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Determinants of Cervical Cancer Screening Among Women Living In Deprived Areas: Applying the Extensive Parallel Process Model

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ABSTRACT

Background & aim: Regular Pap smear testing is an effective method for detecting cervical cancer in apparently healthy women and is considered as a health-promoting behavior. So, identifying factors related to cervical cancer screening is important. This study was conducted to determine the factors associated with cervical cancer screening among women applying Extensive Parallel Process Model (EPPM).

Methods: This study used a cross-sectional design to collect data from 409 women who visited comprehensive health service centers in the outskirts of Hamadan, western Iran. Participants were selected through cluster sampling from seven comprehensive health service centers. The data collection tool was a self-structured questionnaire containing demographic variables, as well as the EPPM constructs and was filled out through closed interview. Data was analyzed using the Pearson correlation coefficient and multiple logistic regression with SPSS 24 software.

Results: The majority of participants (79.4%) either never had a Pap smear or had not one, regularly. Several variables were found to be related to regular Pap smear, including family history of cervical cancer (OR=1.05), age at the first marriage (OR=0.41), educational level (OR=10.22), marital status (OR=1.42), and age of the women ($P<0.05$). Also, a significant relationship was seen between Pap smear and two constructs of EPPM including perceived susceptibility (OR=1.54), and perceived response efficacy (OR=1.43).

Conclusion: Several factors influence women's decision to undergo regular Pap smear. Considering the significant relationship between Pap smear and EPPM constructs, it can be used as a theoretical framework to know factors that are associated with cervical cancer screening and to tailor appropriate interventions, accordingly.

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Introduction

Cervical cancer ranks as the fourth most prevalent cancer among women and the seventh overall worldwide (1-2). The incidence of cervical cancer in Iran is increasing. It affects

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approximately 5.4 out of every 100,000 women. Annually, one out of every 123 women is diagnosed with cervical cancer, and nine out of every 100,000 women lose their lives due to this cancer (3).

While cervical cancer can develop at any age, it typically presents at an average age of 52.2 years (4). The primary risk factor for cervical cancer is human papillomavirus (HPV) infection, early marriage, engaging in sexual activity before age 18, multiple marriages, multiple pregnancies and childbirths, tobacco use, a weakened immune system, and low socioeconomic status (5). Preventative measures for cervical cancer include Pap smear testing, vaccination against human papillomavirus, avoiding tobacco use, and using condoms (5).

Screening for cervical cancer is a crucial step in preventing the disease. In its early stages, cancer is asymptomatic and can only be detected by examining cells that have been shed from the cervix (6, 7). This method identifies 13,000 invasive cancers and nearly one million pre-cancerous lesions each year (8). The Pap smear test is an effective means of detecting cervical cancer in seemingly healthy women and is considered a health-promoting behavior (9). The Pap smear test, which has been used since 1950 to reduce the incidence of cervical cancer, is key to detecting cervical malignancies (10).

It is estimated that only 5% of women in developing countries participate in Pap smear screening programs, while this figure has reached 90% in the United States (11-12). Additionally, women in rural areas face higher cervical cancer incidence and mortality rates due to barriers in prevention, early detection, and treatment (6). The lack of regular screening is associated with a 2-6 fold increase in the risk of developing cervical cancer (7). With increased public awareness, timely diagnosis, and effective treatment, more than 50% of cancer patients can enjoy a long life. Identifying related factors to cervical cancer screening is crucial (13).

The Extended Parallel Process Model (EPPM), developed by Kim Witte (1996), explains that individuals respond to risks by either taking preventive measures (risk control) or avoiding action (fear control). Their response depends on their self-efficacy and risk analysis. The outcomes can be indifference, acceptance, or rejection of the message. If individuals perceive a health threat and understand its severity, they are more likely to take action to mitigate the risk. Results from various studies have shown that the EPPM is a useful framework for evaluating women's intentions regarding health-related behaviors (14-15). It effectively guides public health campaigns and smoking cessation programs by motivating individuals to adopt healthier behaviors (16-17).

Despite the high incidence of cervical cancer and the importance of screening methods in detecting it early and reducing mortality, many women do not undergo routine Pap smear tests, as recommended by medical societies. Therefore, this study was conducted to determine the factors related to cervical cancer screening in women applying Extended Parallel Process Model.

Materials and Methods

This study was a cross-sectional research, and the study population consisted of women who sought health care either for themselves or their children in comprehensive health service centers on the outskirts of Hamadan, western Iran.

Cluster sampling was used to collect data from comprehensive health service centers located on the outskirts of the city. In Hamadan city, there are 14 urban comprehensive health service centers that provide health and treatment services to the population on the city outskirts. After calculating the desired sample size, seven centers were selected, and participants were selected from each center via simple random sampling from women with a file in the SIB system (Integrated Health system). The study included sexually active women aged between 20 and 65 who got married at least once, with a minimum of 12 months having passed since their first marriage. Individuals were excluded from the study if they did not provide their consent to participate or hysterectomy.

In a similar study (18), it was reported that the regular screening behavior for cervical cancer was 11%. With a significance level of 0.05 and an estimated error of 0.036, a sample size of 291 individuals was determined. Given

that the study employed cluster sampling, the estimated sample size was increased by a factor of 1.5, reaching a sample size of 436 women. However, due to the dropouts, data from 409 women were collected.

To collect data a researcher-made questionnaire, which was developed based on the constructs of the EPPM regarding cervical cancer screening, was used. It consisted of two sections. The first section was related to background variables, including age, age at first marriage, marital status, educational status, occupational status, history of cervical cancer in first-degree relatives, history of any uterine disease, and having regular Pap smears (Pap smear for three consecutive years and every three years if there is no problem). The second section of the questionnaire included questions that measured the constructs of the EPPM in four parts. Perceived susceptibility, perceived severity, perceived response efficacy, and perceived self-efficacy were measured each by three questions. To answer these questions, five answers were considered: strongly agree, agree, no opinion, disagree, and strongly disagree. The minimum and maximum scores obtained in these constructs was 3 to 15.

The questionnaire underwent a thorough validation process to ensure its content and face validity. Content validity was assessed by having the questionnaire reviewed by 10 experts in health education and reproductive health. Questions that did not meet the desired content validity ratio (CVR) and content validity index (CVI) were revised based on expert feedback. A score above 0.79 was considered acceptable. Face validity was assessed by having the questionnaire reviewed by 5 women in comprehensive health service centers, and corrections were made based on their feedback.

A pilot study was also conducted on 30 women in comprehensive health service centers to assess the reliability of the questionnaire. The Cronbach's alpha coefficient was used to measure the internal consistency of the questionnaire, with acceptable coefficients found for variables related to perceived susceptibility (α=0.70), perceived severity (α=0.73), perceived response efficacy (α=0.75), and perceived self-efficacy (α=0.84). This indicates that the questionnaire has good reliability and can be used to accurately measure the constructs it is intended to assess. Data collection was conducted through interviews using a self-structured questionnaire based on the EPPM constructs.for this purpose, closed interviews were conducted with women in the training room of comprehensive health service centers.

Data was analyzed using SPSS24 software, with a significance level of 5% for the tests. Inferential statistics, including the Pearson correlation coefficient and binary logistic regression, were employed to determine the relationships between the variables. It should be noted that by performing a univariate logistic regression, initially, the variables with a p-value of less than 0.2 were selected and entered into the multivariable analysis.

Results

Our survey received 409 completed questionnaires, resulting in a 93.81% response rate.

Table 1. Socio-demographic characteristics of women (N= 409)

Variable	N (%)	Mean±SD
Age (years)		
20-30	132 (32.3)	
31-40	150 (36.7)	
41-50	102 (24.9)	36.1±9.1
≥51	25 (6.1)	
Age at first marriage (years)		
<20	241 (58.9)	20.6±4.8
≥20	168 (14.1)	
Marital status		
Married	397 (97.0)	
Divorced/ Widowed	12 (3.0)	
Occupational status		
Employed	89 (21.7)	
Unemployed	320 (78.3)	
Educational level		
High school	249 (60.9)	
Diploma	51 (12.5)	
College degree	109 (26.6)	
History of any type of cervical disease		
No	403 (98.5)	
Yes	6 (1.5)	
Family history of cervical cancer		
No	377 (92.2)	
Yes	32 (7.8)	
Having regular Pap smear test		
No, or irregular Pap smear	325 (79.4)	
Regular Pap smear	84 (20.6)	

The Mean±SD age of women in this study was 36.1±9.1 years, and most of the women participating in the study were under 20 years old at the time of marriage (58.9%). Additionally, 78.3% of the women were not employed, and 97% of the women in the study were married. The majority of women in this study had an education level lower than a high school diploma (60.9%). Only 1.5% of the women in the study reported a history of any kind of cervical disease. Furthermore, 7.8% of the women in the study reported having a family history of cervical cancer. The women participating in the study reported that 20.6% of them regularly perform Pap smear tests, while the rest either do not perform them or do so irregularly (Table 1). There was a positive correlation between perceived susceptibility and perceived severity (r=0.267, P<0.001). Additionally, both perceived susceptibility (r=0.225, P<0.001) and perceived severity (r=0.579, P<0.001) were positively associated with perceived response efficacy. Furthermore, perceived susceptibility (r=0.353, P<0.001), perceived severity (r=0.439, P<0.001), and perceived response efficacy (r=0.508, P<0.001) were all positively associated with perceived self-efficacy (Table 2).

Table 2. Descriptive statistics and correlations among the constructs of Extended Parallel Process Model (N = 409)

Constructs	Range	Lowest score	Highest score	Mean ±SD	Maximum score achievable*	1 *r*(*P*)	2 *r*(*P*)	3 *r*(*P*)	4 *r*(*P*)
Perceived Susceptibility	3-15	3	15	10.8±3.3	65.0	1			
Perceived Severity	3-15	6	15	11.1±2.3	56.6	0.267 (0.001)	1		
Perceived Response Efficacy	3-15	9	15	12.9±1.7	65.0	0.225 (0.001)	0.579 (0.001)	1	
Perceived Self-Efficacy	3-15	6	15	12.3±2.5	70.0	0.353 (0.001)	0.439 (0.001)	0.508 (0.001)	1

*Maximum score achievable= Mean- lower/ upper- lower *100

The results showed that perceived susceptibility and perceived response efficacy were positively associated with regular Pap smears (OR=1.46; 95% CI=1.23–1.96 and OR=1.54; 95% CI=1.08–1.87, respectively). The analysis also showed that women aged 31-40 and 41-50 had a significantly higher likelihood of not doing a Pap smear or doing it irregularly, with 0.6% and 0.10% reductions, respectively, compared to other women (P<0.05). Women with a family history of cervical cancer had a higher likelihood of having regular Pap smears compared to other women (OR=1.24; P=0.018). The likelihood of having regular Pap smears decreased with age at first marriage ≥20 years (OR=0.54; 95% CI=0.30–0.88). The likelihood of not doing a Pap smear or doing it irregularly decreased with a diploma among women compared to other education levels (OR=11.13; P=0.001). Women who reported being divorced/widowed had approximately 1.74 times higher likelihood of having regular Pap smears (P=0.016). Nevertheless, no significant association was found between regular Pap smears and other variables (Table 3).

Table 3. Associations between socio-demographic characteristics and Extended Parallel Process Model constructs with having regular Pap smear in women (N = 409)

Variable	Univariate OR (95% CI)	P-Value	Adjust OR (95% CI)	P-Value
Social- demographic characteristics				
Age (years)				
20-30	Ref*		Ref*	0.001

Variable	Univariate OR (95% CI)	P-Value	Adjust OR (95% CI)	P-Value
31-40	0.21 (0.10-0.70)	0.001	0.06 (0.03-0.19)	0.001
41-50	0.19 (0.13-0.52)	0.001	0.10 (0.03-0.62)	0.005
≥51	1.24 (0.80-1.70)	0.189	0.27 (0.09-1.23)	0.199
Marital status				
Married	Ref*		Ref*	0.001
Divorced/ Widowed	1.55 (1.40-3.70)	0.032	1.74 (1.12-3.48)	0.016
Educational level				
High school	Ref*		Ref*	0.001
Diploma	2.98 (2.14-19.70)	0.015	11.13 (4.09-25.86)	0.001
College degree	1.39 (0.77-1.65)	0.168	2.21 (0.83-4.99)	0.248
Age at first marriage (years)				
<20	Ref*		Ref*	
≥20	0.29 (0.17-0.64)	0.001	0.54 (0.30-0.88)	0.015
Occupational status				
Employed	Ref*			
Unemployed	2.78 (0.13-10.77)	0.579	-	-
History of any type of cervical disease				
No	Ref*			
Yes	2.52 (0.78-15.23)	0.459	-	-
Family history of cervical cancer				
No	Ref*		Ref*	
Yes	1.78 (1.17-1.99)	0.021	1.24 (1.05-1.48)	0.018
EPPM constructs				
Perceived Susceptibility	1.22 (1.09-1.63)	0.033	1.46 (1.23-1.96)	0.021
Perceived Severity	1.11 (0.53-1.19)	0.187	1.26 (0.93-1.54)	0.215
Perceived Response Efficacy	1.45 (1.21-1.79)	0.006	1.54 (1.08-1.87)	0.006
Perceived Self-Efficacy	1.34 (0.89-1.62)	0.098	0.88 (0.67-1.15)	0.085

* The dependent variable is having regular Pap smears, where "No or irregular Pap smear" is coded as 0 and "Regular Pap smear" is coded as 1

Discussion

The results of the present study showed that 20.6% of the study participants had regular Pap smear tests. Similar studies in Iran have shown that a small percentage of women regularly undergo Pap smear tests for cervical cancer screening (19-21). It has also been reported that the rate of Pap smear screenings is low in other developing countries as well (22, 23). Encouraging women to participate in cervical cancer screening programs based on appropriate educational programs can lead to early diagnosis, simpler treatments, and reduced mortality (24).

The present study found that the rate of Pap smear screenings was lower in the age group of 30-50 years, and younger women were more likely to undergo the Pap smear test compared to middle-aged and older women. In a study by Saberi et al., the age of individuals undergoing the test was mostly between 30-39 years, and the rate of Pap smear screenings decreased with increasing age (25). Another study by Ho et al. (2011) also demonstrated that the rate of Pap smear screenings is lower in women above 40 years old (26). The higher prevalence of Pap smear screenings among younger women may be due to their increased awareness and higher utilization of maternal and child health services provided by healthcare centers (24).

We also found that there was an association between the level of education and compliance with Pap smear tests. Women with a high school diploma or less education had undergone more Pap smears than women with a university education. Alves' study (2019) reported that women with lower levels of education had undergone more Pap smear tests than educated women (27). However, several other studies have shown a relationship between higher levels of education and the performance of Pap smear tests (28-30). For instance, in Abuliz's study (2018), it was found that women with higher levels of education were more aware of cervical cancer and were more likely to undergo

regular examinations and Pap smear tests (30). Nonetheless, some studies have not reported any relationship between the level of education and the performance of Pap smear tests (31-32). In the present study, it is suggested that this result may be due to the awareness and information that these women (women with lower education) receive from visiting public health service centers, which increases their tendency to perform Pap smear tests.

A statistically significant correlation was found between perceived susceptibility and the regular performance of Pap smear tests in our study. The results showed that the higher the perceived susceptibility, the more likely women were to perform regular Pap smear tests. These findings are consistent with previous studies, which have shown that high perceived susceptibility increases the likelihood of women performing Pap smears (18, 33-35). In a study conducted by Mahboubi et al (2016), it was found that the average perceived susceptibility among women who regularly performed Pap smear tests was higher than among those who performed them irregularly or not at all. Additionally, low perceived susceptibility was identified as the primary reason for not performing Pap smears (18). For instance, in a study by Demirtas et al (2013), it was reported that women did not perform Pap smear tests due to low perceived susceptibility (35). This can be explained by the fact that individuals must be aware of their risk of developing cervical cancer to perform regular Pap smears.

This study found a statistically significant correlation between perceived response efficacy and the performance of Pap smear tests. The results showed that the higher the perceived response efficacy, the more likely women were to perform Pap smears. These findings are consistent with other studies, which have also reported a statistically significant relationship direct between perceived response efficacy and the performance of Pap smear tests (36-37). This can be explained by the fact that individuals who perceive themselves as more capable of performing Pap smear tests are more likely to do so.

One of the limitations of this study was that it is based on self-reporting. Additionally, this study was not conducted among all social groups of women in the urban areas of Hamadan for comparison between these groups. Also, one of the weaknesses of this study is the lack of sufficient attention to cultural and social factors that can influence women's behavior to do screening.

Conclusion

This study showed that cervical cancer screening is not widely practiced among women in the outskirts of Hamadan city. Several factors influenced their decision to undergo regular Pap smear. The EPPM can be used as a theoretical framework to design and implement interventions that can increase the awareness and motivation of women to participate in cervical cancer screening.

Declerations

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This project has been approved by Deputy of Research and Technology, Hamadan University of Medical Sciences, Hamadan, Iran.

Conflicts of interest

The authors declared no conflicts of interest.

Ethical considerations

Permission was obtained from the Research Council of Hamadan University of Medical Sciences, Hamadan, Iran. Before conducting individual interviews with those who were willing to participate in the study, women were informed by the interviewer about objectives of the study and signed informed consent from.

Code of Ethics

The study was approved by the Ethics Committee of Hamadan University of Medical Sciences (Ethical code: IR.UMSHA.REC.1402.374).

Use of Artificial Intelligence (AI)

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Authors' contribution

MA: conceptualization, methodology, validation, investigation, visualization, writing original draft, review and editing manuscript as well as supervision. SM, ZA, EE, MSJ: conceptualization, data curation and original draft preparation. SB: conceptualization, methodology, data curation, validation and investigation. All authors read and approved the final manuscript.

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