the pain and reducing the social impact of the disease (Lei, 2015). Perceived benefits were measured by

perceived benefit scale of cervical cancer screening of Chinese version of Cervical Cancer Screening Belief Scale (Lei, 2015).

Perceived barriers of uptake of cervical cancer screening refers to the obstacles that individuals may encounter in the process of cervical cancer screening. Perceived barriers were measured by perceived barriers scale of cervical cancer screening of Chinese version of Cervical Cancer Screening Belief Scale (Lei, 2015).

Self-efficacy about uptake of cervical cancer screening refers to the women's confidence in their ability to be screened for cervical cancer. It was measure by Chinese version of cervical cancer Screening Self-efficacy Scale (Liang et al., 2014).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CHAPTER 2
LITERATURE REVIEW

This chapter will describe briefly on cervical cancer screening in China, methods of cervical cancer screening and the factors influencing uptake of cervical cancer screening among women. The literature review is presented in following parts:

1. Overview of cervical cancer.
2. Cervical cancer screening.
3. Situation of cervical cancer screening in China.
4. The Health Belief Model.
5. Factors influencing uptake of cervical cancer screening among women.

Overview of cervical cancer

This section mainly introduces the risk factors of cervical cancer, symptoms of cervical cancer, impact of cervical cancer, benefits of cervical cancer screening and screening methods.

Risk factors of cervical cancer

Cervical cancer is a malignant tumor occurring in the cervix and is the most common gynecological malignant tumor of female reproductive tract. Studies have identified a strong link between cervical cancer and human papillomavirus (HPV) serotypes 16 and 18 (Usyk et al., 2020). Nearly 70% of cervical cases are caused by HPV 16 and 18 (Markowitz et al., 2014). The virus affects changes in the epithelial epithelium of the cervix, which usually occur more quickly during puberty. The American Advisory Committee on Immunization Practices recommends routine HPV vaccination for girls as young as 11 or 12 (Meites et al., 2019). For those who have not been previously vaccinated or who have not completed the three-dose series, the vaccine can be given at any time up to age 26 (Meites et al., 2019).

There are many risk factors for cervical cancer, including the following factors: sexual activity under 21 years of age (1.5-fold increased risk compared to sexual activity starting from 18 to 20 years of age and 2-fold increased risk of sexual activity starting before 18 years of age), having multiple sexual partners, using hormonal contraception for more than 5 years, increased parity (3 or more full-term

pregnancies), smoking (Kashyap et al., 2019) and a history of sexually transmitted infections (Agustiansyah et al., 2021; De Vuyst et al., 2013; Kashyap et al., 2019). These factors raise the risk of developing cervical cancer (Kashyap et al., 2019). Most studies have shown that an increase in the number of stable partners and a younger age at first intercourse increase the likelihood of cervical cancer (Paul et al., 2011).

Symptom of cervical cancer

The earliest stages of cervical carcinoma may be asymptomatic or associated with a watery vaginal discharge and postcoital bleeding or intermittent spotting. Often these early symptoms are not recognized by the patient (Koh et al., 2019). Many cases of cervical cancer are detected at an advanced stage in China (Zheng, 2020). The symptom of terminal cervical cancer basically be vaginal bleeding (contact bleeding), vaginal discharge (white or bloody, thin as water or rice like smell), pain (When the tumor is infiltrating into the cervix, there will be persistent or deep drilling pain in the lumbosacral region radiating along the sciatic nerve), urinary and rectal symptoms of poor fluid quality (Singh et al., 2018).

Impacts of cervical cancer

Cervical cancer (CC) treatment includes surgery, chemotherapy and radiation, but these treatments can cause a lot of burden on the quality of life of patients, such as economic burden, insomnia, decreased sexual quality, pain after surgery, constipation and hair loss after chemotherapy and other problems (Thapa et al., 2018). Acute effects (diarrhea, bladder irritation, fatigue) occur to some degree in most patients undergoing radiation and are typically magnified by concurrent chemotherapy. After radiation therapy for cervical cancer, late side effects may include potential injury to bladder, rectum, bowel, and pelvic skeletal structures (Koh et al., 2019). CC survivors had clinically significant problems with social functioning, constipation, diarrhea, severe lymphedema, menopausal symptoms, reduced body image, sexual or vaginal functioning, as well as difficulties with their finances compared with the general female population (Thapa et al., 2018).

Cervical cancer has a huge negative impact on the quality of life of patients, so it’s important to prevent patients from developing cervical cancer or advanced cervical cancer.

Cervical cancer prevention

Cervical cancer is highly preventable and can be easily treated if detected at early stages (Pimple & Mishra, 2019). Yet it remains one of the most common cancers and cancer-related deaths among women worldwide. The number of new cases of cervical cancer is forecast to increase from 570,000 to 700 per year and the number of deaths from 311,000 to 400,000 between 2018 and 2030 (Organization, 2020b). The World Health Organization (WHO) is therefore taking urgent and bold action to expand and sustain the implementation of evidence-based interventions (human papillomavirus vaccination, cervical cancer screening and management of detected diseases) to eliminate cervical cancer as a public health problem.

This global strategy (Organization, 2020a, 2020b) to eliminate cervical cancer proposes:

1. a vision of a world where cervical cancer is eliminated as a public health problem.

2. a threshold of 4 per 100 000 women-years for elimination as a public health problem.

3. the following 90-70-90 targets that must be met by 2030 for countries to be on the path towards cervical cancer elimination: 90% of girls fully vaccinated with HPV vaccine by age 15 years; 70% of women are screened with a high-performance test by 35 years of age and again by 45 years of age; 90% of women identified with cervical disease receive treatment (90% of women with precancer treated, and 90% of women with invasive cancer managed).

To achieve the 90-70-90 target, WHO recommends a life-course approach to develop a comprehensive strategy to eliminate cervical cancer to ensure lifelong benefits (Organization, 2020b). This strategy is as follows:

Primary prevention: HPV vaccination

HPV has been clearly proven to be one of the causes of invasive cervical cancer (Bedell et al., 2020). It is the most common sexually transmitted virus, and its development is unusual, with its highest prevalence within five years after the onset of the first coitus and then declining with age. Most women with high-risk HPV infection clear themselves and gain immunity to some types. However, in about 15% of HPV infections, the virus persists and induces precancerous lesions or invasive

cervical cancer (Bedell et al., 2020; Koshiol et al., 2008). HPV16 and HPV18 are the most important pathogenic types of high-risk HPV viruses, accounting for 70% of cervical cancer so far (Rerucha et al., 2018).

The HPV vaccine can prevent and treat precancerous lesions or cervical cancer (Wang et al., 2020). Three types of HPV vaccines, the quadrivalent HPV vaccine, the bivalent HPV vaccine and the nonavalent HPV vaccine (The nine-valent HPV vaccine), have been approved for use in many countries (Wang et al., 2020). All three vaccines prevent 70 to 90 percent of HPV-related cancers and have been shown to be safe and effective in randomized trials and post-marketing surveillance (Wang et al., 2020). Bivalent HPV vaccine can reduce the incidence of cervical cancer and precancerous lesions caused by high-risk HPV types 16 and 18, as well as cervical intraepithelial neoplasia and carcinoma in situ caused by these two viruses, and prevent approximately 70% of cervical cancer diseases, suitable for women aged 9 to 45 (Yao et al., 2021). Quadrivalent HPV vaccine can effectively prevent 85% of cervical cancer diseases, including grade 2 and 3 cervical intraepithelial neoplasia caused by high-risk type 16 and 18, and is suitable for women aged 20-45 (Yao et al., 2021). Nine-valent cervical cancer vaccine can prevent cervical cancer caused by HPV16/18 and other viruses, cervical intraepithelial neoplasia (CIN) 2/3 diseases caused by HPV6, 11 and other subtypes of viruses, and viral infection induced condyloma acuminatum, penile cancer and other diseases, and is suitable for women aged 16-26 (Yang, 2020), the prevention rate is as high as 92%, and all vaccines are intramuscular injection (Luo et al., 2019).

Vaccinating teenage girls is the most effective long-term intervention to reduce the risk of cervical cancer (Organization, 2020b). HPV vaccination has huge long-term benefits, so it must be initiated and maintained in all countries. There is also strong evidence that high HPV vaccination coverage can further enhance community protection by protecting unvaccinated individuals through herd immunity (Drolet et al., 2019). Current WHO guidelines recommend that girls ages 9 to 14 receive two doses of the vaccine for full protection. The data suggest that a protective effect after a single dose has led to trials, which will provide evidence for future program optimization (Brotherton et al., 2019; Stanley & Dull, 2018).

In addition to HPV vaccines, a comprehensive prevention strategy must include age-appropriate sexual and reproductive health information, safer sexual practices (such as delaying first sex, reducing the number of sexual partners, condom use and male circumcision, where appropriate) and an end to tobacco use (Organization, 2020b). Concerted efforts to promote healthy lifestyles among adolescents (boys and girls) are essential for healthier populations and sustainable development (Organization, 2020b).

HPV vaccines are effective in preventing human papillomavirus infection and cancer diseases; However, they are prophylactic vaccines with no therapeutic benefit and have limited benefit in eliminating pre-existing infections (Wang et al., 2020). In addition, because precancerous lesions take longer to develop (Hancock et al., 2018), the effects of vaccination may not significantly reduce cancer incidence. So cervical cancer screening is very important, even if women have the HPV vaccine, they need to do cervical cancer screening regularly. The current situation of HPV vaccine vaccination in China is not optimistic. The vaccine is expensive, the supply is seriously insufficient, and there is no suitable and feasible vaccination strategy, public health awareness is low, HPV vaccine has not been included in China's immunization program (Shen & Zheng, 2021). The vaccination rate for 15-year-old girls is negligible (Xia et al., 2020). Therefore, China not only needs to improve the HPV vaccine coverage rate, but also to improve the cervical cancer screening rate of women.

Secondary prevention: screening and treating precancerous lesions.

The primary goal of secondary prevention is to reduce the incidence and mortality of cervical cancer by identifying and treating women with precancerous lesions (Organization, 2020b). Traditionally, HPV infection has been considered to cause cervical intraepithelial neoplasia (CIN) in a slow, progressive, and continuous manner; From normal tissue infected with HPV to CIN1(low grade), CIN2(medium grade), CIN3/CIS (high grade), and finally cancer (Bedell et al., 2020). However, recent data suggest that CIN1 may not be necessary for the development of CIN3, which can evolve directly from normal epithelium infected with HPV, as described in the "molecular switch" model. In this model, the severity of dysplasia is determined by the degree of methylation of certain genes, and this may not be a linear process

(Massad et al., 2013). As such, clinically relevant CIN3 may occur randomly after HPV infection. Therefore, clinically relevant CIN3 may develop quite rapidly after HPV infection. Therefore, all CIN1 lesions and most CIN2 lesions may not be the prodromal phase of cervical cancer, but rather changes in generative HPV infection (Bedell et al., 2020). It can then take 10 years or more to progress from CIN3 to invasive cervical cancer (Bedell et al., 2020).

Cervical cancer screening refers to the application of effective screening methods for women under the guidance of doctors, including gynecological examination, cytology examination, colposcopy, cervical biopsy, and other related examinations. The focus of cervical cancer screening is to detect precancerous lesions in the asymptomatic period, and to make clinical diagnosis and treatment as early as possible in the non-cancerous period, thus reducing cervical cancer incidence, mortality, and treatment-related morbidity (Jassim et al., 2018; Schiffman et al., 2016). Currently, the standard treatment recommendations after diagnosis of CIN1 include monitoring of disease progression (Santesso et al., 2016), while treatment for CIN2 and CIN3 includes cryotherapy, thermoablation, loop electrosurgical excision procedure (LEEP), and cold knife conization (CKC) (Basu et al., 2018; Party, 2016; Stanley, 2010).

The American Cancer Society (ACS) (2020) recommends that individuals with a cervix regardless of sexual history or HPV vaccination status initiate cervical cancer screening at age 25 years and undergo primary human papillomavirus (HPV) testing every 5 years through age 65 years (preferred); if primary HPV testing is not available, then individuals aged 25 to 65 years should be screened with contesting (HPV testing in combination with cytology) every 5 years or cytology alone every 3 years (acceptable) (strong recommendation) (Fontham et al., 2020). The ACS recommends that individuals aged > 65 years who have no history of cervical intraepithelial neoplasia grade 2 or more severe disease within the past 25 years, and who have documented adequate negative prior screening in the prior 10 years, discontinue all cervical cancer screening (qualified recommendation) (Fontham et al., 2020). Adequate negative prior screening is currently defined as 2 consecutive negative HPV tests, or 2 consecutive negative contests, or 3 consecutive negative cytology tests within the past 10 years, with the most recent test occurring within the

recommended interval for the test used (Fontham et al., 2020). These criteria do not apply to individuals who are currently under surveillance for abnormal screening results (Fontham et al., 2020). Individuals older than age 65 years without conditions limiting life expectancy for whom sufficient documentation of prior screening is not available should be screened until criteria for screening cessation are met (Fontham et al., 2020). Cervical cancer screening may be discontinued in individuals of any age with limited life expectancy (Fontham et al., 2020). Women who have undergone total hysterectomy should discontinue routine cytological screening and HPV testing if they have no prior history of CIN2 or higher grade disease (Salina Zhang et al., 2019).

Updated WHO guidelines for screening and treatment of cervical precancer lesions recommend HPV DNA testing as the preferred method over the currently widely used visual inspection with acetic acid (VIA) or cytology (also often called “Pap smears”) (Organization, 2021). WHO recommends (Organization, 2021):

1. Regular cervical cancer screening for women starting at the age of 30.

2. After the age of 50 years, if the screening interval recommended by WHO is regular and two consecutive negative results are obtained, the screening can be stopped.

3. Priority should be given to screening general women aged 30-49 years. When appropriate therapies are available, priority should also be given to women aged 50 to 65 years who have never been screened.

4. If HPV DNA testing is used as the primary screening method, regular screening should be performed every 5-10 years.

5. If HPV DNA testing has not been implemented and VIA or cytology is still the primary screening method, regular screening every 3 years is required.

6. Even screening only twice in a lifetime would be beneficial.

7. If the initial screening was an HPV DNA test, which was positive, but was negative on a subsequent triage test, HPV DNA testing was repeated after 24 months, and if negative, the routine periodic screening interval could be switched.

8. If the initial screening was cytologic, positive, but the colposcopy result was normal, HPV DNA testing was repeated at 12 months, and if negative, the routine periodic screening interval could be switched.

9. HPV DNA testing was prioritized for repeat at 12 months for histologically confirmed CIN2/3 or adenocarcinoma in situ (AIS) or already treated for positive screening results, and if negative, could be switched to the routine periodic screening interval.

10. In institutions where HPV DNA testing is introduced, it is used at the next routine screening, regardless of the method by which a woman was previously screened. If screening is currently dominated by cytology or VIA, use will continue until HPV DNA testing becomes available.

Tertiary Prevention: invasive cancer treatment and palliative care

Treatment of cervical cancer is based on the International Union of Gynecology and Obstetrics (FIGO) clinical staging criteria (Vu et al., 2018). With an adequate screening program, precancerous cancer can be detected and treated early with low-cost techniques such as cryotherapy, annular electrosurgical resection procedures or thermocoagulation (Maza et al., 2017). Once the disease is invasive, treatment for cervical cancer becomes more extensive with radical surgery or radiotherapy and chemotherapy (Vu et al., 2018). As a result, as cervical cancer progresses, treatment options become more expensive and the financial burden on patients increases. Early disease can be treated with surgery, such as cervical cone biopsy, simple or radical hysterectomy, and pelvic lymphadenectomy (Vu et al., 2018). For advanced disease, the recommended treatment options also include chemotherapy, external irradiation and brachytherapy (Vu et al., 2018). Local disease progression leading to ureteral pain, obstruction, and fistula is often encountered before death from cervical cancer (Vu et al., 2018). Advanced symptoms may also require a physician to perform urogenital management targeted therapy for the tumor. These late complications can exacerbate the pain of the patient, and patients with terminal illness may eventually need palliative care (Vu et al., 2018).

As countries facing potential barriers to achieving the necessary vaccinations (e.g., acceptability, cost, program infrastructure and anti-vaccination campaigns) seek solutions, women previously infected with carcinogenic HPV types will continue to be at risk of cervical cancer and its sequelae (Organization, 2020b). Improving access to secondary and tertiary prevention interventions must therefore remain a top priority of the global strategy to eliminate cervical cancer (Organization,

2020b). The current situation of HPV vaccine vaccination in China is not optimistic. The vaccine is expensive, the supply is seriously insufficient, and there is no suitable and feasible vaccination strategy, public health awareness is low, HPV vaccine has not been included in China's immunization program (Shen & Zheng, 2021). The vaccination rate for 15-year-old girls is negligible (Xia et al., 2020). China has a high incidence and death rate from cervical cancer (Arbyn et al., 2020). Many cases of cervical cancer are detected at an advanced stage in China (Zheng, 2020). The focus of cervical cancer screening is to detect precancerous lesions in the asymptomatic period, and to make clinical diagnosis and treatment as early as possible in the non-cancerous period, thus reducing cervical cancer incidence, mortality, and treatment-related morbidity (Jassim et al., 2018; Schiffman et al., 2016). So cervical cancer screening is important.

Cervical cancer screening

Cervical cancer screening refers to the application of effective screening methods for women under the guidance of doctors, including gynecological examination, cytology examination, colposcopy, cervical biopsy, and other related examinations.

Benefits of cervical cancer screening

The occurrence and development of cervical cancer is a continuous pathological process, from precancerous lesions to cancer, which takes several years, creating opportunities for cervical cancer screening. Cervical cancer screening is an effective means for clinical prevention. The cervical cancer screening allows for early detection of cervical cancer (Aldohaian et al., 2019).

Screening is a common prevention strategy recommended by the World Health Organization (WHO) for the early detection and treatment of HPV infection, cervical cancer and cervical intraepithelial neoplasia (CIN) in women of reproductive age (Mo et al., 2017). The association between cervical cancer screening and incidence is stronger in more advanced stage cancers, and screening is more effective at preventing death from cancer than preventing cancer itself (Landy et al., 2016). Routine screening programs have reportedly reduced cervical cancer rates by 60% in developing countries (Organization et al., 2002). Screening a woman just one time in

her life after the age of 35 decreases her risk of dying from cervical cancer by 70% (Bedell et al., 2020). Her risk of dying from cervical cancer drops by more than 85% if she is screened every 5 years (Bedell et al., 2020).

Therefore, it is very important to participate in cervical cancer screening to prevent cervical cancer and reduce the incidence of cervical cancer.

Methods of cervical cancer screening

Traditional Pap smears have been used for the early detection of cervical cancer for more than 50 years. Although its clinical application reduces the mortality of cervical cancer patients, it also has a high rate of missed diagnosis (Sun, 2021). In low-resource settings, cytology-based screening programs have proven difficult to implement. It requires electricity for microscopes, supplies to perform the testing, and trained cytopathologists to interpret the results (Bedell et al., 2020).

Thin Prep Cytologic test (**TCT**) is an advanced technique for cervical cancer and precancerous lesions in the world. Compared with traditional Pap smear, this technique has significantly improved specimen satisfaction and abnormal cell detection rate (Sun, 2021). In China, Thin Prep cytology test (TCT) is often used as the screening method of choice for cervical cancer and pre-cervical lesions (Cheng, 2016; Lai et al., 2017). The advantage of TCT is that epithelial cells can be extracted through high-precision filtration, and thinner cell smears with clearer background can be made after removing blood, mucus and inflammatory cells in the specimen, thus improving the positive detection rate (Sun, 2021). However, the diagnostic results of TCT will be affected by the subjective consciousness of the readers, which will affect the accuracy of screening to a certain extent (Sun, 2021).

The latest update to cervical cancer screening guidelines includes the addition of **HPV testing** to cervical cancer cytology (Bedell et al., 2020). In recent years, researchers have studied the usefulness of HPV testing as a primary screening method. A large study based on primary screening for HPV in the United States, called the Need To Address Advanced HPV Diagnosis Trial, has shown that the HPV test is equally or more effective in primary screening for cervical cancer than cytology alone (Wright et al., 2015).

One significant advantage of using the HPV test for primary screening is the potential to simplify collection. HPV testing can be performed by a patient using a

self-swab rather than a pelvic examination by a trained provider. This can be particularly beneficial in resource-poor Settings (Wright et al., 2001). Multiple additional studies implemented in various international regions have further found that many women screened are willing to utilize the self-swab method (Dzuba et al., 2002; Parkin et al., 2010; Tisci et al., 2003).

The greatest issue with HPV testing is cost, need for laboratory processing, and time to obtain results. The care HPV Test System (QIAGEN, Germantown, MD, USA) is a simple, rapid, low-cost and robust HPV test (Bedell et al., 2020). It's also semi-portable, and each care HPV system can run 90 samples in about three hours at $4 to $6 per sample. With this relatively quick HPV test, patients can wait for results and have their cervix examined the same day with either acetic acid (VIA) or digital colposcopy (DC) (Bedell et al., 2020). The technology reduces the time it takes patients to travel to and from the hospital for diagnosis and treatment.

Situation of cervical cancer screening in China

In May, 2018, WHO issued a global call to eliminate cervical cancer as a public health problem (Brisson et al., 2020). Many measures have been taken across China in response to the call of the World Health Organization. In 2019, The State Council issued the "Healthy China Action Plan (2019-2030)", which clearly stated that cervical cancer screening coverage needs to reach more than 80 percent by 2030.

Cervical Cancer Screening policy in China

The Work Plan of Cervical Cancer Screening (Commission, 2021) issued by the General Office of the National Health Commission in 2021 shows that:

1. Cervical cancer screening in the service object of 35-64 years old women, give priority to protection of rural women, city town low-income women.

2. Cervical cancer screening. The following methods can be used:

Cervical cytology test. The Bethesda System (Cervical/vaginal cytology) reporting system was used to evaluate cervical cells. In principle, cervical cytology test should be performed every 3 years.

High-risk HPV testing. The technology platform and its products used in HPV testing should contain at least 14 high-risk types confirmed by the World Health

Organization, including HPV16, 18, 31, 33, 35, 39, 45, 51, 52, 56, 58, 59, 66, 68 and other subtypes. In principle, high-risk HPV testing should be performed every 5 years.

Colposcopy test. Women with abnormal or suspicious results of cervical cytology, HPV 16/18 positive, other high-risk HPV positive and abnormal or suspicious results of cytology, and abnormal visual examination were examined by colposcopy.

Histopathological examination. Women with abnormal or suspicious colposcopy results underwent histopathological examination.

The flow chart of cervical cancer screening is described in Appendix F.

3. Follow-up management of abnormal or suspicious cases.

Abnormal or suspicious cases in cervical cancer screening mainly included those with atypical squamous cells of undetermined significance (ASC-US) or above in TBS report of cervical cytology, positive high-risk HPV test, abnormal or suspicious cases in gross examination. Abnormal or suspicious colposcopy and high-grade cervical lesions or above by histopathological examination. Follow-up was conducted for abnormal or suspicious cases of cervical cancer screening, urging them to receive further diagnosis and treatment as soon as possible, and the relevant information of the cases was recorded in time.

4. Social publicity and health education.

To make full use of television, internet, and other media, widely carry out the propaganda and education of related policies and core information of cervical cancer prevention and control for women and form a good atmosphere of concern and support for cervical cancer prevention and control in the whole society. Give full play to the role of grassroots medical institutions and women's federations in publicity, education, organization, and follow-up, and carry out in-depth social publicity and health education. To provide scientific guidance for women to carry out self-health management, organize and mobilize women of appropriate age to receive cervical cancer screening, and instruct high-risk groups of cervical cancer to take the initiative to receive screening in medical institutions.

5. Organization and implementation

To keep track of the number of women aged 35 to 64 under the jurisdiction and arrange regular screening in a planned and organized way. Select medical

institutions with screening facilities and skilled personnel to undertake cervical cancer screening. The organization and management should be strengthened, service modes should be optimized to make it more convenient for women to receive screening services, and screening efficiency and quality should be continuously improved.

Situation of cervical cancer screening in Wenzhou, China

To better promote the program of free screening for cervical cancer, women aged 35 to 64 (inclusive) of Wenzhou who participate in the basic medical insurance for urban and rural residents received one free screening test for cervical cancer from 2017 to 2021, and those who test positive received free diagnosis services. Women who have received the notice of medical examination can bring their citizen card (social security card) and id card to the designated examination institution of the cervical cancer projects in their place of residence. Women who have not received the notice of medical examination can consult the local maternal and child health care institution. Free cervical cancer screening, including gynecological examination and HPV test, abnormal results will be further cervical cytology, colposcopy or histopathology (Zheng, 2020).

By 2021, a total of 103 primary screening institutions had been set up in Wenzhou, providing free cervical cancer HPV and TCT tests. Free cervical colposcopy, and pathologic examination were provided in 25 further clinics (meteor, 2021b). The permanent resident population of Wenzhou is 9,572,903, and the male population is 5,075,707, accounting for 53.02%; The female population is 4,497,196, accounting for 46.98% (Statistics, 2021). However, the screening rate of cervical cancer in Wenzhou is very low. The cervical cancer screening rate was 1.5% in 2017 and 2.2% in 2020 (Meteor, 2021a; Zheng, 2019, 2020). At the same time, the incidence of cervical cancer in Wenzhou is increasing. The incidence of cervical cancer in Wenzhou was 0.05% in 2020, with an increase of 0.02% compared with that in 2017(Government, 2019; Meteor, 2021a; Zheng, 2019).

It shows that despite the establishment of cervical cancer screening facilities by the government, cervical cancer screening rates remain low in Wenzhou China. Therefore, it is important to study the factors influencing uptake of cervical cancer screening among women in Wenzhou China. The American Cancer Society (ACS) (2020) recommends that individuals with a cervix regardless of sexual history or HPV

vaccination status initiate cervical cancer screening at age 25 years (Fontham et al., 2020). And in view of the characteristics of the age of onset of cervical cancer in China, The Comprehensive Prevention and control of Cervical cancer suggest that the first screening age should be 25-30 years old (Wang & Zhao, 2018). Therefore, this research mainly studied women with cervix aged 25 years or older.

The Health Belief Model

Health Belief Model (HBM) was developed initially in the 1950s by social psychologists in the U.S. Public Health Service to explain the widespread failure of people to participate in programs to prevent and detect disease (Hochbaum, 1958; Rosenstock, 1960, 1974). The HBM contains several primary concepts that predict why people will take action to prevent, to screen for, or to control illness conditions; these include perceived susceptibility, perceived severity, perceived benefits and perceived barriers to a behavior, cues to action, and most recently, self-efficacy (Champion & Skinner, 2008). HBM aims to explain preventive health behaviors rather than behavior during illness (Ben-Natan & Adir, 2009). The model can be applied to a range of health behaviors and thus provides a framework for shaping behavior patterns relevant to public health and for training health professionals to work based on patients' subjective perceptions of illness and treatment (Abraham & Sheeran, 2015).

Constructs of HBM

Perceived susceptibility refers to beliefs about the likelihood of getting a disease or condition. Perceived risk refers to an individual's subjective perception of his or her susceptibility to disease. For example, a woman must believe that she is likely to develop cervical cancer to be interested in uptake cervical cancer screening. Health belief model predicts that women will be more likely to adhere to cervical cancer screening recommendations if they feel they are vulnerable to cervical cancer (Glanz et al., 2008).

Perceived Severity refers to the feelings about the seriousness of contracting an illness or of leaving it untreated include evaluations of both medical and clinical consequences (for example, death, disability, and pain) and possible social consequences (such as effects of the conditions on work, family life, and social

relations). The combination of susceptibility and severity has been labeled as perceived threat (Champion & Skinner, 2008)

Perceived benefits refer to the belief in efficacy of the advised action to reduce risk or seriousness of impact. Even if a person perceives personal susceptibility to a serious health condition (perceived treat), whether this perception leads to behavior change will be influenced by the person’s belief regarding the perceived benefits of the various available actions for reducing the susceptibility (Tavafian, 2012).

Perceived barriers refer to the belief about the tangible and psychological costs of the advised action. The potential negative aspects of a particular health action—perceived barriers—may act as impediments to undertaking recommended behavior (Champion & Skinner, 2008). There are many barriers that affect women's participation in cervical screening, according to a systematic review. For example, causal beliefs, life stage, current health state, family history, and so on (Chorley et al., 2017).

Cues to Action refer to the strategies to activate “readiness”. Readiness for action (perceived susceptibility and perceived benefits) can only be enhanced by other factors, particularly through cues that trigger action, such as physical events or environmental events, such as media propaganda (Glanz et al., 2008). For example, they are more likely to engage in preventive behavior, such as cervical cancer screening, if alerted by a family member, friend, or health-care provider.

Self-efficacy refers to the confidence in one’s ability to act. For behavior change to succeed, people must feel threatened by their current behavior patterns (perceived susceptibility and severity) and believe that a particular type of change will produce valuable outcomes at an acceptable cost (perceived benefits). Then they must also feel empowered (self-efficacy) to take action against perceived barriers (Champion & Skinner, 2008). For example, women should have confidence that they can be regularly screened for cervical cancer.

Other Variables. Diverse demographic, sociopsychological, and structural variables may influence perceptions and, thus, indirectly influence health-related behavior. For example, sociodemographic factors, particularly educational attainment,

are believed to have an indirect effect on behavior by influencing the perception of susceptibility, severity, benefits, and barriers (Champion & Skinner, 2008).

Relationship between constructs

If individuals regard themselves as susceptible (perceived susceptibility) to a condition, believe that condition would have potentially serious consequences (perceived Severity, perceived threat), believe that a course of action available to them would be beneficial (perceived benefits) in reducing either their susceptibility to or severity of the condition, and believe the anticipated benefits of taking action outweigh the barriers to (or costs of) action, they are likely to take action (self-efficacy) that they believe will reduce their risks.

Health belief models (HBM) focus on health-related behaviors that predict a person's future behavior. HBM has been tested, translated, and used to study women in different cultures. According to this model, the decision to participate in a "disease prevention or detection program" is determined by a number of factors: perceived susceptibility to health conditions, awareness of the impact of the disease on their health (perceived severity), perceived benefits of receiving screening, perceived barriers and costs of screening methods (Darvishpour et al., 2018; Yakout et al., 2016).

To date, there have been no studies employing the HBM about cervical cancer screening in Wenzhou, China. Therefore, this study applied the HBM to predict the factors influencing uptake of cervical cancer screening among women in Wenzhou, China.

Factors influencing uptake of cervical cancer screening among women.

Guided by the HBM and the literature review, this research mainly studied five factors, which included knowledge of cervical cancer, perceived threat of cervical cancer, perceived benefits of uptake of cervical cancer screening, perceived barriers of uptake cervical cancer screening, self-efficacy of uptake cervical cancer screening.

Knowledge of cervical cancer refers to women' knowledge of cervical cancer, including risk factors and symptoms of cervical cancer, knowledge about cervical cancer screening methods and treatment of cervical cancer. At present, the knowledge of cervical cancer patients is relatively lack, and most of them do not participate in cervical cancer screening, and most of them are in advanced stage when

diagnosed (Pelullo et al., 2019). Bai et al. (2018) conducted a study on rural women's willingness to be screened for cervical cancer in Hubei province based on the theory of protection motivation. The result showed that a high score of cervical cancer knowledge (OR= 4.322) was a relevant factor influencing women's willingness to be screened ($p < .05$) (Bai et al., 2018). Ghalavandi et al. (2020) conducted a descriptive analysis of women's knowledge, attitudes, practices, and self-efficacy regarding cervical cancer screening. The result showed that in multiple models, the chances of cervical cancer screening increased 1.61 times with an increase in knowledge (OR = 1.61, 95% CI: 1.44, 1.77) score per unit ($p < .001$) (Ghalavandi et al., 2020). However, Mings & Soto Mas (2019) conducted a cross-sectional survey of barriers to pap smears for homeless women at the Albuquerque Healthcare for the Homeless. The result showed no significant relationship between cervical cancer knowledge and willingness to undergo pap smears (Mings & Soto Mas, 2019).

Therefore, this research chose cervical cancer knowledge as an independent variable to study the relationship between knowledge of cervical cancer and uptake of cervical cancer screening among women and to detect whether knowledge of cervical cancer can predict uptake of cervical cancer screening.

Perceived threat of cervical cancer refers to a women's perception of the likelihood that cervical cancer will affect them, and how bad it will be if that risk does. If women know their susceptibility to cervical cancer, fear of cervical cancer, and fear of being diagnosed with cervical cancer, these factors will affect their uptake of cervical cancer screening (Ampofo et al., 2020).

Ampofo et al. (2020) conducted a cross-sectional study on barriers to cervical cancer screening in Ghana, which conducted perceived threat showed significant differences with interest in participating in screening (Chi-square = 230.500, $p < .001$) (Ampofo et al., 2020). Solomon et al. (2019) conducted a study on predictors of cervical cancer screening among HIV-positive women attending an adult antiretroviral therapy clinic in Bishoftu, Ethiopia, which showed perceived threat was a predictor of cervical cancer screening practice (AOR = 1.08, 95% CI: 1.05-1.12) (Solomon et al., 2019). However, Miri et al. (2018) studied cognitive predictors of changes in screening for cervical cancer in Iranian women healthy volunteers, which

showed that the perceived threat of cervical cancer was not a factor to predict the changing stage of cervical cancer screening ($\beta = .002$, $p > .05$) (Miri et al., 2018).

Therefore, this research chose perceived threat as an independent variable to study the relationship between perceived threat and uptake of cervical cancer screening among women and to detect whether perceived threat can predict uptake of cervical cancer screening.

Perceived benefits of uptake of cervical cancer screening refers to the possible advantages that individuals believe to be brought to their physical and mental health by cervical cancer screening (Lei, 2015).

Ampofo et al. (2020) conducted a cross-sectional study on barriers to cervical cancer screening in Ghana, which conducted perceived benefits showed significant differences with interest in participating in screening (Chi-square = 185.663, $p < .001$) (Ampofo et al., 2020). Solomon et al. (2019) conducted a study on predictors of cervical cancer screening among HIV-positive women attending an adult antiretroviral therapy clinic in Bishoftu, Ethiopia, which showed perceived benefit was a predictor of cervical cancer screening practice (AOR = 1.181, 95% CI: 1.122, 1.243) (Solomon et al., 2019). Miri et al. (2018) studied cognitive predictors of changes in screening for cervical cancer in Iranian women healthy volunteers, which showed that the perceived benefit of cervical cancer was a factor to predict the changing stage of cervical cancer screening ($\beta = .17$, $p < .05$) (Miri et al., 2018). Sun et al. (2021) conducted a study on the influencing factors of cervical cancer screening behavior of women in Jinan based on health belief model, and the results showed that perceived benefits (OR = 2. 061, 95% CI:1. 561- 2. 72) were independent influencing factors of women’s cervical screening in Jinan (Sun et al., 2021). However, Ibekwe et al. (2010) conducted a hospital-based cross-sectional study on the perceived benefits of cervical cancer screening among women attending the Mahalapye District Hospital in Botswana, which showed that perceived benefits was not a significant determinant of uptake of cervical cancer screening (OR = 1.291, $p > .05$) (Ibekwe et al., 2010).

Therefore, this research chose perceived benefits as an independent variable to study the relationship between perceived benefits and uptake of cervical cancer

screening among women and to detect whether perceived benefits can predict uptake of cervical cancer screening.

Self-efficacy about uptake of cervical cancer screening refers to the women's confidence in their ability to be screened for cervical cancer.

A cross-sectional study of the relationship between self-efficacy and timely pap smears in Iranian women found that (Majdfar et al., 2016): There was a significant association between self-efficacy and Pap smear screening ($p < .01$) (Majdfar et al., 2016). In univariate analysis, there was a significant association between cervical cancer screening uptake and level of self-efficacy (OR = 15.3 for intermediate and OR=7.4 for good level) (Majdfar et al., 2016). In multivariate analysis, significant associations persisted between Pap smear uptake and self-efficacy (OR = 23.8; 95% CI: 8.7, 65.5). Another study showed that greater self-efficacy affected Pap tests (Kim et al., 2018). A community study of breast and cervical cancer screening in women in the Ardabil region of northwestern Iran showed that females with high self-efficacy (OR = .94; 95% CI: .9, .97) scores were more likely to perform Pap smears compared to females with low self-efficacy scores ($p < .05$) (Farzaneh et al., 2017). Solomon et al. (2019) conducted a study on predictors of cervical cancer screening among HIV-positive women attending an adult antiretroviral therapy clinic in Bishoftu, Ethiopia, which showed perceived self-efficacy (AOR = 1.24, 95% CI: 1.13, 1.37) was a predictor of cervical cancer screening practice (Solomon et al., 2019). Miri et al. (2018) studied cognitive predictors of changes in screening for cervical cancer in Iranian women healthy volunteers, which showed that the perceived self-efficacy of cervical cancer was a factor to predict the changing stage of cervical cancer screening ($\beta = .10$, $p < .05$) (Miri et al., 2018). Ghalavandi et al. (2020) conducted a descriptive analysis of women's knowledge, attitudes, practices, and self-efficacy regarding cervical cancer screening, which showed that the chances of cervical cancer screening increased 1.41 times with an increase in self-efficacy (OR = 1.41, 95% CI: 1.28, 1.56) score per unit ($p < .001$) (Ghalavandi et al., 2020).

As can be seen from the above literature review, there was a significant association between self-efficacy and cervical cancer screening. Therefore, this

research chose perceived self-efficacy as an independent variable to study the relationship between perceived self-efficacy and uptake of cervical cancer screening.

Perceived barriers of cervical cancer screening refers to the obstacles that individuals may encounter in the process of cervical cancer screening (Lei, 2015), such as fear of screening due to concerns about excessive pain or bleeding, lack of proper communication on screening procedures and long waiting time (Njuguna et al., 2017), anxious feeling once the disease was diagnosed, no symptoms / discomfort, do not know the benefit of cervical cancer screening (Jia et al., 2013).

Ebu et al. (2015) found that failure to get pap smears was significantly associated with seven barriers, including personal barriers, negative belief barriers, fatalistic barriers, negative counteract barriers, financial barriers, social barriers and institutional barriers (Ebu et al., 2015). Ampofo et al. (2020) conducted a cross-sectional study on barriers to cervical cancer screening in Ghana, which found that the main barriers identified by respondents were personal beliefs and attitudes about screening, socioeconomic and healthcare system barriers (Ampofo et al., 2020). Chi-square analysis of perceived barriers and participation in screening was performed in this study, which conducted perceived barriers showed significant differences with interest in participating in screening ($p < .003$) (Ampofo et al., 2020). Solomon et al. (2019) conducted a study on predictors of cervical cancer screening among HIV-positive women attending an adult antiretroviral therapy clinic in Bishoftu, Ethiopia, which showed compared with women who had never received cervical cancer screening, women who had ever received cervical cancer screening had lower perceived barrier ($t = -2.303$; $p < .05$) (Solomon et al., 2019). Miri et al. (2018) studied cognitive predictors of changes in screening for cervical cancer in Iranian women healthy volunteers, which showed that the perceived barriers of cervical cancer was a factor to predict the changing stage of cervical cancer screening ($\beta = -0.19$, $p < .05$) (Miri et al., 2018). Sun et al. (2021) conducted a study on the influencing factors of cervical cancer screening behavior of women in Jinan based on health belief model, and the results showed that perceived barriers (OR = 1. 466, 95% CI: 1. 22 - 1. 763) were independent influencing factors of women's cervical screening in Jinan (Sun et al., 2021). A study conducted by Xia et al. (2022) on the influencing factors of cervical cancer screening behavior among community women

in Shanghai based on health belief model found that perceived barriers (OR=1.884, 95% CI: 1.311-2.709) was the influencing factor of cervical cancer screening behavior (Xia et al., 2022).

As can be seen from the above literature review, there was a significant association between perceived barriers and cervical cancer screening. Therefore, this research chose perceived barriers as an independent variable to study the relationship between perceived barriers and uptake of cervical cancer screening.

Summary

In conclusion, the incidence of cervical cancer in Wenzhou, China is increasing. Despite efforts across Wenzhou, cervical cancer screening rates remain low. Therefore, it’s important to study the factors influencing uptake of cervical cancer screening among women in Wenzhou, China.

According to the literature review, there are many factors influencing uptake of cervical cancer screening among women, and the health belief model can provide a framework to better explore the factors influencing uptake of cervical cancer screening among women. Many foreign studies have applied health belief model to analyze the influencing factors of participation of cervical cancer screening (Ampofo et al., 2020; Ghalavandi et al., 2020; Miri et al., 2018; Solomon et al., 2019), but there are few articles in Wenzhou that apply health belief model to analyze the influencing factors of uptake of cervical cancer screening. At present, there is no relevant study on the influencing factors of uptake of cervical cancer screening among women in Wenzhou, China, using the health belief model as a framework. According to literature review, the relationship between knowledge of cervical cancer, perceived threat of cervical cancer, perceived benefits of uptake of cervical cancer screening, and cervical cancer screening had different conclusions.

Therefore, the study chose knowledge of cervical cancer, perceived threat of cervical cancer, perceived benefits of uptake of cervical cancer screening, perceived barriers of uptake cervical cancer screening, self-efficacy of uptake cervical cancer screening as the independent variables of this study. And this study applied the HBM to predict the factors influencing uptake of cervical cancer screening among women in Wenzhou, China.

CHAPTER 3
METHODOLOGY

This chapter presents the methodology of the study which include research design, research setting, population and sampling, research instruments, validity and reliability of the instruments, protection of the rights of human subjects, data collection method, and data analysis.

Research Design

In this study, a correlational predictive design was used to examine whether knowledge of cervical cancer, perceived threat, perceived benefits, perceived barriers, perceived self-efficacy could influence the uptake of cervical cancer screening among women in Wenzhou, China.

Research setting

The study was conducted at two physical examination centers of the First Affiliated Hospital of Wenzhou Medical University in China, which is one of the first four comprehensive hospitals in Zhejiang province that have passed the third-class hospital accreditation. The Physical Examination Center of the First Affiliated Hospital of Wenzhou Medical University has two branches: the medical care Center building of The Park Road Hospital and the Physical examination Center of the South White Elephant Hospital. There are a total of 44 hospitals in Wenzhou, the first Affiliated Hospital of Wenzhou Medical University is the first comprehensive hospital in these hospitals, its medical services radiate 30 million people in southern Zhejiang, Northern Fujian, and Eastern Jiangxi, covering a total area of 373,335 square meters, a total construction area of nearly 480,000 square meters, open 4100 beds. The physical Examination Center of the First Affiliated Hospital of Wenzhou Medical University is the first international medical and health care center in south Zhejiang that integrates physical examination, early cancer screening, diagnosis and treatment of famous doctors, health management and international medical services. The center operates from 8:00 am to 12:00 am and 1:30 PM to 4:30 PM Monday to Friday. The number of monthly health check-ups is about 14,062.

The working process of the physical examination center is as follows: When people enter the physical examination center, the nurse will ask about their needs and provide them with corresponding help according to their needs. For example, women undergoing medical examinations for the first time are introduced to items of health examination and are given a manual on items of medical examination. Women can choose medical examination items according to their own needs. The nurse then registers the women's identities and book medical examinations for them. On the day of the medical examination, the nurse signs the woman in with her registration information and then leads her into the waiting hall to wait for the medical examination. If the woman has any questions, the nurse will answer them. When a male doctor screens a woman for cervical cancer, a female nurse is arranged to assist the doctor in completing the cervical cancer screening. When the women were finished, the nurse told them how to get the results and directed them to the consulting room to see a doctor about the results.

Population and Sample

Population

The research population were all women who attended the two physical examination centers of the First Affiliated Hospital of Wenzhou Medical University, Wenzhou, Zhejiang province, China, including the physical examination center of the Park Road Hospital and the physical examination center of the South White Elephant Hospital.

Sample

The samples were women who attended the physical examination center of the First Affiliated Hospital of Wenzhou Medical University including the physical examination center of the Park Road Hospital and the physical examination center of the South White Elephant Hospital. The sample for this study was recruited from the target population following the inclusion criteria:

1) Aged 25 years or older.
2) Have a good orientation to place and time and have no history of mental illness.
3) Be able to understand, read, write, and speak Chinese.
4) Women with no history of gynecological cancer

5) Women who haven't undergone total hysterectomy.

Sample size

The sample size of this study estimated based on the number of independent variables (Mertler et al., 2021). The sample size was 40 for each independent variable. This study consisted of five independent variables. Therefore, the total number of participants were 200 women. Dropouts were considered when a participant did not complete the study for any reason. Since the dropout rate of more than 20% can seriously affect the internal authenticity of the test, the research results are basically difficult to be established (Yue, 2016). Therefore, 10%~20% dropout rate is often considered in sample size calculation (Yue, 2016). In this study, 20% of incomplete rate was used to add 40 subjects. Therefore, 240 participants were recruited in total.

Sample recruitment

A simple random sampling method was used to recruit the samples into the study. A randomly selected sample in this way was unbiased and it can ensure that the difference between sample and population attributes was purely accidental. Each selected participant was accidental and fair.

Sample recruitment steps

1. The researcher submitted ethical review materials to the First Affiliated Hospital of Wenzhou Medical University, obtained consent to collect data in the physical examination center of the First Affiliated Hospital of Wenzhou Medical University including the physical examination center of the Park Road Hospital and the physical examination center of the South White Elephant Hospital, and obtain cooperation from the staff in the physical examination center.

2. On the day before data collection, a researcher went to the physical examination center and asked the staff for the list of people who would visit the physical examination center the next day. The researcher screened women on the checkup list based on sample inclusion and exclusion criteria and made a list on the day before the visiting day of the tentative participants.

3. On the visiting day, a researcher randomly selected the tentative participants who visited the center by using the last digit of their hospital number, the odd or the even number. On each data collection day, if researcher randomly selected

and got the odd or even number, on that day the eligible participants who had the odd or the even number were the sample on that day. Then a researcher further invited them to participate the study.

4. On the visiting day when tentative participants come to the physical examination center, the researcher introduced herself to the tentative participants, informed them the detail of research purposes, steps/procedures, and benefits of the study. Then, the researcher invited them to participate in the study voluntarily. If they voluntarily agreed to participate in this study, they were asked to sign a consent form and complete the questionnaires individually in the private room.

5. The recruitment randomly selected 10-12 women per data collection day (The recruitment varied depending on the number of women willing to participate in the study that day).

6. Since there are two branches of the physical examination center, the Park Road Hospital and the South White Elephant Hospital, 120 participants were randomly collected from each hospital following procedures No 1 - 6. The researcher finished data collection from one hospital and then went to another hospital to complete the data collection process. When the required sample size was reached, the recruitment stopped, and the next phase of the study proceeded.

Research Instruments

Research instruments consisted of 4 questionnaires including the Demographic data questionnaire, the Chinese version of cervical cancer prevention knowledge questionnaire, the Chinese version of Cervical Cancer Screening Belief Scale, and the Chinese version of Cervical Cancer Screening Self-Efficacy Scale. All questionnaires were used in this study with permission from the original authors. The dependent variable for this study was the uptake of cervical cancer screening, which is whether women have been screened for cervical cancer. The research instruments were as follows.

The Uptake of cervical cancer screening

The uptake of cervical cancer screening was measured by asking women if they had been screened for cervical cancer in lifetime. “yes” indicated previous cervical cancer screening and “never done” indicated never having had cervical

cancer screening in lifetime. This question was included in the demographic data questionnaire.

The Demographic data questionnaire

The demographic data questionnaire was developed by the researcher which included 14 items and it was used to collect the demographic characteristic and personal / health information of the samples, including age, occupation, educational background, religion, marital status, the number of sexual partners, number of child birth, whether women have used hormonal contraception for more than 5 years, family history of cervical cancer, age of first sexual intercourse, smoking, history of sexually transmitted infections, whether women have been screened for cervical cancer, if never, what the reasons; if yes, how often did they screened for cervical cancer; and what the method did they take.

The Chinese version of cervical cancer prevention knowledge questionnaire

The Chinese version of cervical cancer prevention knowledge questionnaire was used to measure knowledge of cervical cancer from women. It was developed by the Ministry of Health of China (Li et al., 2013). The questionnaire contains 10 items. The content of the questionnaire includes cervical cancer symptoms, cervical cancer risk factors, cervical cancer prognosis, cervical cancer screening frequency, cervical cancer screening methods, cervical cancer screening benefits and other contents. One point is awarded for each question answered correctly and zero points for each question answered incorrectly. The total score of these items ranges from 0 to 10. The higher the total score, the higher the knowledge of cervical cancer (Li et al., 2013). The Cronbach's alpha of the scale was .811 (Li et al., 2013).

The Chinese version of Cervical Cancer Screening Belief Scale

The Chinese version of Cervical Cancer Screening Belief Scale was developed by Lei (2015) from the Health Belief Model Scale for Cervical Cancer and Pap Smear Test (Guvenc et al., 2011). This instrument includes 32 items with five dimensions including health behavior, perceived susceptibility, perceived severity, perceived barriers, and perceived benefits. The item-level content validity index (I-CVI) ranged from 0.86 to 1, and the average content validity was 0.87, indicating good reliability and validity (Lei, 2015). For this study, only four dimensions

including perceived susceptibility, perceived severity, perceived barriers, and perceived benefits were used to measure perceived threat, perceived benefits, and perceived barriers. Therefore, the instrument used in this study included 23 items.

In the Chinese version of Cervical Cancer Screening Belief Scale, all items were scored according to Likert 5-level score, with 1 score indicating “strongly disagree”, 2 score indicating “disagree”, 3 score indicating “uncertainty”, 4 score indicating “agree”, and 5 score indicating “strongly agree. The combination of susceptibility and severity has been labeled as perceived threat (Champion & Skinner, 2008). In this study, the sum score of perceived susceptibility plus perceived severity was used to measure perceived threat (Champion, 1984, 1993).

Based on the Chinese version of Cervical Cancer Screening Belief Scale (Lei, 2015), the dimension of perceived susceptibility and perceived severity (labeled as perceived threat), perceived benefits, and perceived barriers were used to measure perceived threat, perceived benefits, and perceived barriers (Lei, 2015). The information of items of each dimension are presented as follows:

The perceived threat of cervical cancer

The perceived threat of cervical cancer was based on the items of perceived susceptibility and perceived severity of the Chinese version of Cervical Cancer Screening Belief Scale (Lei, 2015). There were 10 items, including items 1, 2, 3, 4, 5, 6, 7, 8, 9, 10. These items are scored according to Likert 5-level score, with 1 score indicating “strongly disagree”, 2 score indicating “disagree”, 3 score indicating “uncertainty”, 4 score indicating “agree”, and 5 score indicating “strongly agree. The total score of these items ranges from 10 to 50. The higher the score indicates the higher level of perceived threat while the lower score indicates the lower level of perceived threat. The Cronbach’s alpha of perceived susceptibility was .873, and the Cronbach’s alpha of perceived severity was .828 (Lei, 2015).

The perceived benefit of cervical cancer screening

The perceived benefits of cervical cancer screening were based on the items of perceived benefits of the Chinese version of Cervical Cancer Screening Belief Scale (Lei, 2015). There were 4 items, including items 19, 20, 21, 22. These items are scored according to Likert 5-level score, with 1 score indicating “strongly disagree”, 2 score indicating “disagree”, 3 score indicating “uncertainty”, 4 score indicating

“agree”, and 5 score indicating “strongly agree. The total score of these items ranges from 4 to 20. Item 22 is a reverse question. When calculating the total score, the score of this question needs to be scored in reverse, that is, when the actual score is 1, the reverse score is 5 points, the actual score is 2 points, the reverse score is 4 points, the actual score is 3 points, and the reverse score is 3 points. The higher the score indicates the higher level of perceived benefits while the lower score indicates the lower level of perceived benefits. The Cronbach’s alpha of perceived benefits was .718 (Lei, 2015).

The perceived barrier of cervical cancer screening

The perceived barriers of cervical cancer screening were based on the items of perceived barriers of the Chinese version of Cervical Cancer Screening Belief Scale (Lei, 2015). There were 9 items, including items 23, 24, 25, 26, 27, 28, 29, 30, 32. These items were scored according to Likert 5-level score, with 1 score indicating “strongly disagree”, 2 score indicating “disagree”, 3 score indicating “uncertainty”, 4 score indicating “agree”, and 5 score indicating “strongly agree. The total score of these items ranges from 9 to 45. The higher the score indicated the higher level of perceived barriers while the lower score indicates the lower level of perceived barriers. The Cronbach’s alpha of perceived barriers was .892 (Lei, 2015).

The Chinese version of Cervical Cancer Screening Self-Efficacy Scale

The Chinese version of Cervical Cancer Screening Self-Efficacy Scale (Liang et al., 2014) was developed by Liang et al. (2014) from the Self-Efficacy Scale for Pap Smear Screening Participation (SES-PSSP) (Hogenmiller et al., 2007) designed by Jette R. Hogenmiller and other colleagues. The instrument includes 16 items. The Cronbach’s alpha coefficient of the 16 items in the scale was .934 (Liang et al., 2014). The 16-question scale was used to examine a woman’s likelihood of uptake of cervical cancer screening. Each item was scored by Likert 5, 1-5 points from the lowest to the highest (1 = definitely not, 2 = unlikely, 3 = probably, 4 = very likely, and 5 = definitely). The accumulated score of all items indicates the final score of Self-Efficacy (SE) of uptake of cervical cancer screening. The score ranges from 16 to 80, with the higher score indicating the higher SE of uptake of cervical cancer screening (Hogenmiller et al., 2007; Liang et al., 2014).

Psychometric properties of the instruments

The Chinese version of all the instruments was used in this study, and they were tested and validated by the experts in some previous studies, which meant all instruments had good validities.

The reliability of all the instruments was found to be good as shown by the Cronbach's alpha in previous studies. In Table 1, the reliability of each scale in this study is shown. For this study, the reliability of the instruments was tested with 30 participants and Cronbach alpha of the Chinese version of Cervical Cancer Screening Belief Scale was .867, the perceived threat to cervical cancer subscale was .864, the perceived benefit subscale of cervical cancer screening was .718, the perceived barrier subscale of cervical cancer screening was .914, and The Chinese version of Cervical Cancer Screening Self-Efficacy Scale was .962. The Kuder and Richardson Formula 20 (Kuder & Richardson, 1937) was used to test the reliability of The Chinese version of cervical cancer prevention knowledge questionnaire. The Kuder and Richardson Formula 20 is equivalent to performing the split-half methodology on all combinations of questions and is applicable when each question is either right or wrong. ρ_{KR20} = .760 for The Chinese version of cervical cancer prevention knowledge questionnaire which shows that the Chinese version of cervical cancer prevention knowledge questionnaire has high reliability (Kuder & Richardson, 1937).

Table 1 Reliability of each questionnaire

	Reliability	
Knowledge questionnaire	.760*	
Cervical Cancer Screening Belief Scale	.867	
Perceived threat		.864
Perceived benefit		.718
Perceived barrier		.914
Cervical Cancer Screening Self-Efficacy Scale	.962	

* = KR20

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Protection of the rights of human subjects

This study was approved by the Institutional Review Board of Burapha University (Protocol code G-HS023/2565) and the Ethics Committee of the First Affiliated Hospital of Wenzhou Medical University (Protocol code KY2022-096). This study was carried out after the approval.

Women were informed about the aim and the procedures of this study carefully before obtaining their consent, and they had rights to participate or to refuse to participate in this study. If they agreed to participate in this study, they signed a consent form, and data collection was carried out after the consent form was signed. During the procedure of data collection, women had right not to answer any questions that made them uncomfortable, and they also had right to withdraw from this study at any time. This study did not cause any harm to participants.

All collected information was anonymous and was only used in this research. All the collected information kept in a safe place where only the researcher could access it.

Data Collection Procedures

Data were collected by the researcher from June 13, 2022, through December 30, 2022. The data collection procedures were as follows:

1. The research proposal was submitted to the Institutional Review Board of Burapha University and the Ethics Committee of the First Affiliated Hospital of Wenzhou Medical University for approval of data collection.

2. After the approval, the researcher introduced the purposes of this study and the data collection process to the physicians and nurses who worked in the physical examination centers of the First Affiliated Hospital of Wenzhou Medical University including the physical examination center of the Park Road Hospital and the physical examination center of the South White Elephant Hospital, to obtain cooperation.

3. On the day before data collection, the researcher went to the physical examination center and asked the staff for the list of women who would visit the physical examination center on the next day. The researcher screened women on the checkup list based on sample inclusion criteria and then made a name list of eligible women (tentative participants).

4. On the data collection day, the researcher was at the physical examination center from 8:00 to 16:30. Then the researcher randomly selected the tentative participants who visited the center using the last digit of their hospital number by writing the odd or the even number on a piece of paper separately. If the researcher picked up the odd number or the even number, on that day the eligible participants who had the odd or the even number were the sample on that day. Then made the name list for those who were the samples on that day. After confirming the sample list, the researcher waited for them at the reception desk of the physical examination center.

5. When the tentative participants came to the physical examination center, the researcher introduced herself to the tentative participants, inform them the detail of research purposes, steps/procedures, and benefits of the study. Then, the researcher invited them to participate the study voluntarily. If they voluntarily agreed to participate in this study, they were asked to sign a consent form and complete the questionnaires individually in the private room.

6. The researcher took women to a private room to complete the questionnaires including the demographic data questionnaire, the Chinese version of cervical cancer prevention knowledge questionnaire, the Chinese version of Cervical Cancer Screening Belief Scale, and the Chinese version of Cervical Cancer Screening Self-Efficacy Scale. Totally, the questionnaires consist of 63 items, it took around 25 to 30 minutes to complete all questionnaires.

7. After participants completed the questionnaires, the researcher checked the questionnaires. If the researcher found any omissions in the questionnaires, she asked them timely to complete the questionnaires to prevent invalid questionnaires. 10 to 12 women were recruited in one day (The recruitment varied depending on the number of women willing to participate in the study that day).

8. 120 participants were randomly collected from each hospital (the Park Road Hospital and the South White Elephant Hospital) following procedures No 1 - 7. The researcher finished data collection (120 participants) from one hospital and then went to another hospital. When the required sample size was reached, the recruitment was stopped, and the next phase of the study proceeded.

9. Currently, there was no epidemic trend of the corona virus in 2019 (COVID-19) in Wenzhou, China. However, due to the global pandemic situation, the data collection process of this study still took measures to prevent the spread of the virus. At the entrance of physical examination center, women were required to wear masks all the time, go through temperature screening, and show a health OR code (an official way to declare residents' health status). Those who displayed a green code and temperature below 37.3 °C were allowed to entry into physical examination center. Also, the private room was routinely disinfected daily, and the researcher needed to wear masks as required. Every participant maintained a one-meter social distancing from other participants and researcher. After doing the questionnaire, participants needed to take any belonging away, the researcher used alcohol pads to disinfect used pen.

Data Analysis

Data were analyzed by using statistical software (SPSS 26.0). The result of the study was evaluated using a conventional statistical criterion (α = .05), and data analysis included:

1. The descriptive statistics including frequency statistics, mean and standard deviation were used to describe the demographic characteristics of the subjects.

2. Various function of the statistics was used to test the assumptions of binary logistic regression (normality of variables, no outlier, and no multicollinearity).

3. A logistics regression model was run and analyzed with uptake of cervical cancer screening as the dependent variable and knowledge of cervical cancer, perceived threat of cervical cancer, perceived benefits of uptake of cervical cancer screening, perceived barriers of cervical cancer screening and self-efficacy about uptake of cervical cancer screening as independent variables to predict factors that may influence uptake of cervical cancer screening.

4. Odds ratios (ORs) were used to measure the degree of association of independent variables and dependent variables.

CHAPTER 4
RESULTS

This chapter presents the findings of the study. The purposes of the study were to describe rate of the uptake of cervical cancer screening, and to examine factors influencing uptake of cervical cancer screening among women in Wenzhou, China including knowledge of cervical cancer, perceived threat of cervical cancer, perceived benefits of uptake of cervical cancer screening, perceived barriers of uptake of cervical cancer screening, self-efficacy of uptake cervical cancer screening. The findings of the study are presented as follows:

1. Description of participant characteristics
2. Description of independent and dependent variables
3. Factors influencing uptake of cervical cancer screening among women in Wenzhou, China.

Description of participant characteristics

A total of 240 women who came to two Physical Examination Centers of the First Affiliated Hospital of Wenzhou Medical University participated in this study. The age of participants ranged from 25 years old to 64 years old with a mean age of 37.5 years. From Table 2, the largest number of participants were women aged 30-49, with 148 participants, accounting for 61.7%. 38.8% of the women in this study were unemployed. Nearly half of the participants had a university and above education (43.3%), and only a small minority were illiterate (0.8%). Nearly half of the participants were Buddhist (45.0%), and 42.9% had no religious affiliation.

Most participants were married (79.6%), and a minority were living with a partner (0.8%). Most participants had one sexual partner (83.3%), 10.8% had none, and a very small minority (1.3%) had four or more partners. 73.3% of participants had 1-2 children, 22.5% had no children, and 4.2% had 3 or more children. The age of first sexual intercourse was younger than 18 years in 1.3% of participants, and more than half (63.3%) had their first sexual intercourse at age older than 20 years. Many participants had not used hormonal contraceptives for more than 5 years (97.1%); however, a small minority had used them for more than 5 years (2.9%). Few

participants had a history of smoking and a family history of cervical cancer (4.6%). Few participants had a history of a sexually transmitted disease (1.3%).

Cervical cancer screening was performed in 63.3% of participants, and 35% of these participants were screened annually. 36.7% of participants had never been screened for cervical cancer. 11.7% of the participants said they did not receive cervical cancer screening because they didn't know about cervical cancer screening. 10.4% said they had not had cervical cancer screening because they never had sexual intercourse. Table 2 shows the details about the demographic data of the participants.

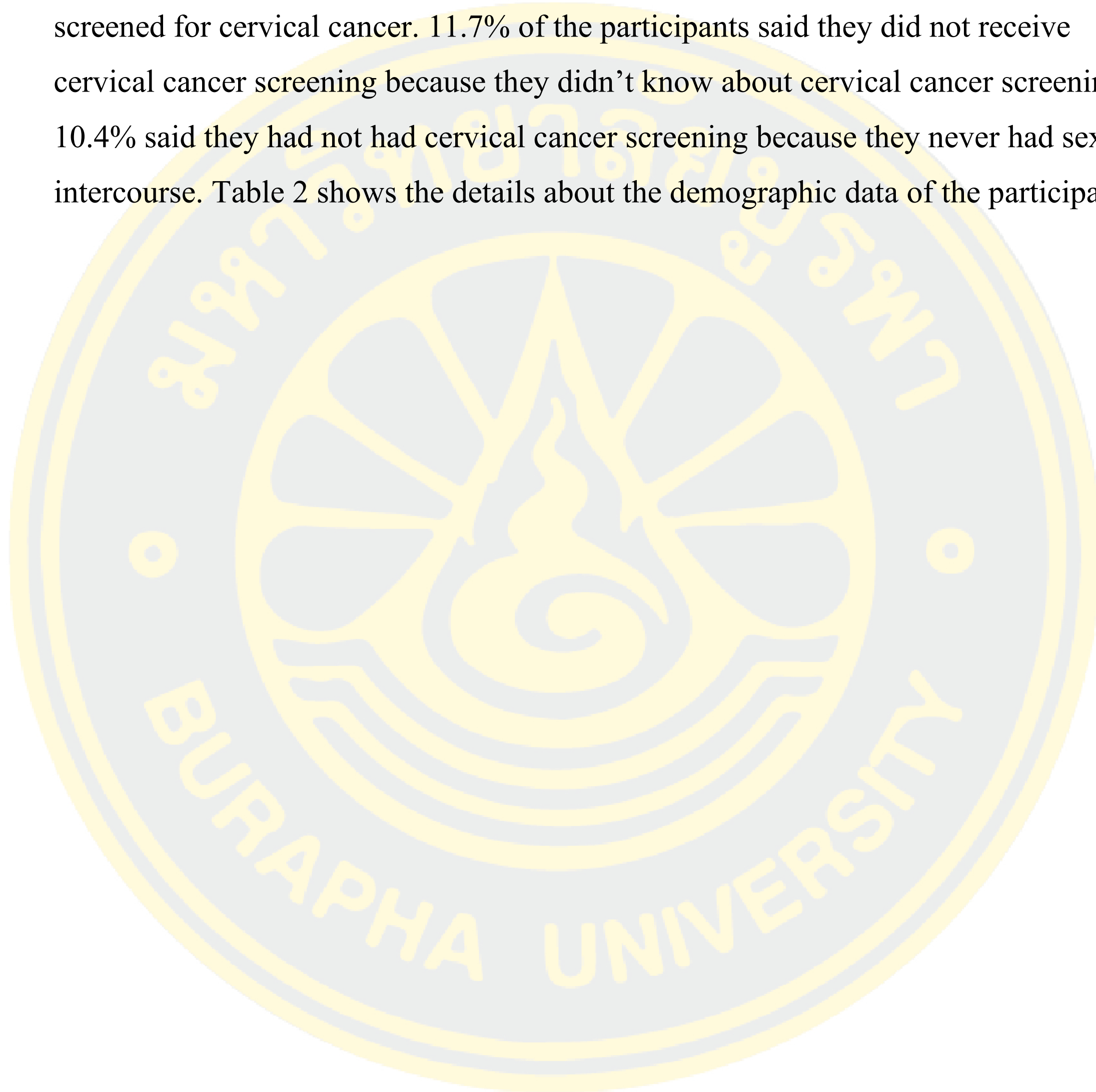

Table 2 Demographic characteristics of participants (n = 240)

Characteristics	**Number (n)**	**Percentage (%)**
Age (M = 37.5, SD = 9.40, Min = 25, Max = 64)		
25-29 years	61	25.4
30-49 years	148	61.7
50-64 years	31	12.9
Occupation		
No job	93	38.8
Office clerk	67	27.9
Business	31	12.9
Worker	29	12.1
Medical worker	20	8.3
Educational background		
Illiterate	2	0.8
Primary	22	9.2
Junior high school (JHS)	66	27.5
Senior high school (SHS)	46	19.2
University and above	104	43.3
Religion		
None	103	42.9
Christian	28	11.7
Buddhism	108	45.0
Catholicism	1	0.4
Marital status		
Married	191	79.6
Single	39	16.3
Divorced	8	3.3
Live with partner	2	0.8

Table 2 (Continued)

Characteristics	**Number (n)**	**Percentage (%)**
Number of sexual partners		
None	26	10.8
1	200	83.3
2	6	2.5
3	5	2.1
≥4	3	1.3
Number of children		
None	54	22.5
1	91	37.9
2	85	35.4
3	9	3.8
≥4	1	0.4
Age of first sexual intercourse		
< 18 years old	3	1.3
18-20 years old	59	24.6
≥ 21 years old	152	63.3
Never have sex.	26	10.8
Use hormonal contraception for more than 5 years.		
Yes	7	2.9
No	233	97.1
Family history of cervical cancer		
Yes	11	4.6
No	229	95.4
Smoking		
Yes	11	4.6
No	229	95.4

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Table 2 (Continued)

Characteristics	**Number (n)**	**Percentage (%)**
Have the history of sexually transmitted infections		
Yes	3	1.3
No	237	98.8
Have been screened for cervical cancer		
Yes	152	63.3
Never done	88	36.7

Description of independent and dependent variables

In this study, the study variables were uptake of cervical cancer screening, knowledge of cervical cancer, perceived threat of cervical cancer, perceived benefits of uptake of cervical cancer screening, perceived barriers of uptake cervical cancer screening, self-efficacy about uptake of cervical cancer screening. Table 3 and table 4 shows the description of the dependent variable (DV), while table 5 shows the details of the independent variables that were studied.

Table 3 shows that 63.3% of participants had been screened for cervical cancer and 35% of these participants were screened annually. 31.7% of participants were screened for HPV testing, 4.2% for TCT, and 27.5% for both TCT and HPV testing. 36.7% of participants had never been screened for cervical cancer.

Table 3 Screening frequency and methods

Uptake of cervical cancer screening	**Number (n)**	**Percentage (%)**
Have been screened for cervical cancer		
Yes	152	63.3
Screening frequency		
Once a year	84	35.0
Every 2 years	25	10.4
Every 3 years	19	7.9
Every 4 years or more	24	10.0
Method of screening		
HPV testing	76	31.7
Thin Prep Cytologic test (TCT)	10	4.2
HPV and TCT	66	27.5
Pap smear	-	-

Table 4 presents reasons why participants had never been screened for cervical cancer. 11.7% of participants reported they didn't know about cervical cancer screening. 10.4% of participants reported never had sexual intercourse. Five percent mentioned that they were healthy, no need to do the screening.

Table 4 Reasons for never been screened.

Uptake of cervical cancer screening	**Number (n)**	**Percentage (%)**
Never been screened (reasons)	88	36.7
Don't know about cervical cancer screening	28	11.7
Never have sexual intercourse	25	10.4
I think I am healthy and do not need to screen.	12	5.0
No time	9	3.8
Other reasons	14	5.8

Table 5 Mean and standard deviation of the independent variables (n = 240)

Independent variables	**Possible score**	**Actual score**	**M**	**SD**
Knowledge	0-10	0-10	6.18	2.54
Perceived threat	10-50	10-48	32.02	5.65
Perceived benefits	4-20	7-20	15.65	2.08
Perceived barriers	9-45	9-27	17.47	3.99
Self-efficacy	16-80	16-80	61.92	16.08

Table 5 illustrates that knowledge of cervical cancer score ranged from 0 to 10, with mean of 6.18 (SD = 2.54). The perceived threat of cervical cancer score ranged from 10-48, with mean of 32.02 (SD = 5.65). Perceived benefits of uptake of cervical cancer screening score ranged from 7-20, with mean of 15.65 (SD = 2.08). Perceived barriers of uptake of cervical cancer screening score ranged from 9-27, with mean of 17.47 (SD = 3.99). Self-efficacy about uptake of cervical cancer screening score ranged from 16-80, with mean of 61.92 (SD = 16.08).

Factors influencing uptake of cervical cancer screening among women in Wenzhou, China

Assumption testing for logistic regression analysis was performed, including tests for normality of the variables under study, autocorrelation tests, and logistic regression tests. The normality test done with P-P plot test showed the variables (knowledge of cervical cancer, perceived threat, perceived benefits, perceived barriers, and self-efficacy) were distributed normally. The dependent variable uptake of cervical cancer screening in this study is a dichotomous variable, that is, “yes” means having had cervical cancer screening, and “no” means never having had cervical cancer screening.

A binary logistics regression model was run and analyzed with uptake of cervical cancer screening as the dependent variable and knowledge of cervical cancer, perceived threat, perceived benefits, perceived barriers, and self-efficacy as independent variables to predict factors that may influence uptake of cervical cancer screening. The Hosmer-lemmeshaw test showed that p was greater than .05, which meant that the equation model of this binary logistic regression could fit well with the

original data. And the prediction accuracy of the established binary logistic regression equation was 73.3%. This indicated that the binary logistic regression equation established in this study had good predictability.

Table 6 Logistic regression among the independent and dependent variables (n = 240)

	B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I. for EXP(B)	
							Lower	Upper
Knowledge of cervical cancer	.038	.065	.341	1	.559	1.038	.915	1.178
Perceived threat	.025	.028	.804	1	.370	1.025	.971	1.082
Perceived benefits	-.171	.091	3.562	1	.059	.842	.705	1.007
Perceived barriers	-.122	.047	6.651	1	.010*	.885	.807	.971
Self-efficacy	.059	.011	30.162	1	< .001**	1.060	1.038	1.083
Constant	.834	2.002	.174	1	.677	2.302		

* $p < .05$, ** $p < .001$

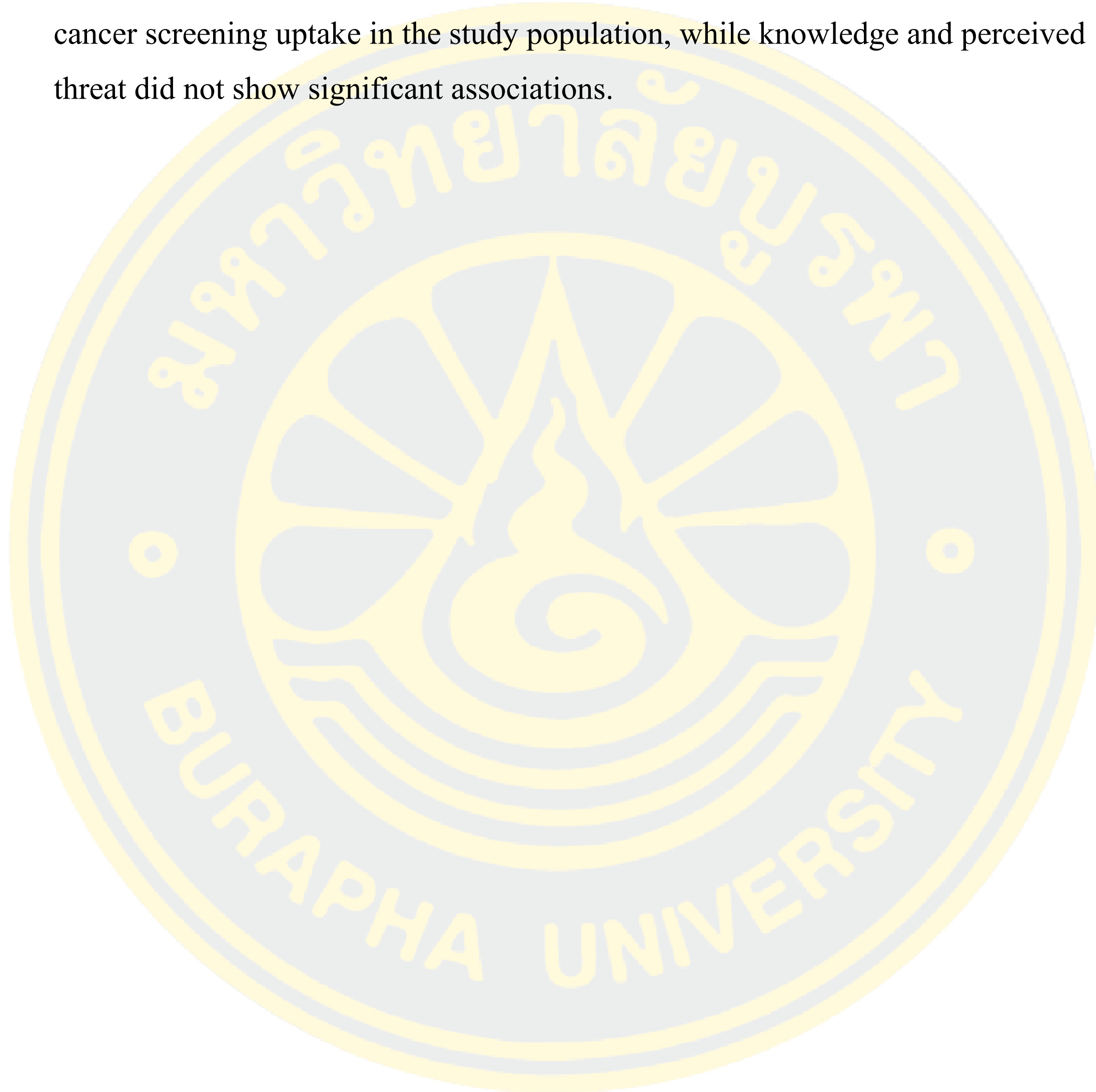
Nagelkerke R2 = .272; Hosmer and Lemeshow Test: χ^2 (8) = 6.341, p = .609

From the binary logistic regression analysis, the results revealed that all variables including knowledge of cervical cancer, perceived threat, perceived benefits, perceived barriers, and self-efficacy significantly associated with cervical cancer screening uptake (n = 240) which explained approximately 27.2% of the variance in cervical cancer screening uptake (Nagelkerke R^2 = .272). Notably, perceived barriers of uptake of cervical cancer screening (OR= .885, 95% CI: .807, .971; $p < .05$) and self-efficacy about uptake of cervical cancer screening (OR= 1.060, 95% CI: 1.038, 1.083; $p < .001$) had a significant effect on uptake of cervical cancer screening. It means that at each one-point increase in perceived barriers to cervical cancer screening (OR = 0.885, 95% CI: 0.807–0.971) was associated with an 11.5% (calculate by 0.885 - 1 = -0.115), decrease in the likelihood of screening uptake. Conversely, for each one-point increase in self-efficacy regarding cervical cancer screening (OR = 1.060, 95% CI: 1.038–1.083), women were 6.0% (calculate by 1.060 - 1 = 0.06) more likely to undergo screening.

However, knowledge of cervical cancer screening (OR= 1.038, 95% CI: .915, 1.178; $p > .05$), perceived threat of cervical cancer (OR= 1.025, 95% CI: .971, 1.082; $p > .05$), and perceived benefits of uptake of cervical cancer

screening (OR= .842, 95% CI: .705, 1.007; $p > .05$) were not significantly associated with cervical cancer screening uptake.

In summary, the results clearly showed that lower perceived barriers and higher self-efficacy were significantly associated with increased odds of cervical cancer screening uptake in the study population, while knowledge and perceived threat did not show significant associations.



CHAPTER 5
CONCLUSION AND DISCUSSION

This chapter provides the summary and discussion of the study. The chapter also discusses the implication of the study findings in nursing practices and research. Recommendations for future research are also provided towards end of the chapter.

Summary of findings

This study was carried out to explore uptake of cervical cancer screening and examine the factors that predict uptake of cervical cancer screening among women in Wenzhou China. Predicting factors were knowledge of cervical cancer, perceived threat of cervical cancer, perceived benefits of uptake of cervical cancer screening, perceived barriers of uptake cervical cancer screening, perceived self-efficacy of uptake cervical cancer screening. A total of 240 women were recruited by a simple random sampling method from the Physical Examination Centers of the First Affiliated Hospital of Wenzhou Medical University.

Data were collected by self-report questionnaires using the demographic data questionnaire, The Chinese version of cervical cancer prevention knowledge questionnaire (Li et al., 2013), The Chinese version of Cervical Cancer Screening Belief Scale (Lei, 2015), which including the perceived threat to cervical cancer subscale, the perceived benefit subscale of cervical cancer screening, the perceived barrier subscale of cervical cancer screening, The Chinese version of Cervical Cancer Screening Self-Efficacy Scale (Liang et al., 2014). The Cronbach's alpha for The Chinese version of Cervical Cancer Screening Belief Scale, the perceived threat to cervical cancer subscale, the perceived benefit subscale of cervical cancer screening, the perceived barrier subscale of cervical cancer screening, and The Chinese version of Cervical Cancer Screening Self-Efficacy Scale were .867, .864, .718, .914 and .962 respectively; and the value ρ_{KR20} (Kuder & Richardson, 1937) for The Chinese version of cervical cancer prevention knowledge questionnaire was .760.

From the analysis, the findings revealed that 61.7% (n = 148) of the 240 participants were women aged 30-49 years, and their mean age was 37.5 years. 38.8% (n = 93) of the participants were unemployed. Among the participants, 43.3% (n =

104) had tertiary education, and only 0.8% (n = 2) were illiterate. 45.0% (n = 108) of the participants were Buddhist. The results showed that 79.6% (n = 191) of the participants were married and 16.3% (n = 39) were single. 83.3% (n = 200) of the participants had only 1 sexual partner, 10.8% (n = 26) had no sexual partner. 73.3% (n = 176) had 1-2 children. 63.3% (n = 152) had first sex at the age of 21 years or older. 10.8% (n = 26) of the participants had never had sex. Most participants (97.1%, n = 233) had no history of taking hormonal contraceptives for more than 5 years, 95.4% (n = 229) had no history of smoking or family history of cervical cancer, and 98.8% (n = 237) had no history of sexual transmission.

The results showed that 63.3% (n = 152) of the participants had been screened for cervical cancer, and 36.7% (n = 88) had never screened. Cervical cancer screening was performed annually for 35.0% (n = 84), every 2 years for 10.4% (n = 25), every 3 years for 7.9% (n = 19), and every 4 years or more for 10.0% (n = 24). HPV testing was used in 31.7% (n = 76) of participants, TCT in 4.2% (n = 10), and HPV testing plus TCT in 27.5% (n = 66) of participants. The results also showed that the most common reason for never had cervical cancer screening was not knowing about cervical cancer screening (11.7%, n = 28), followed by never having sexual intercourse (10.4%, n = 25). There are many other reasons why participants never had cervical cancer screening. For example, 0.4% of participants said: “I didn’t think about screening for cervical cancer”; There was also one participant who did not have screening because “Never have sexual intercourse, no time, and don’t know about cervical cancer screening”. Five percents of the participants (n = 12) said: “I think I am healthy and do not need cervical cancer screening”. One participant said, “I don’t think I will get cervical cancer, so I don’t go for cervical cancer screening”. “I forgot to get a cervical cancer screening” was also reported by 0.4% of the participants. 0.4% of the participants said: “Unaccompanied, I do not want to go to cervical cancer screening”. 0.8% (n = 2) of the participants said: “I do not feel ill and consider myself healthy, so there is no need for cervical cancer screening”.

The mean score of knowledge of cervical cancer among participants was 6.18 out of 10 (SD = 2.54). The mean score of perceived threat of cervical cancer among participants was 32.02 out of 50 (SD = 5.65). The mean score of perceived benefits of uptake of cervical cancer screening was 15.65 out of 20 (SD = 2.08). The

mean score of perceived barriers of uptake of cervical cancer screening was 17.47 out of 45 (SD = 3.99). And the mean score of Self-Efficacy about uptake of cervical cancer screening was 61.92 out of 80 (SD = 16.08).

Binary logistic regression results showed that perceived barriers of uptake of cervical cancer screening (OR= .885, 95% CI: .807, .971; $p < .05$) and self-efficacy about uptake of cervical cancer screening (OR= 1.060, 95% CI: 1.038, 1.083; $p < .001$) can predict the uptake of cervical cancer screening in this study. It can be interpreted that for each one-point increase in perceived barriers of uptake of cervical cancer screening (OR= .885, 95% CI: .807, .971), women were 11.5% less likely to uptake of cervical cancer screening ($p < .05$). For each point increase in self-efficacy about uptake of cervical cancer screening (OR= 1.060, 95% CI: 1.038, 1.083), a woman was 6.0% more likely to uptake of cervical cancer screening ($p < .001$).

Discussion

Uptake of cervical cancer screening among women in Wenzhou, China

For this study, uptake of cervical cancer screening among women in Wenzhou China was 63.3% (n=152). In 2019, The State Council issued the "Healthy China Action Plan (2019-2030)", which clearly stated that cervical cancer screening coverage needs to reach more than 80 percent by 2030. Although the screening rate of 63.3% in this study was higher than the screening rate of 1.5% in 2017, 4.0 % in 2019, and 2.2 % in 2020 in Wenzhou (Meteor, 2021a; Zheng, 2019, 2020). However, the uptake of cervical cancer screening in this study is still far from 80%. Still, nearly 40% of participants in our study had never been screened, so there is an urgent need to increase cervical cancer screening rates.

The study result can be explained by the Health Belief Model (HBM) (Champion & Skinner, 2008) which proposed that demographic factors such as age, occupation, educational degree, religion, marital status, knowledge and so on, have influence indirectly on preventive health behaviors (Champion & Skinner, 2008) which is the uptake of cervical cancer screening in this study. The reason for the increase in cervical cancer screening rates in this study compared to previous years may be related to the age of the women who participated in this study. In the current study, 61.7% of the participants were aged 30 to 49 years. A study found that women

aged 30 to 49 years are more likely to receive cervical cancer screening than women in other age groups (Bao et al., 2018).

The fact that nearly 40% of participants in this study never had cervical cancer screening may be related to occupation. In this study, 38.8% (n= 93) of the participants were not employed. This may be related to the financial situation of the participants, as women who do not work do not have a regular source of income, resulting in them having no money for cervical cancer screening, which in turn affects cervical cancer screening rates. Occupational class and household wealth level were associated with the affordability of cervical cancer screening. Many studies have found that even in some developed countries, most poor women still face financial barriers to screening (Levano et al., 2014; Menvielle et al., 2014). Consistently, results from previous studies which show that unemployed, poor, or uninsured women were less likely to undergo screening for cervical cancer (Akinyemiju et al., 2016; Bao et al., 2017; Bao et al., 2018).

The fact that nearly 40% of the participants in this study never had screening may be related to the level of education. In this study, 9.2% of participants were primary school education and 0.8% (n= 2) were illiterate. The association between educational attainment and cervical cancer screening can be attributed to the association between educational attainment and the ability to obtain information about cancer screening or to make appropriate decisions (Damiani et al., 2015; Rodríguez et al., 2005). Studies have found that illiterate and primary women are less likely to receive cervical cancer screening (Akinyemiju et al., 2016; Bang et al., 2012; Bao et al., 2017; Bao et al., 2018; Coughlin et al., 2006; Dutta et al., 2018). A study found that uptake of cervical cancer screening was higher in women with secondary studies (OR= 1.76, 95% CI: 1.53–2.04) and university studies (OR= 2.79, 95% CI: 2.33–3.33) than primary studies ($p < .001$) (Zamorano-Leon et al., 2020).

In this study, 79.6% (n= 191) of the participants were married. The higher rate of cervical cancer screening in our study may be related to the greater number of participants who were married. Nwabichie et al. (2018) found that married women were 2.257 times more likely to have a good uptake of cervical cancer screening (AOR=2.257, 95% CI: 1.006-4.361) when compared to unmarried women (Nwabichie et al., 2018). A study found a marginal association that single women had

lower odds of being screened than married women (OR=0.11, 95% CI: 0.01 - 1.04) (Cunningham et al., 2015). This may be due to spouse support, for example, a study assessing women's access to cervical screening in Malaysia (Gan & Dahlui, 2013) and Tanzania (Lyimo & Beran, 2012) found that women who received social support from their husbands were more likely to attend cervical screening. However, other studies have found that spouses may hinder cervical cancer screening (Mupepi et al., 2011).

The number of sexual partners may be correlated with uptake of cervical cancer screening. In this study, 5.9% of the participants had more than one sexual partner. One study found that women with more than one sexual partner were 4.9 times more likely to attend cervical cancer screening than women with one or fewer sexual partners (OR=4.9, 95% CI 1.2 to 20.7, $p < .05$) (Fru et al., 2020). A study found that the more sexual partners a woman had the higher odds of being high risk HPV positive for infections were (e. g. >3 partners AOR= 5.0, 95%CI: 1.7–14.6; $p < .05$; 2-3 partners AOR= 3.7, 95%CI: 1.3–10.4; $p < .05$; 1 partner AOR= 3.3, 95%CI: 1.1–9.3; $p < .05$) (Krings et al., 2019).

The number of children may be related to uptake of cervical cancer screening. In this study, 73.3% of the participants had 1-2 children, and 4.2% had 3-4 children. And women with a higher number of children were more likely to attend cervical cancer screening than women without children (e. g. 1-2 children OR= 12.091, 95% CI: 5.733 - 25.499, $p < .001$; ≥ 3 children OR= 15.636, 95% CI: 2.899 - 84.324, $p < .05$). High parity (≥ 3 children) is one of risk factors of cervical cancer (Karadag Arli et al., 2019).

In the present study, 36.7% (n= 88) of the participants had never been screened for cervical cancer, and among these, the most common reason for never being screened was "Don't know about cervical cancer screening" (11.7%, n= 28). 5% of participants said: "I think I am healthy and do not need cervical cancer screening." 0.8% of participants said: "I do not feel ill and consider myself healthy, so there is no need for cervical cancer screening." This is consistent with the results of a qualitative study, which found that women who did not initiate cervical screening gave their perceived reasons: a total of 57% mentioned because there were no symptoms and

signs, and 56.3% said they were not aware of screening (Getachew et al., 2019). In multivariate logistic regression analysis, having adequate knowledge about cervical cancer and women mentioning health professionals as a source of information were found to be independent predictors of adequate knowledge about cervical cancer screening. Women who had knowledge about cervical cancer were 5 times more likely to receive cervical cancer screening than those who did not (AOR = 5, 95 % Cl: 2.7 ~ 9.0) (Getachew et al., 2019). Women who mentioned a health professional as a source of information were 1.8 times more likely to have knowledge of cervical cancer screening than women who did not mention a health professional as a source of information (AOR = 1.8, 95% Cl: 1-3.2) (Getachew et al., 2019).

Factors influencing uptake of cervical cancer screening among women in Wenzhou, China

In the study, the results of logistic regression analysis showed that only perceived barriers of uptake of cervical cancer screening (OR= .885, 95% CI: .807, .971; $p < .05$) and self-efficacy about uptake of cervical cancer screening (OR= 1.060, 95% CI: 1.038, 1.083; $p < .001$) can predict uptake of cervical cancer screening.

For this study, perceived barriers of uptake of cervical cancer screening were the variable that could significantly predict uptake of cervical cancer screening (OR= .885, 95% CI: .807, .971; $p < .05$). The finding of the study suggested that participants with higher perceived barriers score of cervical cancer screening were less likely to have uptake of cervical cancer screening. This result is consistent with many other studies which show that perceived barriers of uptake of cervical cancer screening is a strong predictor of uptake of cervical cancer screening in many countries and across many different settings (Afsah, 2017; Ampofo et al., 2020; Babazadeh et al., 2018; Kaneko, 2018; Nagendiram et al., 2020; Nwabichie et al., 2018).

The relationship between perceived barriers of uptake of cervical cancer screening and uptake of cervical cancer screening can be evaluated by HBM (Champion & Skinner, 2008). Cervical cancer screening is a preventive health behavior, and when women perceive that the barriers are too large, it may affect their

determination to undergo cervical cancer screening, which in turn may lead to the abandonment of cervical cancer screening.

A systematic review about self-perceived barriers to participation in cervical cancer screening found that Self-identified barriers to screening were categorized into personal factors, practice factors, test-related factors, and logistic factors. And the most common barriers included lack of time, embarrassment, fear of outcome, irrelevance, and male health professionals (Nagendiram et al., 2020). In this study, 5.4% of participants mentioned that they had not had cervical cancer screening because they did not have time. When asked if they knew the location of cervical cancer screening, 10.0% of participants were unsure and 0.4% did not know. When asked if participants would feel embarrassed about having to expose their perineum for cervical cancer screening, 10.8% of the participants responded “uncertainty”. Embarrassment may be a barrier to cervical cancer screening, especially when women are less likely to be willing to undergo cervical cancer screening when they know that male medical workers do the screening for women (Nagendiram et al., 2020).

Self-efficacy was referred as confidence in one’s ability to act in HBM. The greater the self-efficacy, the greater the likelihood of taking the action. In this study, the results showed that the higher the self-efficacy about uptake of cervical cancer screening in women, the more likely they were to participate in cervical cancer screening (OR= 1.060, 95% CI: 1.038, 1.083; $p < .001$). The results of a study examining the effectiveness of a self-efficacy promotion program on women’s self-efficacy and cervical cancer screening showed that women’s self-efficacy scores were higher after the implementation of the program than before, and the cervical cancer screening rate was higher than before (Bunkarn et al., 2020). One study showed that some women were not aware of the importance of screening and did not receive news and information from health professionals, which hindered women from learning to improve self-efficacy and help them make decisions about cervical cancer screening (Alnafisah et al., 2019). A study showed that perceived self-efficacy (AOR = 1.24, 95% CI: 1.13, 1.37) was a predictor of cervical cancer screening practice (Solomon et al., 2019). After holding all other variables constant, the odds of receiving cervical cancer screening increased by 24.20% for each unit increase in total score of perceived self-efficacy (AOR = 1.242, 95% CI: 1.128, 1.368) (Solomon et al., 2019).

In this study, knowledge of cervical cancer was not a predictor of uptake of cervical cancer screening (OR= 1.038, 95%CI: .915, 1.178; $p > .05$). This is not consistent with the results of previous studies. A study indicated that knowledge about cervical cancer was associated with increased odds of participating in cervical cancer screening (aOR = 1.32, 95% CI 1.11, 1.56) (Enyan et al., 2022). Results from another study showed that women with knowledge about cervical cancer were five times more likely to undergo cervical cancer screening than those without knowledge (AOR = 5, 95 % Cl: 2.7 ~ 9.0) (Getachew et al., 2019). A study showed that knowledge of cervical cancer (OR=5.81, 95% CI 1.58 to 21.4) were strongly associated with being screened among urban women (Cunningham et al., 2015).

The reason for the inconsistency between the results of this study and those of previous studies may be related to the knowledge of cervical cancer among the participants in this study. In this study, the total score of the cervical cancer knowledge scale was 10, and the average knowledge of cervical cancer score of participants was 6.18, and 54.6% of the participants exceeded the average score. Since the data collection place was in the physical examination center, the participants were more likely to receive the relevant cervical cancer knowledge education from the medical staff of the physical examination center before participating in the study, so the cervical cancer knowledge score of the participants in this study may be affected. A study showed that women who had health professionals as a source of information were 1.8 times more likely to have cervical cancer screening knowledge (AOR = 1.8, 95% Cl: 1-3.2) compared to women who did not cite health professionals as a source of information (Getachew et al., 2019).

The perceived threat of cervical cancer was not a predictor of uptake of cervical cancer screening in this study (OR= 1.025, 95% CI:.971, 1.082; $p > .05$). Miri et al. (2018) studied cognitive predictors of changes in screening for cervical cancer in Iranian women healthy volunteers. The results showed that the perceived threat of cervical cancer was not a factor to predict the changing stage of cervical cancer screening (Miri et al., 2018). The perceived threat has no direct effect on Pap-smear behavior ($\beta = .002$, $p > .05$) (Miri et al., 2018). However, perceived threat has been found to be one of the key factors in predicting the likelihood of receiving medical

services (Feng et al., 2021). Ampofo et al. (2020) conducted a cross-sectional study on barriers to cervical cancer screening in Ghana. Chi-square analysis of perceived threat and participation in screening was performed in this study, which conducted perceived threat showed significant differences with interest in participating in screening (Chi-square = 230.500, $p < .001$) (Ampofo et al., 2020).

The reason for the differences in the results of each study may be related to the different regions of each study. The perceived threat of cervical cancer was also affected by women's age, education level and knowledge of cervical cancer (Yadav et al., 2022). Hajializadeh et al. (2013) found that higher education levels increase perceived severity when analyzing the relationship between HBM structure and demographic variables. Higher education appears to increase awareness and thus participation in prevention and treatment services (Hajializadeh et al., 2013). To increase the utilization of cervical cancer screening services, health promotion and educational interventions should not only provide information about cervical cancer and its associated risk factors, signs, and effects, but also design appropriate risk communications to raise awareness of the threat of cervical cancer. This will help to target women at risk and increase uptake of cervical cancer screening services (Yadav et al., 2022).

The perceived benefit of cervical cancer screening was not a predictor of uptake of cervical cancer screening in the study (OR=.842, 95% CI:.705, 1.007; $p > .05$). The findings of a cross-sectional study conducted at Mahalapye District Hospital in Botswana are consistent with the this study, which showed that perceived benefits was not a significant predictor for cervical cancer screening (OR=1.291, $p > .05$) (Ibekwe et al., 2010). Ampofo et al. (2020) conducted a cross-sectional study on barriers to cervical cancer screening in Ghana. Chi-square analysis of perceived benefits and participation in screening was performed in this study, which conducted perceived benefits showed significant differences with interest in participating in screening (Chi-square = 185.663, $p < .001$) (Ampofo et al., 2020). A systematic review of 12 studies reported that Pap smear rates were directly associated with higher benefit scores and indirectly with perceived barriers to receiving the test (Bayu et al., 2016; Nigussie et al., 2019; Tanner-Smith & Brown, 2010). In this study,

although participants' perceived benefits of cervical cancer screening were high, and perceived benefit is also influenced by other factors. For example, the participants have insufficient knowledge of cervical cancer, little perceived threat of cervical cancer screening, and perceived barriers to cervical cancer screening are large, and their self-efficacy is not high, they may not go to cervical cancer screening. This suggests that perceived benefits do not translate into cervical cancer screening practice.

Conclusion

In this study, the results indicated perceived barriers of uptake of cervical cancer screening and Self-efficacy about uptake of cervical cancer screening were predictors of uptake of cervical cancer screening, and knowledge of cervical cancer, perceived threat of cervical cancer and perceived benefits of uptake of cervical cancer screening did not predict uptake of cervical cancer screening. The health belief model points out that these variables affect each other, so as to directly or indirectly affect the uptake of cervical cancer screening (Champion & Skinner, 2008). According to the health belief model, the more knowledge about cervical cancer, the more perceived benefits of cervical cancer screening and perceived threat of cervical cancer, and the self-efficacy about uptake of cervical cancer screening increased. Increased perceived threat of cervical cancer has been shown to lead to higher motivation for screening (De Jesus et al., 2021). When perceived benefits and self-efficacy outweigh perceived barriers and perceived threats, women are more likely to participate in cervical cancer screening.

Implications of the findings

Nursing practice

In this study, nearly 40% of participants had never been screened for cervical cancer, and there is an urgent need to improve cervical cancer screening rates. In terms of demographic characteristics, a study have shown that women aged 30-49 years are more likely to undergo cervical cancer screening than women in other age groups (Bao et al., 2018). Therefore, in the future cervical cancer screening work, women aged 30-49 years old can be the focus of publicity. About job, results from previous studies which show that unemployed, poor, or uninsured women were less

likely to undergo screening for cervical cancer (Akinyemiju et al., 2016; Bao et al., 2017; Bao et al., 2018). For women who don't work or have financial difficulties, they need to be informed about the medical institutions that can be screened for free and encouraged to undergo free screening. Studies have found that illiterate and primary women are less likely to receive cervical cancer screening (Akinyemiju et al., 2016; Bang et al., 2012; Bao et al., 2017; Bao et al., 2018; Coughlin et al., 2006; Dutta et al., 2018). Therefore, in the future cervical cancer screening work, women with low education levels can be the focus of publicity.

In this study, the most common reason for never being screened was "Don't know about cervical cancer screening", and the score of knowledge of cervical cancer is not very high. A study found that women who had knowledge about cervical cancer were 5 times more likely to receive cervical cancer screening than those who did not (AOR = 5, 95 % Cl: 2.7 ~ 9.0) (Getachew et al., 2019). It is important to raise the knowledge of cervical cancer in women. Women who mentioned a health professional as a source of information were 1.8 times more likely to have knowledge of cervical cancer screening than women who did not mention a health professional as a source of information (AOR = 1.8, 95% Cl: 1-3.2) (Getachew et al., 2019). In the promotion of cervical cancer screening in the future, medical staff can make a popular science video about cervical cancer and cervical cancer screening and broadcast it on TV channels or other video software to improve women's knowledge about cervical cancer.

A study found that the most common barriers of cervical cancer screening included lack of time, embarrassment, fear of outcome, irrelevance, and male health professionals (Nagendiram et al., 2020). In this study, 3.8% of participants had a barrier to not undergoing cervical cancer screening due to lack of time. HPV testing on self-collected vaginal samples (Self-HPV) can be recommended for such women. In this type of sampling, the woman takes the sample herself at home, mails the sample to the health care facility for testing, and the health care facility mails the report to the woman. Self-HPV is convenient, quick, and can save women the embarrassment of exposing their perineum to medical staff. One study showed that Self-HPV screening was more cost-effective than currently used cytology-based screening, and offering self-HPV to people not involved in cervical cancer prevented

90% of cervical cancers and 94% of cervical cancer-related deaths (Vassilakos et al., 2019).

In this study, the results showed that the higher the self-efficacy about uptake of cervical cancer screening in women, the more likely they were to participate in cervical cancer screening (OR= 1.060, 95%CI: 1.038, 1.083; $p < .001$). Therefore, when providing cervical cancer screening services in the community in the future, women should be proactive and encouraged to participate, as this helps women to have better expectations and enthusiasm for themselves. This reinforcement develops female role models that are able to properly educate women, while also enhancing women's self-efficacy and building confidence in women's ability to make their own decisions (Suksawat et al., 2017).

Nursing research

In this study, 63.3% of the participants had undergone cervical cancer screening. However, there is still a certain gap to reach the goal of cervical cancer screening coverage to reach more than 80% by 2030 as mentioned in "Healthy China Action Plan (2019-2030)" issued by The State Council. Therefore, based on the study results and the characteristics of the current study population, it is important to develop detailed intervention plans to improve cervical cancer screening rates.

Since the data of this study were collected in the physical examination center of a hospital, the participants may have acquired relevant knowledge about cervical cancer from medical staff before participating in this study, which may have a certain effect on the screening results of cervical cancer. Therefore, similar studies can be carried out in other places such as communities in Wenzhou, China in the future.

The results of this study showed that knowledge of cervical cancer and perceived threat were not predictors of cervical cancer screening, which is inconsistent with the results of some previous studies. This need to be further investigated in future studies.

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APPENDICES

APPENDIX A

Questionnaires in English

Part 1: The Demographic data questionnaire

Direction: Please read the questions in part 1 carefully and give an honest answer. Please choose the answer as follow by tick ☑ or write down your answers in the space provided.

1. Age: ....

2. Occupation: ....

3. Educational background

☐ Illiterate ☐ Primary ☐ Junior high school (JHS) ☐ Senior high school (SHS) ☐ Tertiary

4. Religion

☐ Christian ☐ Muslim ☐ Traditional ☐ Buddhism ☐ Others: ....

5. Marital status

☐ Married ☐ Single ☐ Divorced ☐ Widowed ☐ Cohabitation (Live with your partner)

6. How many sexual partners do you have since in the past until now?

☐ 0 ☐ 1 ☐ 2 ☐ 3 ☐ Other number: ....

7. Number of child birth

☐ 0 ☐ 1 ☐ 2 ☐ 3 ☐ Other number: ....

8. Age of first sexual intercourse

☐ < 18 years old ☐ 18-20 years old ☐ ⩾ 21 years old ☐ No sexual history

9. Do you use hormonal contraception for more than 5 years?

☐ Yes ☐ No

10. Family history of cervical cancer.

☐ Yes ☐ No

11. Do you smoke?

☐ Yes ☐ No

12. Do you have the history of sexually transmitted infections?

☐ Yes ☐ No

13. Have you been screened for cervical cancer?

☐ Never done...... **(If you select this choice, DO NOT answer question No. 14)**

Please select reason below (you can select more than 1 reason)

☐ Never have sexual intercourse

☐ No time

☐ Don't know about cervical cancer screening

☐ Other reasons:.................

☐ **Yes…………. How often**: Please select item below,

☐ 1) Once a year

☐ 2) Every 2 years

☐ 3) Every 3 years

☐ 4) Every 4 years

☐ 5) Every 5 years or more

14. If you have been screened for cervical cancer, which method did you take?

(You can select more than 1 answer if you do the screening many times by different methods)

☐ Pap smear

☐ Thin Prep Cytologic test (TCT)

☐ HPV testing

☐ Other method: please identify…………………………

Part 2: The Chinese version of cervical cancer prevention knowledge questionnaire

Direction: This part is to about your knowledge of cervical cancer. Please read and think about it carefully and choose the suitable one on your condition. Please choose the answer as follow by tick ☑

1. Which of the following do you think is a symptom of cervical cancer?

☐ The vulva has nodules

☐ Abdominal pain

☐ Abdominal mass

☐ Profuse menstruation

☐ Vaginal bleeding after sexual intercourse *

2. ……………………………….

3.……………………………….

4. ……………………………...

5. ……………………………….

6. ………………………………..

7. ……………………………….

8.…………………………………

9. ……………………………….

10. You know what can be found by regular screening for common diseases in women?

☐ vaginitis

☐ myoma of uterus

☐ cervicitis

☐ pelvic infection

☐ All of the above diseases are ok*

(Note: The items with a * sign are correct options, the rest are wrong options.)

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Part 3: The Chinese version of Cervical Cancer Screening Belief Scale

Perceived threat to cervical cancer

Direction: This part is about your perceived threat to cervical cancer. Please tick '√' in the item which best reflects what you actually do. Please answer every question.

Question	Strongly Agree	Agree	Uncertainty	Disagree	Strongly Disagree
1. It is likely that I will get cervical cancer in the future	5	4	3	2	1
2……	5	4	3	2	1
3……	5	4	3	2	1
4……	5	4	3	2	1
5……	5	4	3	2	1
6……	5	4	3	2	1
7……	5	4	3	2	1
8……	5	4	3	2	1
9……	5	4	3	2	1
10. If I developed cervical cancer, I would not live longer than 5 years.	5	4	3	2	1

Perceived benefits of cervical cancer screening

Direction: This part is about your perceived benefits to cervical cancer screening. Please tick '√' in the item which best reflects what you actually do. Please answer every question.

Question	Strongly Agree	Agree	Uncertainty	Disagree	Strongly Disagree
1. If cervical cancer was found at a regular cervical cancer screening its treatment would not be so bad	5	4	3	2	1
2……	5	4	3	2	1
3……	5	4	3	2	1
4. If it turns out I have cervical cancer, I'd rather not know	5	4	3	2	1

Perceived barriers scale of cervical cancer screening

Direction: This part is about your perceived barriers to cervical cancer screening. Please tick ‘ √ ’ in the item which best reflects what you actually do. Please answer every question.

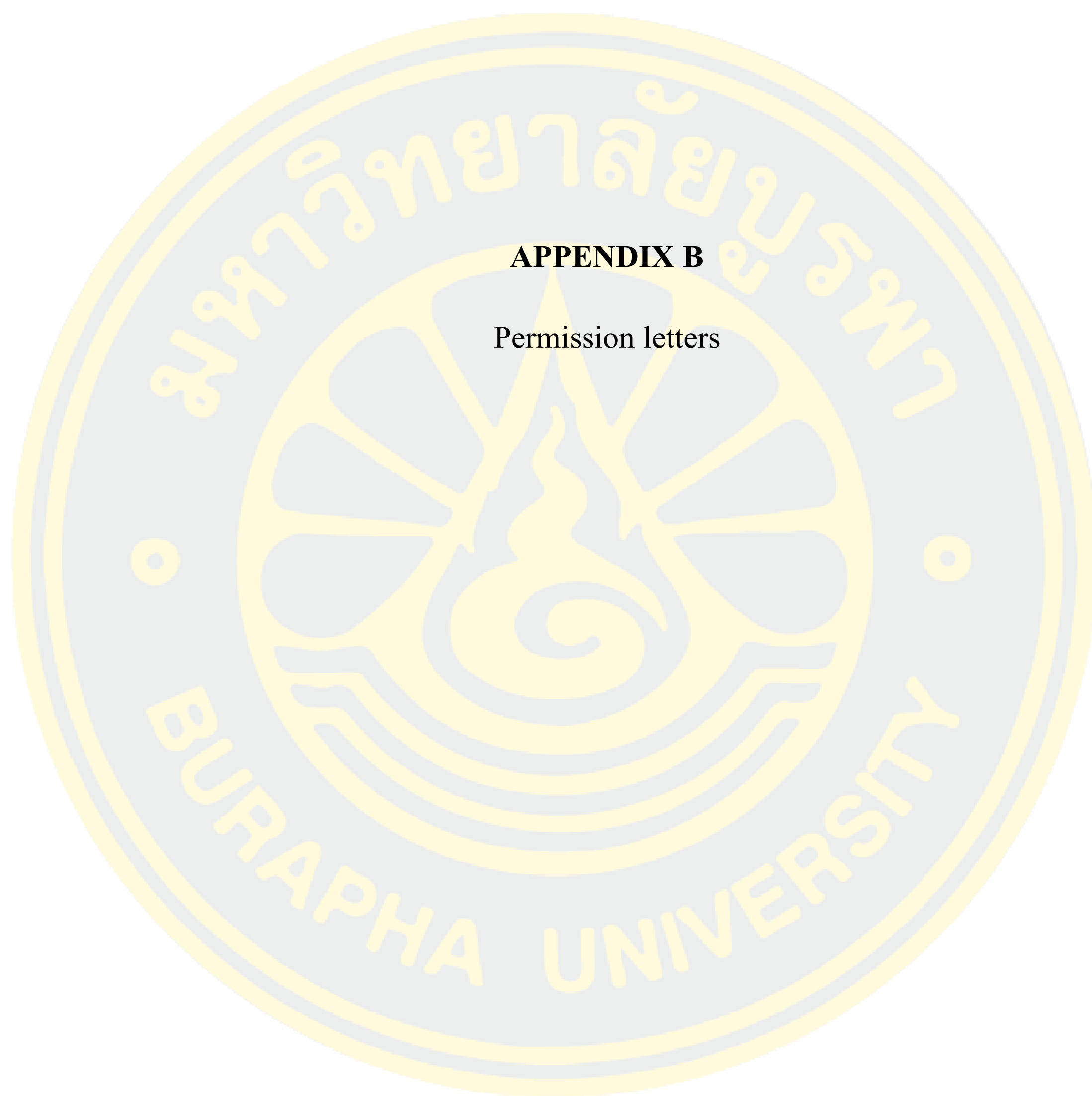
Question	Strongly Agree	Agree	Uncertainty	Disagree	Strongly Disagree
1. I don't know where to go for a cervical cancer screening	5	4	3	2	1
2……	5	4	3	2	1
3……	5	4	3	2	1
4……	5	4	3	2	1
5……	5	4	3	2	1
6……	5	4	3	2	1
7……	5	4	3	2	1
8……	5	4	3	2	1
9. I will never have a cervical cancer screening if I have to pay for it	5	4	3	2	1

Part 4: The Chinese version of Cervical Cancer Screening Self-Efficacy Scale

Direction: this part is about your confidence of uptake of cervical cancer screening. Please tick ‘ √ ’ in the item which best reflects what you actually do. Please answer every question.

Preamble: How likely are you to get a Pap smear (a method of cervical cancer screening)?

Question	Definitely	Very likely	Probably	Unlikely	Definitely not
1. If your last Pap was normal	5	4	3	2	1
2……	5	4	3	2	1
3……	5	4	3	2	1
4……	5	4	3	2	1
5……	5	4	3	2	1
6……	5	4	3	2	1
7……	5	4	3	2	1
8……	5	4	3	2	1
9……	5	4	3	2	1
10……	5	4	3	2	1
11……	5	4	3	2	1
12……	5	4	3	2	1
13…….	5	4	3	2	1
14…….	5	4	3	2	1
15…….	5	4	3	2	1
16. If you attend, you will have to pay someone to watch your child (or grandchild, etc.) during this time.	5	4	3	2	1



APPENDIX B

Permission letters

Permission letter to use The Chinese version of Cervical Cancer Screening Belief Scale

晚上9:22

Re:寻求宫颈癌筛查信念量表的使用同意

liuwei8092 详情

请勿轻信邮件中的密保，汇款，中奖信息

思媛：

你好， 谢谢对此量表的应用和传播！ 附上类伟的邮箱。

祝好！

姓名 14届类伟 详细

邮箱 luzhenhuaqh@163.com

设为星标联系人

--

柳韦华

山东第一医科大学（山东省医学科学院）护理学院

山东省泰安市长城路619号， 271000

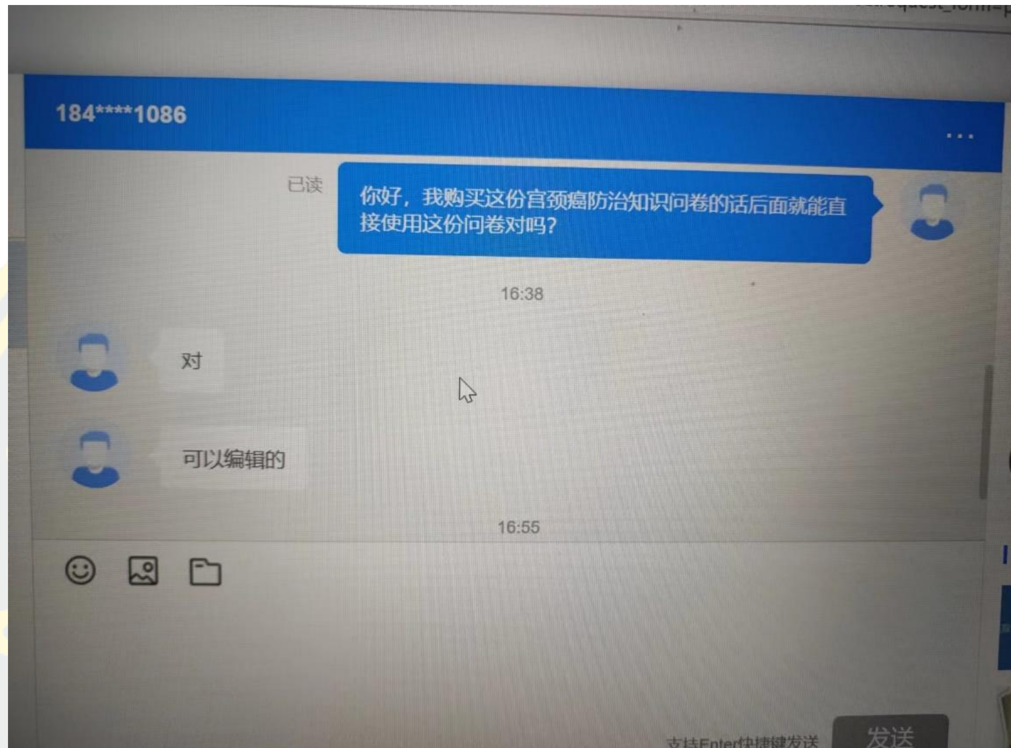
LIU Weihua MMed, RN

Professor of School of nursing

Shandong First Medical University&Shandong Academy of Medical Sciences,619 Changcheng

Permission letter to use The Chinese version of Cervical Cancer Screening Self-Efficacy Scale

Permission letter to use The Chinese version of cervical cancer prevention knowledge questionnaire



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APPENDIX C

Participant information sheet and consent form

Participant Information Sheet

IRB approval number: …G-HS023/2565……………………………… ………..

Title of study: Factors influencing uptake of cervical cancer screening among women in Wenzhou China

Dear participants

I am Ms Siyuan Xiong, a student in Master of Nursing Science (International Program) Faculty of Nursing, Burapha University Thailand. My study is "Factors influencing uptake of cervical cancer screening among women in Wenzhou China". The objectives are to describe rate of the uptake of cervical cancer screening among women in Wenzhou, Zhejiang province, China; and to examine factors influencing uptake of cervical cancer screening among women in Wenzhou, Zhejiang province, China including knowledge of cervical cancer, perceived threat of cervical cancer, perceived benefits of uptake of cervical cancer screening, perceived barriers of uptake cervical cancer screening, perceived self-efficacy of uptake cervical cancer screening.

This study will be a survey study. Participating in this study is voluntary. If you agree to participate in this study, you will answer the following questionnaires, which will take approximately 25-30 minutes. During the data collection period, the researcher will clarify any questions posed by the participants for clarity regarding the language or content. You will not get any direct benefits by participating in this study. However, the information you provide will be valuable to identify factors influencing uptake of cervical cancer screening among women. By understanding the factors that influence women's uptake of cervical cancer screening and addressing these barriers, staff can develop solutions to improve cervical cancer screening rates, thereby reducing cervical cancer incidence and mortality. There will be no identified physical and psychological risk to the person participating in the study and no risk to the society.

During the study, you have the right not to answer questions, and you also have the right to change your minds and refuse to participate in the project at any time, and the refusal would not affect the medical services you received. Any information collected from this study, including your identity, will be kept confidential. A coding number will be assigned to you and your name will not be

used. Findings from the study will be presented as a group of participants and no specific information from any individual participant will be disclosed. All data will be accessible only to the researcher which will be destroyed one year after publishing the findings. You will receive a further explanation of the nature of the study upon its completion, if you wish.

The research will be conducted by Ms. Siyuan Xiong under the supervision of my major-advisor, Assistant Professor Dr.Khemaradee Masingboon. If you have any questions, please contact me at mobile number: + 86 13758480800 or by email 1636557024@qq.com and/or my advisor's e-mail address khemaradee@nurse.buu.ac.th or my advisor's phone number: +66 819875586. Or you may contact Burapha University Institutional Review Board (BUU-IRB) telephone number +6638 102 620. Your cooperation is greatly appreciated. You will be given a copy of this consent form to keep.

Siyuan Xiong

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PARTICIPANT'S CONSENT FORM

IRB number: ………………………………………………… ..

Title of the study: Factors influencing uptake of cervical cancer screening among women in Wenzhou China

Date of data collection …… ..... …Month … .... …… . ………Year ……………… .

Before giving my signature below, I have been informed by researcher, Ms. Siyuan Xiong, about the purposes, method, procedures, benefits and possible risks associated with participation in this study thoroughly, and I understood all of the explanations. I consent voluntarily to participate in this study. I understand that I have the right to leave the study any time I want, without fearing that it might affect the medical services i will receive.

The researcher Ms. Siyuan Xiong has explained to me that all data and information of the participants will be kept confidential and only be used for this study. I have read and understood the information related to participation in this study clearly and I am signing this consent form.

Signature

……………………..……………………..

Participant

(…………………………………………………….)

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APPENDIX D

Ethical approval letter and data collection letter

สำเนา

ที่ IRB3-044/2565

เอกสารรับรองผลการพิจารณาจริยธรรมการวิจัยในมนุษย์
มหาวิทยาลัยบูรพา

คณะกรรมการพิจารณาจริยธรรมการวิจัยในมนุษย์ มหาวิทยาลัยบูรพา ได้พิจารณาโครงการวิจัย

รหัสโครงการวิจัย : G-HS023/2565

โครงการวิจัยเรื่อง : Factors influencing uptake of cervical cancer screening among women in Wenzhou China

หัวหน้าโครงการวิจัย : MISSSIYUAN XIONG

หน่วยงานที่สังกัด : คณะพยาบาลศาสตร์

BUU Ethics Committee for Human Research has considered the following research protocol according to the ethical principles of human research in which the researchers respect human's right and honor, do not violate right and safety, and do no harms to the research participants.

Therefore, the research protocol is approved (See attached)

1. Form of Human Research Protocol Submission Version 2 : 20 May 2022
2. Research Protocol Version 1 : 8 May 2022
3. Participant Information Sheet Version 2 : 20 May 2022
4. Informed Consent Form Version 2 : 10 May 2022
5. Research Instruments Version 1 : 8 May 2022
6. Others (if any) Version - : -

วันที่รับรอง : วันที่ 27 เดือน พฤษภาคม พ.ศ. 2565

วันที่หมดอายุ : วันที่ 27 เดือน พฤษภาคม พ.ศ. 2566

ลงนาม *นางสาวรมร แย้มประทุม*

(นางสาวรมร แย้มประทุม)

ประธานคณะกรรมการพิจารณาจริยธรรมการวิจัยในมนุษย์ มหาวิทยาลัยบูรพา

ชุดที่ 3 (กลุ่มคลินิก/ วิทยาศาสตร์สุขภาพ/ วิทยาศาสตร์และเทคโนโลยี)

MHESI 8137/759

Graduate School, Burapha University
169 Longhaad Bangsaen Rd.
Saensuk, Muang, Chonburi
Thailand, 20131

June 10th, 2022

Dear President of The First Affiliated Hospital of Wenzhou Medical University,

Enclosure: 1. Certificate ethics document of Burapha University
2. Research Instruments (Try out)

On behalf of the Graduate School, Burapha University, I would like to request permission for Ms. SIYUAN XIONG to collect data for testing reliability of the research instruments.

Ms. SIYUAN XIONG ID 63910135, a graduate student of the Master of Nursing Science program in Adult Nursing Pathway, Faculty of Nursing, Burapha University, Thailand, was approved her thesis proposal entitled: "Factors influencing uptake of cervical cancer screening among women in Wenzhou, China" under supervision of Assist. Prof. Dr. Khemaradee Masingboon as the principle advisor. She proposes to collect data from 30 women with cervical cancer, who are aged at least 25 years old, and no history of gynecological cancer or undergone total hysterectomy. The participants will be recruited from two physical examination centers of the First Affiliated Hospital of Wenzhou Medical University. There will be 15 cases from the Park Road Hospital and the other 15 cases from the South White Elephant Hospital. The data collection will be carried out from June 13-30, 2022. In this regard, you can contact Ms. SIYUAN XIONG via mobile phone +86-1375-8480-800 or E-mail: 1636557024@qq.com

Please do not hesitate to contact me if you need further relevant queries.

Sincerely yours,

(Assoc. Prof. Dr. Nujjaree Chaimongkol)
Dean of Graduate School, Burapha University

Graduate School Office
Tel: +66 3810 2700 ext. 701, 705, 707
E-mail: grd.buu@go.buu.ac.th
http://grd.buu.ac.th

เอกสารนี้ลงนามด้วยลายเซ็นอิเล็กทรอนิกส์ ตรวจสอบได้ที่ (https://e-sign.buu.ac.th/verify)

MHESI 8137/760

Graduate School, Burapha University
169 Longhaad Bangsaen Rd.
Saensuk, Muang, Chonburi
Thailand, 20131

June 10th, 2022

Dear President of The First Affiliated Hospital of Wenzhou Medical University,

Enclosure: 1. Certificate ethics document of Burapha University
2. Research Instruments

On behalf of the Graduate School, Burapha University, I would like to request permission for Ms. SIYUAN XIONG to collect data for conducting research.

Ms. SIYUAN XIONG ID 63910135, a graduate student of the Master of Nursing Science program in Adult Nursing Pathway, Faculty of Nursing, Burapha University, Thailand, was approved her thesis proposal entitled: "Factors influencing uptake of cervical cancer screening among women in Wenzhou, China" under supervision of Assist. Prof. Dr. Khemaradee Masingboon as the principle advisor. She proposes to collect data from 240 women with cervical cancer, who are aged at least 25 years old, and no history of gynecological cancer or undergone total hysterectomy. The participants will be recruited from two physical examination centers of the First Affiliated Hospital of Wenzhou Medical University. There will be 120 cases from the Park Road Hospital and the other 120 cases from the South White Elephant Hospital. The data collection will be carried out from July 4 to December 30, 2022. In this regard, you can contact Ms. SIYUAN XIONG via mobile phone +86-1375-8480-800 or E-mail: 1636557024@qq.com

Please do not hesitate to contact me if you need further relevant queries.

Sincerely yours,

(Assoc. Prof. Dr. Nujjaree Chaimongkol)
Dean of Graduate School, Burapha University

Graduate School Office
Tel: +66 3810 2700 ext. 701, 705, 707
E-mail: grd.buu@go.buu.ac.th
http://grd.buu.ac.th

เอกสารนี้ลงนามด้วยลายเซ็นอิเล็กทรอนิกส์ ตรวจสอบได้ที่ (https://e-sign.buu.ac.th/verify)

Please type or write with readable hand writing

GRD-109 (Eng)
(Try out)

Graduate School Burapha University

Request form for issuing a requesting letter for data collection (Try out)

To Dean of Graduate School

I am (Mr./Mrs./Ms.) Ms.Siyuan Xiong .... Student ID #.........63910135..............................

❑ Doctoral degree ☑ Master degree - plan ✓ A ❍ B Study type ☑ Full-time ❍ Part-time

Program.......... Master of Nursing Science (International Program) Major/Pathway...Adult Nursing.....

Faculty.......... Faculty of Nursing Telephone ...+8613758480800...... E-mail 1636557024@qq.com

Doctoral dissertation/ Master thesis/ IS **Title:**......

Factors influencing uptake of cervical cancer screening among women in Wenzhou, China..........

Principal advisor' name... Assistant Prof. Dr. Khemaradee Masingboon ....

I would like to request for issuing **a requesting letter for data collection (Try out)**:

By issuing to (name of the director of Institute/ University/ Organization)

...The First Affiliated Hospital of Wenzhou Medical University, Zhejiang province, China, to collect data at two physical examination centers as following:

1) The physical examination center of the Park Road Hospital
2) The physical examination center of the South White Elephant Hospital

Institute/ University/ Organization/ Department/Division

... The physical examination centers of the First Affiliated Hospital of Wenzhou Medical University, Zhejiang province, China including:

1) The physical examination center of the Park Road Hospital
2) The physical examination center of the South White Elephant Hospital

To collect data from (details of participants and sample size)..

............Participants are 30 cases of women with cervix, age at least 25 years old, no history of gynecological cancer or undergone total hysterectomy. Participants will be recruited from the two physical examination centers of the First Affiliated Hospital of Wenzhou Medical University including:

1) 15 cases from the physical examination center of the Park Road Hospital
2) 15 cases from the physical examination center of the South White Elephant Hospital.

Duration of data collection: from date......13th June 2022.....to......30th..June...2022...........................

My contact information: # cellphone and E-mail..phone number: +8613758480800 Email: 1636557024@qq.com...

With this request, I have enclosed documents......1..........copies

1) A copy of proof of ethical approval from Burapha university, and
2) Research instruments

Please be informed accordingly,

Student's name ....Siyuan Xiong.........

(.........Ms..Siyuan Xiong ....)

Date...31... Month......May......Year...2022

Principal advisor acknowledged	Dean of Faculty/College acknowledged	Dean of Graduate School approved
Approved (Signed)...K. Masingboon... (Assistant. Prof. Dr. Khemaradee Masingboon) Date.......- 7 JUN 2022..........	(Signed)...Pornchai... (Assistant. Prof. Dr. Pornchai Jullamate) Date...- 7 JUN 2022........	(Signed)...Nj Chai... (Associate. Prof. Dr. Nujjaree Chaimongkol) Date....10...June....2022.........

Please type or write with readable hand writing

GRD-109 (Eng)
(Main Study)

Graduate School Burapha University

Request form for issuing a requesting letter for data collection (Main Study)

To Dean of Graduate School

I am (Mr./Mrs./Ms.)...............Ms.Siyuan Xiong.........Student ID #............63910135..

❑ Doctoral degree ☑ Master degree - plan ☑ A ❍ B Study type ☑ Full-time ❍ Part-time

Program..........Master of Nursing Science (International Program)...Major/Pathway. Adult Nursing..

Faculty............Faculty of Nursing......Telephone........+8613758480800.........E-mail..1636557024@qq.com...

Doctoral dissertation/ Master thesis/ IS **Title:**.....

...........Factors influencing uptake of cervical cancer screening among women in Wenzhou, China......................

Principal advisor' name......... Assistant Prof. Dr. Khemaradee Masingboon ....

I would like to request for issuing **a requesting letter for data collection (Main Study)**:

By issuing to (name of the director of Institute/ University/ Organization)

... The First Affiliated Hospital of Wenzhou Medical University, Zhejiang province, China, to collect data at two physical examination centers as following:

1) The physical examination center of the Park Road Hospital
2) The physical examination center of the South White Elephant Hospital

Institute/ University/ Organization/ Department/Division

... The physical examination centers of the First Affiliated Hospital of Wenzhou Medical University, Zhejiang province, China including:

1) The physical examination center of the Park Road Hospital
2) The physical examination center of the South White Elephant Hospital

To collect data from (details of participants and sample size) ....

...........Participants are 240 cases of women with cervix, age at least 25 years old, no history of gynecological cancer or undergone total hysterectomy. Participants will be recruited from the two physical examination centers of the First Affiliated Hospital of Wenzhou Medical University including:

1) 120 cases from the physical examination center of the Park Road Hospital
2) 120 cases from the physical examination center of the South White Elephant Hospital.

Duration of data collection: from date......4th July..2022........to 30th December 2022..........................

My contact information: #...phone number...+8613758480800 Email: 1636557024@qq.com...............

With this request, I have enclosed documents.......1.......copies

1) A copy of proof of ethical approval from Burapha university, and
2) Research instruments

Please be informed accordingly,

Student's name ......Siyuan Xiong............
(............Ms. Siyuan Xiong ....)
Date...31... Month...May......Year......2022.....

Principal advisor acknowledged	Dean of Faculty/College acknowledged	Dean of Graduate School approved
Approved (Signed)....K. Masingboon.... (Assistant. Prof. Dr. Khemaradee Masingboon) Date................................. - 7 JUN 2022	(Signed)....Pornchai.... (Assistant. Prof. Dr. Pornchai Jullamate) Date................................. - 7 JUN 2022	(Signed)....NJ Chai.... (Associate. Prof. Dr. Nujjaree Chaimongkol) Date.....10 June 2022.........

温州医科大学附属第一医院临床研究伦理委员会委员签到表

会议时间：2022年6月30日

会议地点：新院1-4A22会议室

审查内容：中国温州妇女接受宫颈癌筛查的影响因素 Factors influencing uptake of cervical cancer screening among women in Wenzhou China

姓 名	性别	工作单位	专 业	职 称	伦理委员会职务	签到
夏景林	男	温州医科大学附属第一医院	消化介入	教授/主任医师	主 任	
黄晓颖	女	温州医科大学附属第一医院	呼吸内科	教授/主任医师	副主任	
吴高俊	男	温州医科大学附属第一医院	心血管内科	主任医师	委 员	
张纯武	男	温州医科大学附属第一医院	伤骨科	主任医师	委 员	
金 嵘	女	温州医科大学附属第一医院	流行病学	教授	委 员	
耿武军	男	温州医科大学附属第一医院	麻醉科	教授/主任医师	委 员	
陈咨苗	男	温州医科大学附属第一医院	内分泌科	副主任医师	委 员	
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徐卫	男	温州医科大学附属第一医院	预防医学	副主任医师	委 员	
孙彩霞	女	温州医科大学附属第一医院	护 理	主任护师	委 员	
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陈 雷	男	温州医科大学附属第一医院	骨 科	教授/主任医师	委 员	
郑祥武	男	温州医科大学附属第一医院	放射影像	教授/主任医师	委 员	
林观样	男	温州医科大学附属第一医院	药 学	主任药师	委 员	
苏小芳	女	浙江震瓯律师事务所	法 律	律 师	委 员	
胡建芬	女	退 休	统计学	高级统计师	委 员	
方 耀	男	温州理工学院	伦理学	讲 师	委 员	

伦理委员会声明：

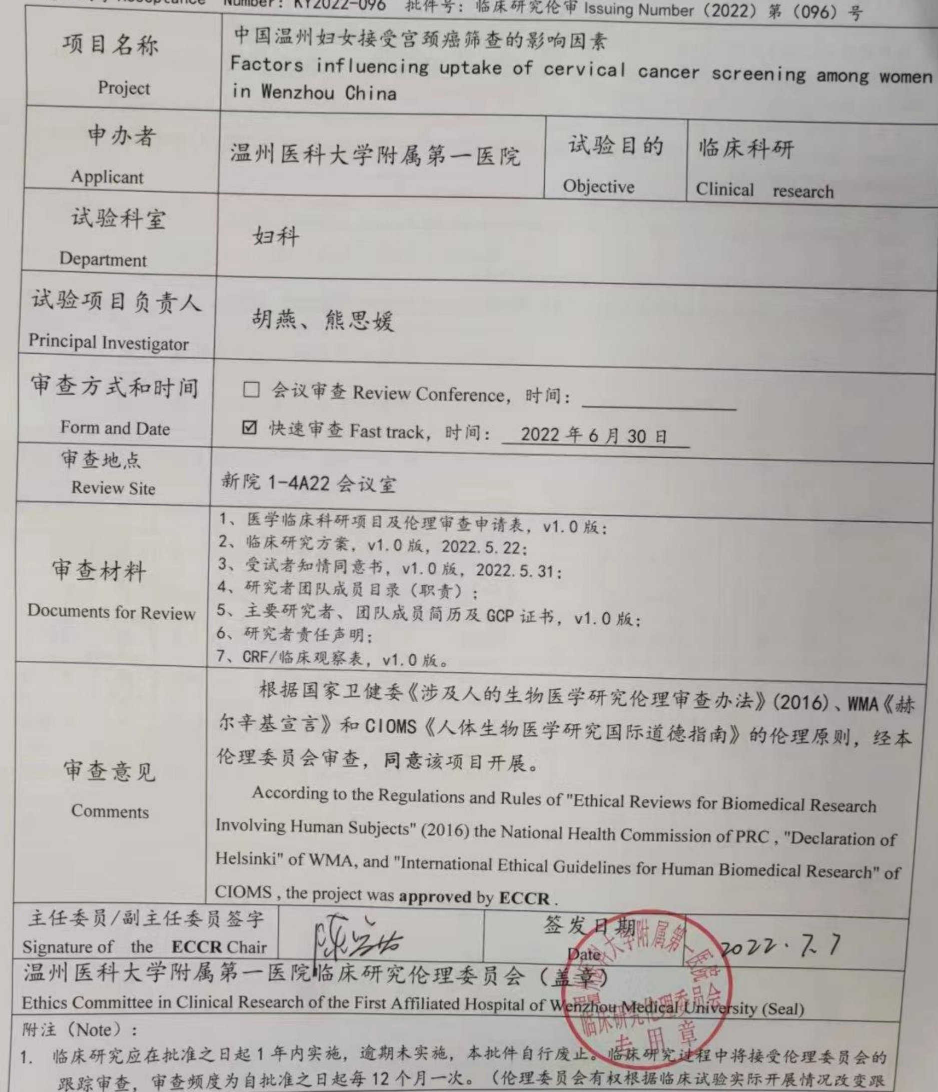
★ 温州医科大学附属第一医院临床研究伦理委员会组成及工作程序遵循中国GCP、ICH-GCP及相关法律法规，其审查过程不受伦理委员会以外任何组织及个人影响。

★ 本伦理委员会各委员已签署保密协议，所有标准操作规程文件、机密信息、会议记录等及其副本的所有权均归伦理委员会。

地址：浙江省温州市瓯海区南白象温州医科大学附属第一医院新院区 邮编：325000

联系电话：0577-55578055 传真：0577-55578033 E-mail:wyyyclinical@126.com

版本日期：2021年06月21日



临床研究伦理委员会

温州医科大学附属第一医院临床研究伦理委员会审查批件
（Review of Ethics Committee in Clinical Research (ECCR) of the First Affiliated Hospital of Wenzhou Medical University）

受理编号 Acceptance Number：KY2022-096 批件号：临床研究伦审 Issuing Number（2022）第（096）号

项目名称 Project	中国温州妇女接受宫颈癌筛查的影响因素 Factors influencing uptake of cervical cancer screening among women in Wenzhou China		
申办者 Applicant	温州医科大学附属第一医院	试验目的 Objective	临床科研 Clinical research
试验科室 Department	妇科		
试验项目负责人 Principal Investigator	胡燕、熊思媛		
审查方式和时间 Form and Date	☐ 会议审查 Review Conference，时间： ☑ 快速审查 Fast track，时间：2022 年 6 月 30 日		
审查地点 Review Site	新院 1-4A22 会议室		
审查材料 Documents for Review	1、医学临床科研项目及伦理审查申请表，v1.0 版； 2、临床研究方案，v1.0 版，2022.5.22； 3、受试者知情同意书，v1.0 版，2022.5.31； 4、研究者团队成员目录（职责）； 5、主要研究者、团队成员简历及 GCP 证书，v1.0 版； 6、研究者责任声明； 7、CRF/临床观察表，v1.0 版。		
审查意见 Comments	根据国家卫健委《涉及人的生物医学研究伦理审查办法》(2016)、WMA《赫尔辛基宣言》和 CIOMS《人体生物医学研究国际道德指南》的伦理原则，经本伦理委员会审查，同意该项目开展。 According to the Regulations and Rules of "Ethical Reviews for Biomedical Research Involving Human Subjects" (2016) the National Health Commission of PRC , "Declaration of Helsinki" of WMA, and "International Ethical Guidelines for Human Biomedical Research" of CIOMS , the project was **approved** by **ECCR** .		
主任委员/副主任委员签字 Signature of the **ECCR** Chair	陈[illegible]	签发日期 Date	2022.7.7
温州医科大学附属第一医院临床研究伦理委员会（盖章） Ethics Committee in Clinical Research of the First Affiliated Hospital of Wenzhou Medical University (Seal)			
附注（Note）： 1. 临床研究应在批准之日起 1 年内实施，逾期未实施，本批件自行废止。临床研究过程中将接受伦理委员会的跟踪审查，审查频度为自批准之日起每 12 个月一次。（伦理委员会有权根据临床试验实际开展情况改变跟			

温州医科大学附属第一医院临床研究伦理委员会专用章

版本日期：2021 年 06 月 21 日

APPENDIX E

Questionnaires in Chinese

第一部分: 人口数据问卷

注意:请仔细阅读第一部分的问题，并如实回答。请在下列空格内打勾☑或在空格内填写答案。

1. 年龄: ....

2. 职业: ....

3. 学历:

☐ 文盲 ☐ 小学 ☐ 初中 ☐ 高中 ☐ 大学及以上

4. 宗教信仰

☐ 基督教 ☐ 穆斯林 ☐ 传统的 ☐ 佛教 ☐ 其他: ....

5. 婚姻状况

☐ 已婚 ☐ 单身 ☐ 离婚 ☐ 丧偶 ☐ 同居

6. 你从过去到现在一共有多少性伴侣?

☐ 0 ☐ 1 ☐ 2 ☐ 3 ☐ 其他数量: ....

7. 生了几个小孩?

☐ 0 ☐ 1 ☐ 2 ☐ 3 ☐ 其他数量: ....

8. 第一次性行为的年龄

☐ < 18 岁 ☐ 18-20 岁 ☐ ⩾ 21 岁 ☐ 无性生活史

9. 你是否使用激素避孕 5 年以上?

☐ 是 ☐ 否

10. 你有宫颈癌家族史吗?

☐ 是 ☐ 否

11. 你抽烟吗?

☐ 是 ☐ 否

12. 你有性传播疾病史吗?

☐ 是 ☐ 否

13. 你是否做过子宫颈癌筛查?

☐ 从未做过 （如果你选择这个选项，则不需要回答 14 题）

为什么没做过？请在下面选择原因(您可以选择多于一个原因)

☐ 没有过性生活

☐ 没时间

☐ 不知道宫颈癌筛查

☐ 其他原因:..................

☐ 是... 如果是，多久做一次，请选择下面的选项:

☐ 1) 一年一次

☐ 2) 两年一次

☐ 3) 三年一次

☐ 4) 四年一次

☐ 5) 5 年一次或更久

14. 如果做过，是什么类型的筛查?（如果你用不同的方法进行多次筛选，你可以选择多于一个答案）

☐ 巴氏涂片

☐ 液基薄层细胞检测 (TCT 检查)

☐ HPV 检查

☐ 其他方式: ....

第二部分: 宫颈癌预防知识问卷

说明: 这部分是关于你对宫颈癌的认识。请仔细阅读和思考，根据你的情况选择合适的答案。请在选中的答案的空框内打勾☑。

1. 你认为下列哪项是宫颈癌的症状

☐ 外阴长结节 ☐ 腹痛 ☐ 腹部包块 ☐ 月经量多 ☐ 同房后阴道出血

2. ....

3. ....

4. ....

5. ....

6. ....

7. ....

8. ....

BURAPHA UNIVERSITY

9. ……………………………………………………………

10. 你知道定期进行妇女常见病筛查可以发现哪些疾病

□ 阴道炎 □ 子宫肌瘤 □ 宫颈炎 □ 盆腔炎 □ 以上几种疾病都可以

第三部分: 子宫颈筛查信念量表

子宫颈癌感知威胁性量表

说明:这部分是关于你对宫颈癌的感知威胁性。请在最能反映你实际工作的项目上打"√"。请回答每一个问题。

问题	非常同意	同意	不确定	不同意	非常不同意
1. 在不久的将来,我有可能患宫颈癌	5	4	3	2	1
2……	5	4	3	2	1
3……	5	4	3	2	1
4……	5	4	3	2	1
5……	5	4	3	2	1
6……	5	4	3	2	1
7……	5	4	3	2	1
8……	5	4	3	2	1
9……	5	4	3	2	1
10. 如果我患了宫颈癌,我的生命不会超过5年.	5	4	3	2	1

子宫颈癌筛检感知益处量表

说明:这部分是关于你对宫颈癌筛查的认知益处。请在最能反映你实际情况的项目上打"√"。请回答每一个问题。

问题	非常同意	同意	不确定	不同意	非常不同意
1. 如果常规做宫颈癌筛查,可有助于宫颈癌的治疗	5	4	3	2	1
2……	5	4	3	2	1
3……	5	4	3	2	1
4. 如果检查出我患有宫颈癌,那我宁愿自己不知道	5	4	3	2	1

子宫颈癌筛查的感知障碍量表

说明：这部分是关于你认为的宫颈癌筛查的障碍。请在最能反映你实际情况的项目上打勾"√"。请回答每一个问题。

问题	非常同意	同意	不确定	不同意	非常不同意
1. 我不知道去哪做宫颈癌筛查	5	4	3	2	1
2……	5	4	3	2	1
3……	5	4	3	2	1
4……	5	4	3	2	1
5……	5	4	3	2	1
6……	5	4	3	2	1
7……	5	4	3	2	1
8……	5	4	3	2	1
9. 如果自己交钱做宫颈癌筛查,我永远不会去做	5	4	3	2	1

第四部分: 宫颈癌筛查自我效能量表

说明:这部分是关于您对参加宫颈癌筛查的信心。请在最能反映你实际情况的项目上打勾 '√'。请回答每一个问题。

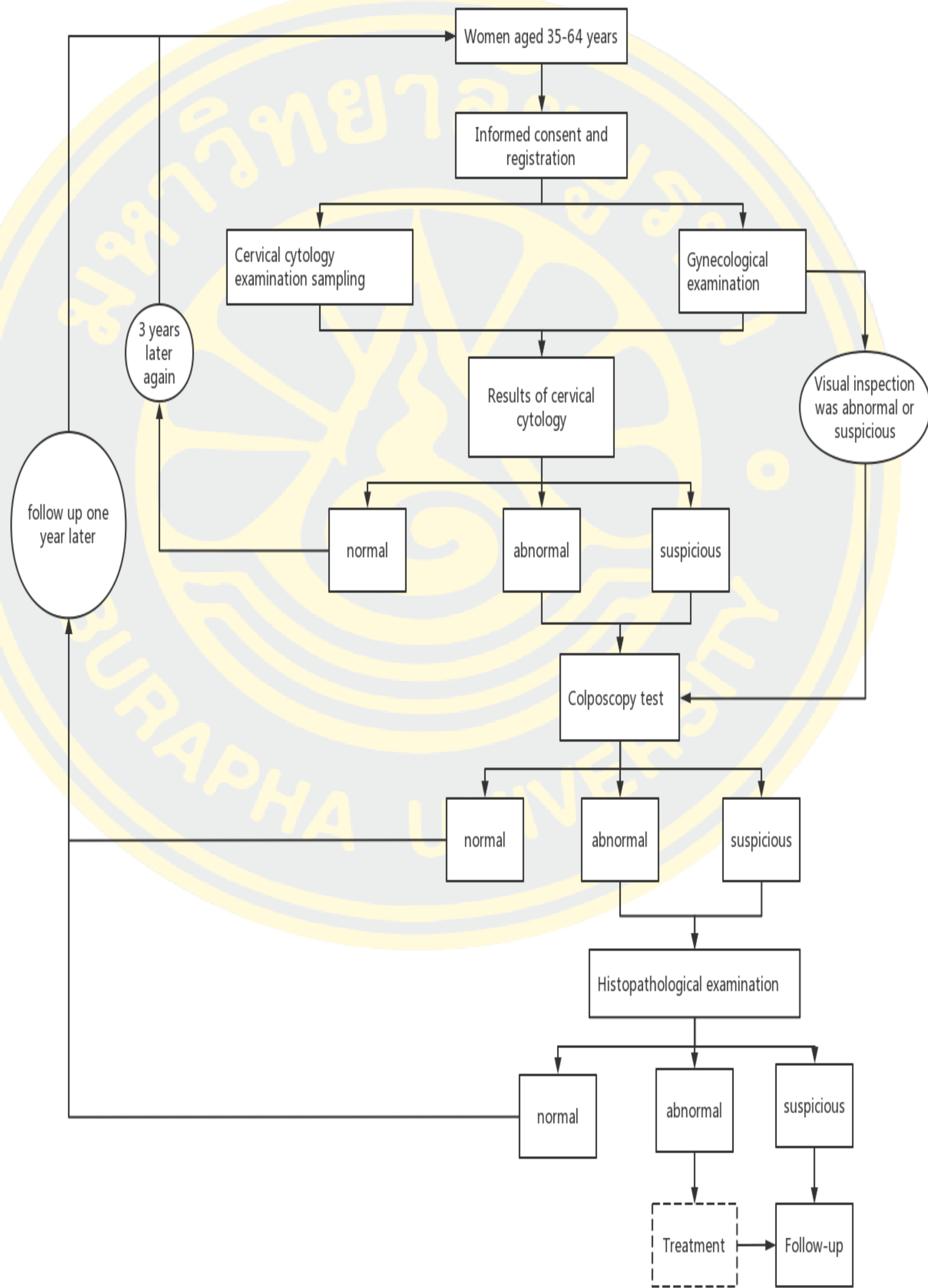
前言: 出现下列情况，您接受巴氏涂片检查(一种宫颈癌筛查方法)的可能性有多大?

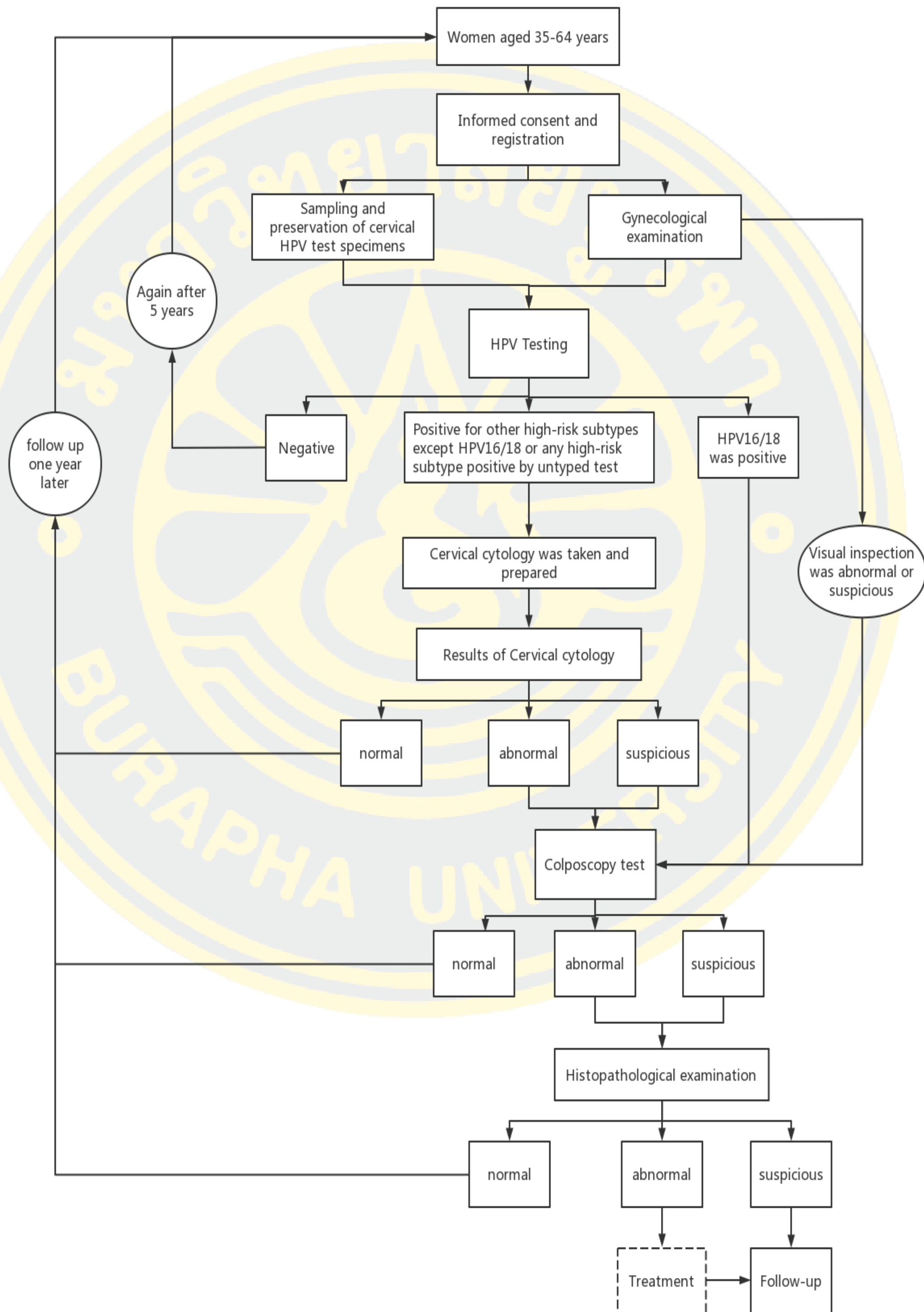
问题	一定会	很有可能	可能	不大可能	一定不会
1. 如果你上一次的宫颈检查结果是阴性的(正常的)	5	4	3	2	1
2……	5	4	3	2	1
3……	5	4	3	2	1
4……	5	4	3	2	1
5……	5	4	3	2	1
6……	5	4	3	2	1
7……	5	4	3	2	1
8……	5	4	3	2	1
9........	5	4	3	2	1
10……	5	4	3	2	1
11……	5	4	3	2	1
12……	5	4	3	2	1
13……	5	4	3	2	1
14……	5	4	3	2	1
15……	5	4	3	2	1
16. 如果你参加检查,则必须花钱雇人在这段时间看管你的孩子(或孙子等)	5	4	3	2	1

APPENDIX F

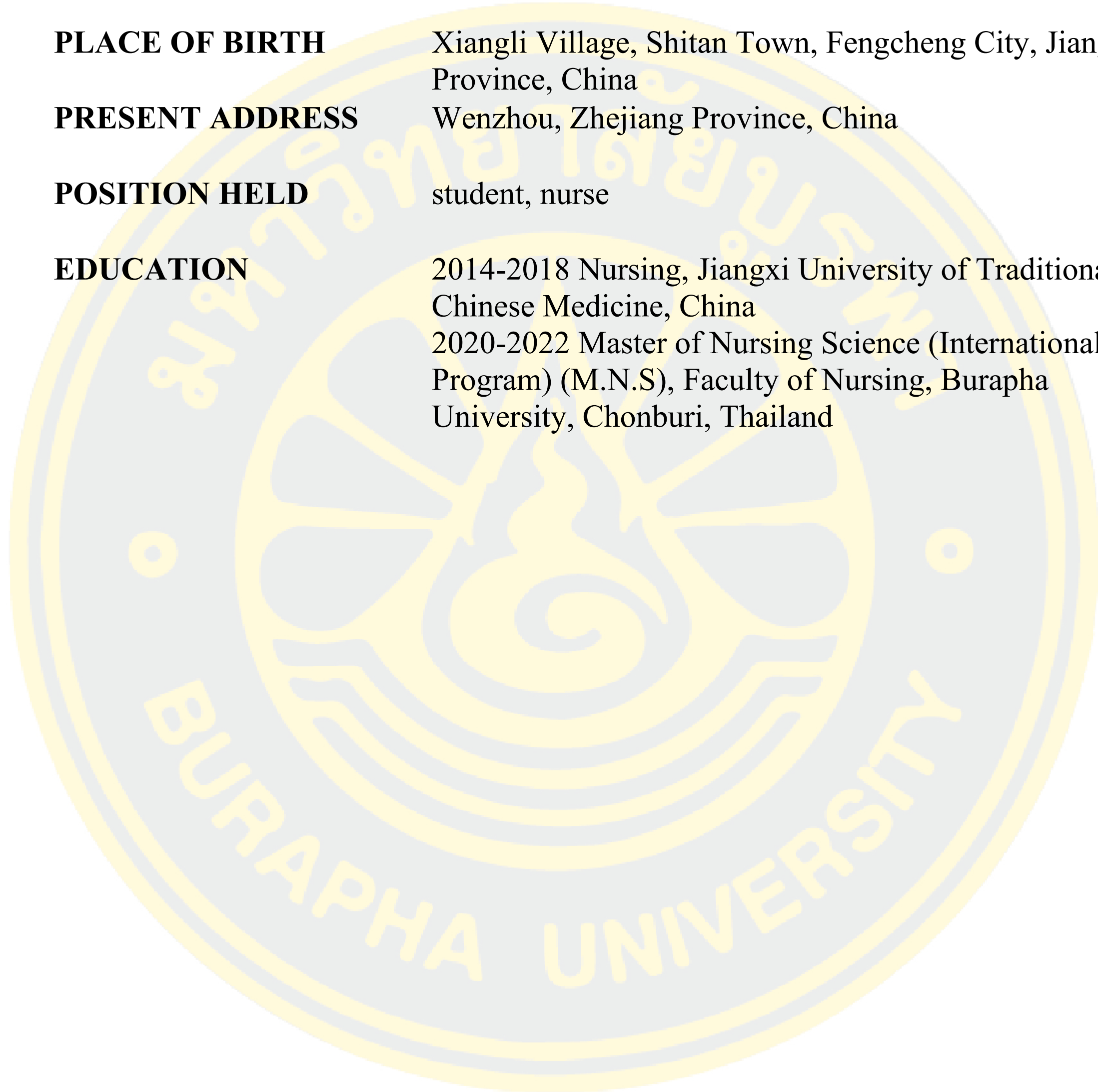
Flow chart of cervical cancer screening

Flow chart of cytological examination




Flow chart of high-risk HPV testing
Women aged 35-64 years
Informed consent and registration
Sampling and preservation of cervical HPV test specimens
Gynecological examination
Again after 5 years
HPV Testing
follow up one year later
Negative
Positive for other high-risk subtypes except HPV16/18 or any high-risk subtype positive by untyped test
HPV16/18 was positive
Visual inspection was abnormal or suspicious
Cervical cytology was taken and prepared
Results of Cervical cytology
normal
abnormal
suspicious
Colposcopy test
normal
abnormal
suspicious
Histopathological examination
normal
abnormal
suspicious
Treatment
Follow-up

BIOGRAPHY



NAME	Siyuan Xiong
DATE OF BIRTH	26 Nov 1995
PLACE OF BIRTH	Xiangli Village, Shitan Town, Fengcheng City, Jiangxi Province, China
PRESENT ADDRESS	Wenzhou, Zhejiang Province, China
POSITION HELD	student, nurse
EDUCATION	2014-2018 Nursing, Jiangxi University of Traditional Chinese Medicine, China 2020-2022 Master of Nursing Science (International Program) (M.N.S), Faculty of Nursing, Burapha University, Chonburi, Thailand