

Original Article



Prediction of the factors influencing cervical cancer screening using the extended protection motivation model: A path analysis

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Abstract

Background and aims: Cervical cancer is one of the most common cancers of the female reproductive system. Despite the importance of cervical cancer screening in early detection, the uptake of screening is poor. The present study aimed to predict the factors that influence the cervical cancer screening behavior of Iranian women visiting health centers.

Methods: This cross-sectional study was performed on 661 women of reproductive age referred to health centers in Karaj, Iran, in 2021, who were selected by convenience sampling. Data collection was performed with a multi-sectional questionnaire designed to collect information about demographic characteristics and constructs of Protection Motivation Theory (PMT) and emotional support. Data analysis was performed using SPSS version 24.0, and AMOS version 24.

Results: The mean age of the participants was 38.2 ± 13.77 . Most of the participants had a high school diploma and a moderate socioeconomic status. The results showed the direct effect of intention on behavior ($\beta=0.54$) and the direct effect of fear on intention ($\beta=-0.66$). Perceived self-efficacy had the greatest indirect effect on behavior through intention ($\beta=0.34$). All protection motivation constructs except response cost ($\beta=0.06$) showed a significant effect on cervical cancer screening behavior. Model fit indices showed the good capability of the extended protection motivation model to predict cervical cancer screening behavior.

Conclusion: Perceived self-efficacy is the strongest predictor of cervical cancer screening behavior, and emotional support affects this behavior through self-efficacy and intention. Therefore, it is recommended to pay attention to these factors when designing and planning educational interventions for improving cervical cancer screening behavior.

Keywords: Cervical cancer, Pap smear, Screening, Protection motivation theory, Path analysis

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Introduction

Cervical cancer is the second most common cancer in women after breast cancer and one of the leading causes of death in women in developing countries. Most people with this cancer live in poor and low-income countries (1). Although cervical cancer occurs in women of all ages, the mean age of patients with this cancer is 52.2 years, and its peaks are observed at age ranges of 35-39 and 60-64 (2).

One of the primary methods of early detection of precancerous abnormalities is screening. In the case of cervical cancer, Pap smear is one of the most successful screening procedures (3,4).

From an epidemiological perspective, the prevalence of cervical cancer among Iranian women is increasing and its incidence is higher in central parts of the country than in other regions (5). Considering the increasing prevalence of risk factors of cervical cancer due to lifestyle

changes, including smoking, multiple sexual partners, human papillomavirus infection, use of birth control pills, multiple pregnancies, obesity, stress, and psychological pressures, there are concerns about the future prevalence of this cancer in Iran (5,6).

Studies have shown that in Iran, factors such as younger age and higher education level are positively correlated with the likelihood of being screened. Poor risk perception, poor knowledge of symptoms, not knowing where screening tests are performed, fear and embarrassment, the cost of the test, the behavior of health care providers, and ways of interacting with people are some of the factors that can negatively affect the likelihood of participation in screening in Iran (1,7).

As far as prevention is concerned, even the most effective training program needs to be reviewed and changed over time (8). Moreover, such a program can only be effective

if it is firmly grounded in theory (9). Therefore, one of the first prerequisites for designing appropriate intervention and training programs is to identify the factors that influence people's preventive behaviors.

One of the theories that can strongly predict people's preventive behaviors is the Protection Motivation Theory (PMT) (10,11). PMT was introduced in 1975 by Rogers, which is a theory based on the concept of fear appeals that can be used to understand and predict a person's intention of engaging in health protection behaviors. This theory posits that protection behaviors are governed by two processes: threat appraisal and coping appraisal. Threat appraisal refers to a person's assessment of factors that influence the likelihood of unhealthy behaviors, including perceived susceptibility, perceived severity, and perceived reward for unhealthy behavior. Coping appraisal refers to people's assessment of their ability to deal with or eliminate the threat, including perceived self-efficacy, perceived response efficacy, and perceived response cost. These two cognitive processes combine to form the protection motivation (intention) (12). Based on the existing evidence, the constructs of this theory can properly predict cancer-preventing behaviors (13). A study in this field has shown that several constructs including fear, response efficacy, and self-efficacy can very well predict cervical cancer screening behavior (14). Understanding the factors that influence this behavior, their importance, and their direct and indirect effects can help health planners and educators design more effective educational interventions (15).

Many factors may influence the behavior of women to

engage in cervical cancer screening services (16). Based on studies, social support is one of the factors that can play a strong role in predicting health behaviors through its emotional dimension (17,18). Different studies have been conducted to determine the factors affecting cervical cancer screening behavior with the aim of designing educational interventions (16,19). Regarding the importance of the subject, the objective of this research was to identify PMT variables and emotional social support construct associated with cervical cancer screening behavior in women visiting the health centers located in the city of Karaj, Iran (Figure 1).

Materials and Methods

The study was designed as cross-sectional research and was performed on 661 women of reproductive age visiting the health centers in Karaj, the capital of Alborz province of Iran, in 2021. The participants were selected through multi-stage sampling, which included dividing the city into four zones based on their socio-economic status (high, above average, below average, low) and selecting 5 health centers. This division was based on housing prices, as well as the income and occupation of individuals. The centers were selected from each zone based on the number of visitors proportional to the size of the covered population. Next, eligible individuals were selected in person using the convenience sampling method. The inclusion criteria were basic literacy (reading and writing), the age range of 20 to 65 years, consent to participate in the study (filling the informed consent form), no history of hysterectomy, and being sexually active. Ultimately, 661 women entered

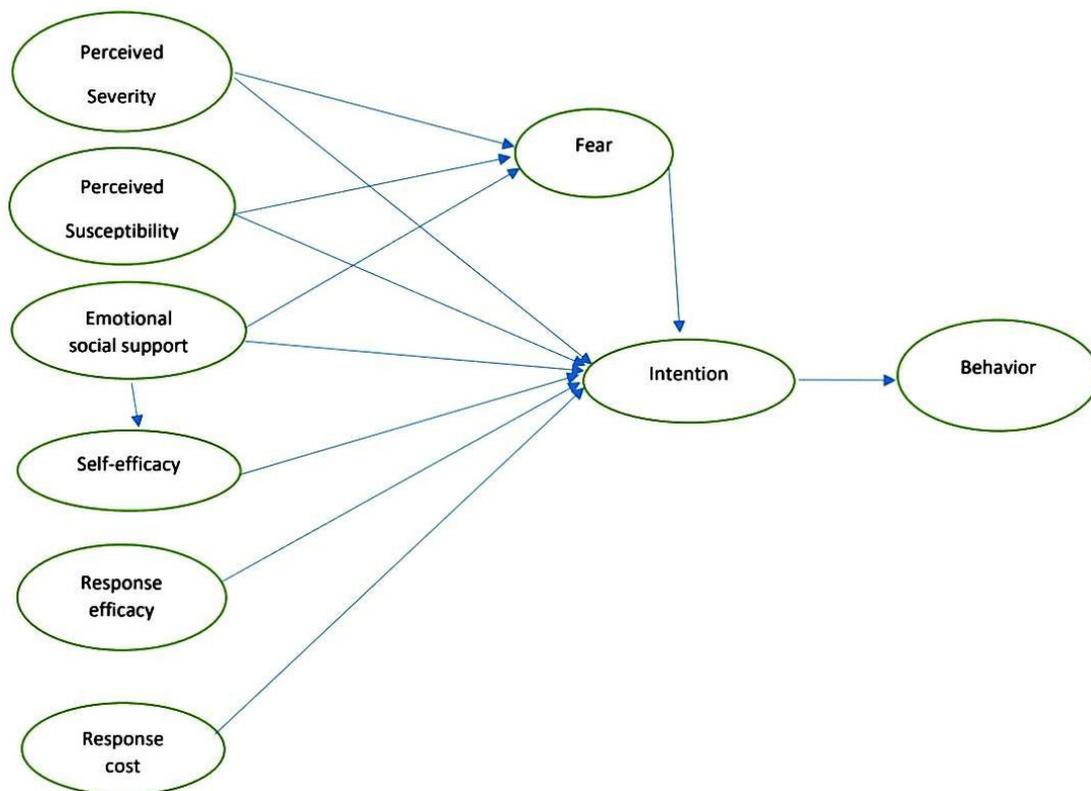


Figure 1. Proposed casual model of the research variables based on the extended protection motivation theory.

the study.

To determine the sample size, the following formula was applied:

$$n = \frac{(Z_{1-\frac{\alpha}{2}} + Z_{1-\beta})^2}{(cr)^2} + 3$$

$$cr = 0.5 \log((1-r)/(1+r))$$

Based on a previous study (20), $r=0.124$ was selected as the maximum correlation coefficient between protection motivation and perceived severity. Moreover, 95% confidence ($1-\alpha=0.95$) and 80% test power were considered for the test.

Accordingly, the minimum sample size was calculated to be 509, which was then multiplied by 1.3 to factor in the effect of cluster sampling design, increasing the sample size to 661.

The researchers personally visited all the health centers to better communicate with the participants. In each visit, the leading researcher (MK) explained the research objectives to potential participants, and those who wished to participate were asked to fill out an informed consent form. The questionnaire was then distributed among the participants with due attention to ethical principles and collected after about 10-15 minutes. The data collection tool was a self-administered multi-sectional questionnaire based on the PMT, which included a researcher-made questionnaire of emotional social support for cervical cancer screening.

Instruments

The multi-sectional questionnaire consisted of 34 items grouped in three sections. The first section was dedicated to collecting demographic information including age, education level, marriage length, gravida, history of Pap smear, employment status, economic status, and health insurance. The second section of the questionnaire was comprised of the PMT constructs for the assessment of cervical cancer screening, which has been designed and psychometrically evaluated by Dehdari et al (16) for Iranian women of reproductive age.

The third section of the questionnaire was concerned with emotional social support, which was designed and psychometrically evaluated by the authors. The emotional social support is measured by 8 items such as: "I have people to accompany me when I visit a doctor to undergo screening".

The validity of the emotional social support questionnaire was assessed through the content analysis method using the opinions of 12 experts, including 5 people with PhD in health promotion sciences, 4 people with PhD in health psychology, 2 people with PhD in social determinants of health, and 1 person with PhD in social medicine. The reliability of the questionnaire was assessed by Cronbach's alpha and the test-retest method. The Cronbach's alpha of the questionnaire was

determined to be 0.79 and its intra-cluster correlation coefficient was calculated to be 0.93.

The questionnaire of Protection Motivation/Emotional Social Support for cervical cancer screening was scored on a 5-point Likert scale with options ranging from completely disagree (with a score of 1) to completely agree (with a score of 5).

Statistical analysis

The descriptive part of the data was analyzed in SPSS version 24.0 and the data related to path analysis were analyzed in AMOS version 24.0. Since the variance tolerance interval was close to 1 and the variance inflation factor was less than 2, it was concluded that there is no collinearity between the predictor variables. The normality of the multivariate distribution was checked using Mardia's multivariate kurtosis coefficient, which showed the normal distribution of the research data.

The presence of a significant correlation between variables was assumed as a precondition for path analysis. Perceived susceptibility, perceived severity, emotional social support, perceived self-efficacy, response efficacy, and response cost were considered as predictor variables, fear and intention were considered as mediating variables, and behavior was considered as the dependent variable. Model fitting was performed using the chi-square divided by degree of freedom (χ^2/df), root mean square error (RMSE), normed fit index (NFI), non-normed fit index (NNFI), comparative fit index (CFI), goodness of fit index (GFI), and adjusted goodness of fit (AGFI) (Table 1).

Results

The mean age of participants was 38.2 ± 13.77 and the age range with the highest frequency (40.5%) was 31-40 years. The majority of participants (77.3%) were housewives and the education level with the highest frequency (32.1%) was high school diploma. Other demographic characteristics of the participants are shown in Table 2.

The mean and standard deviation of perceived susceptibility and perceived severity were 9.51 ± 2.49 and 13.7 ± 3.44 , respectively. The mean and standard deviation of other constructs are reported in Table 3.

The correlations between the variables are shown in Table 4. The strongest correlation was observed between self-efficacy and intention.

Structure model

The fitted model (Figure 2) confirmed the direct effect of intention on behavior ($\beta=0.54$, $P<0.05$) and the direct

Table 1. Indicators for Model Fit

Fit indices	df/ χ^2	RMSE	NFI	NNFI	CFI	GFI	AGFI
Values obtained	2.35	0.06	0.91	0.93	0.95	0.94	0.92
Limit	>3	>0.1	<0.9	<0.9	<0.9	<0.9	<0.9

Note: df: Degree of freedom, RMSE: Root mean square error, NFI: Normed fit index, NNFI: Non-normed fit index, CFI: Comparative fit index, GFI: Goodness of fit index, AGFI: Adjusted goodness of fit.

Table 2. Frequency distribution of demographic characteristics among the participants (n=661)

Variable	N	%
Age		
20-30	183	27.7
31-40	268	40.5
41-50	144	21.8
51-60	54	8.2
>60	12	1.8
Education		
High school	200	30.3
Diploma	212	32.1
Associate diploma	31	4.7
Bachelor	164	24.8
Master	45	6.8
PhD	9	1.3
Marriage length		
1-10	293	44.3
11-20	215	32.5
21-30	97	14.7
31-40	56	8.5
Employed		
Yes	150	22.7
No	511	77.3
Insurance		
Yes	429	64.9
No	232	35.1
Gravida		
0	52	7.9
1 or 2	476	72.1
>3	133	20
Economic status		
High	32	4.8
Middle	484	73.3
Low	145	21.9

Table 3. Mean and standard deviation of the constructs of protection motivation theory and emotional social support (n=661)

Variable	Mean	SD	N
Perceived susceptibility	9.51	2.49	661
Perceived severity	13.70	3.44	661
Fear	9.05	3.17	661
Response cost	5.79	2.21	661
Response efficacy	16.9	2.80	661
Perceived self-efficacy	28.16	5.70	661
Emotional social support	28.71	5.40	661
Intention	11.59	2.48	661
Behavior	1.34	0.48	661

effect of fear on intention ($\beta = -0.66, P < 0.05$). The results showed that among the studied variables, perceived self-efficacy (through intention) has the greatest indirect

effect on behavior ($\beta = 0.34, P < 0.05$). The indirect effect of response cost on behavior (through intention) was not confirmed ($\beta = -0.06, P > 0.05$). Perceived severity ($\beta = 0.21, P < 0.05$) and emotional social support ($\beta = 0.17, P < 0.05$) were found to have an indirect effect on behavior (through fear and intention), but perceived susceptibility did not show such an effect ($\beta = -0.1, P > 0.05$). The results showed that response efficacy has an indirect effect on behavior ($\beta = 0.14, P < 0.05$). All of these paths are shown in Table 5.

Discussion

This study aimed to investigate the factors affecting cervical cancer screening based on the PMT in women referred to health centers in Karaj. Path analysis was used to assess expanded PMT (with emotional support construct) and predict the cervical cancer screening behavior. Based on the fit indicators, adequate fitting of the model was observed.

Findings showed that intention alone is the strongest direct predictor of cervical cancer screening behavior. In a meta-analysis, the strongest and most stable association was observed between intention and behavior (21). According to the PMT, the intention is significantly associated with behavior and tends to have a moderate to strong correlation with behavior and be the best predictor of this variable. Protection motivation, which is synonymous with intention, can encourage a person to start or continue a health protection behavior. Therefore, as intention increases, so does the likelihood of adaptive cervical cancer screening behavior. This finding is consistent with the results of some previous studies (20,22). In the present study, fear had an indirect effect on behavior through intention (fear \rightarrow intention \rightarrow behavior). This was an inverse relationship, indicating that as fear increases, the person's intention to engage in screening behavior decreases. This finding is inconsistent with the results of a study by Dehdari et al (23), where no significant relationship was found between fear and intention. This discrepancy can be due to differences in studied populations and cognitive assessments of participants. When a person's assessment leads to a lot of fear, the person may engage in behaviors such as avoidance and denial to reduce emotional threat and fear, which can have a negative effect on the intention (24). A certain level of fear can be a predictor of screening behaviors, but high levels of fear and anxiety combined with low confidence in screening methods can act as a barrier to screening (25).

The results of this study also showed that perceived severity affects cervical cancer screening behavior through intention, which is consistent with the findings of previous studies (20,26,27). Perceived severity also affects the screening behavior of the studied women by affecting intention through fear (perceived severity \rightarrow fear \rightarrow intention \rightarrow behavior). Fear can act as both a barrier and a facilitator depending on factors such as psychological

Table 4. Matrix of correlation between perceived susceptibility, perceived severity, fear, response cost, response efficacy, perceived self-efficacy, emotional social support, intention, and behavior

	Perceived susceptibility	Perceived severity	Fear	Response cost	Response efficacy	Perceived self-efficacy	Emotional social support	Intention	Behavior
Perceived susceptibility	1								
Perceived severity	0.26**	1							
Fear	0.57**	0.39**	1						
Response cost	-0.20**	-0.28**	0.45**	1					
Response efficacy	0.19**	0.17*	-0.61**	-0.29**	1				
Perceived self-efficacy	0.48**	0.56**	-0.71**	-0.55**	0.33**	1			
Emotional social support	0.43**	0.37**	-0.56**	0.14	0.29**	0.73**	1		
Intention	0.52**	0.49**	-0.73**	-0.16*	0.44**	0.81**	0.59**	1	
Behavior	0.61**	0.54**	-0.45**	-0.32**	0.60**	0.64**	0.53**	0.66**	1

*Significant at 0.05; **Significant at 0.01.

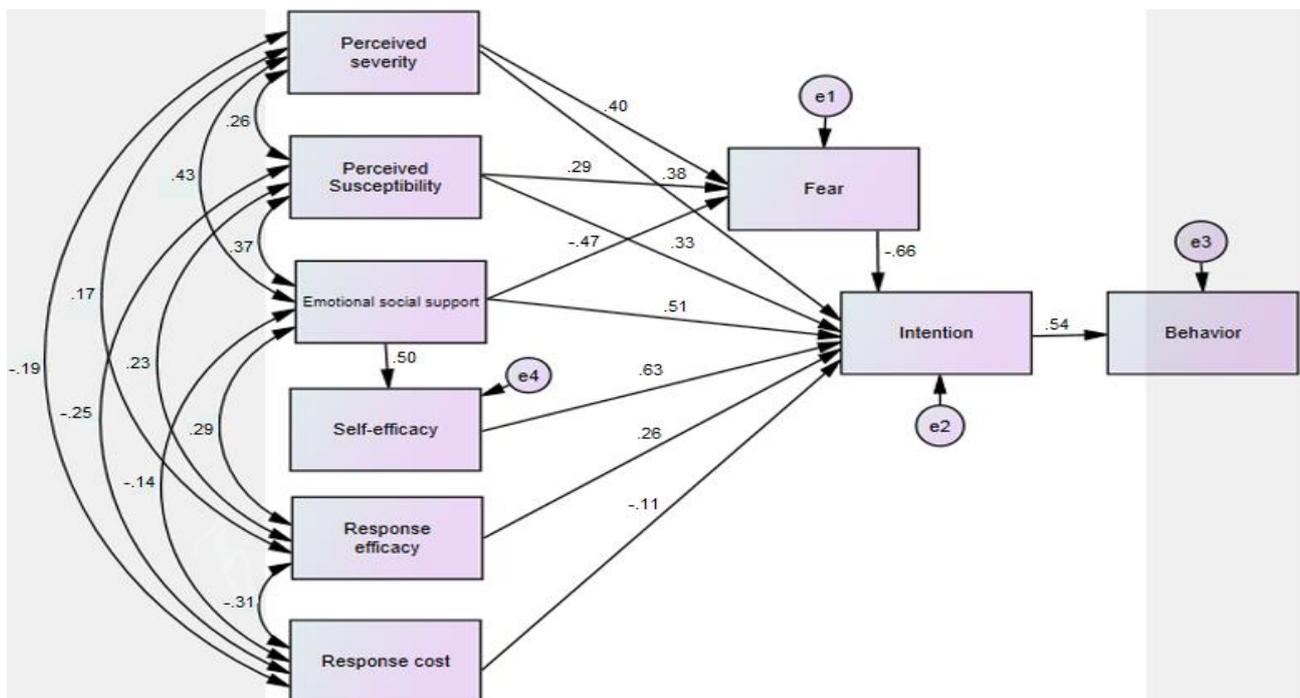


Figure 2. Path analysis of protection motivation theory with the emotional social support for predicting cervical cancer screening behavior.

Table 5. Path coefficients and significance of direct and indirect effects of protection motivation model and emotional social support variables on behavior

Independent variable	Dependent variable	Direct/indirect effect	Total effect	t-value	P value
Intention	behavior	Direct	0.54	6.23	0.001
Fear	intention	Direct	-0.66	-6.94	0.001
Emotional social support	Perceived self-efficacy	Direct	0.50	6.07	0.001
Fear	Behavior	Indirect (through intention)	-0.35	-4.63	0.001
Perceived severity	Behavior	Indirect (through intention)	0.21	3.19	0.001
Perceived susceptibility	Behavior	Indirect (through intention)	0.18	2.89	0.003
Emotional social support	Behavior	Indirect (through intention)	0.28	3.75	0.001
Perceived self-efficacy	Behavior	Indirect (through intention)	0.34	4.61	0.001
Response efficacy	Behavior	Indirect (through intention)	0.14	2.31	0.009
Response cost	Behavior	Indirect (through intention)	-0.06	-1.06	0.13
Perceived severity	Behavior	Indirect (through intention and fear)	-0.14	2.32	0.008
Perceived susceptibility	Behavior	Indirect (through intention and fear)	-0.10	-1.64	0.07
Emotional social support	Behavior	Indirect (through intention and fear)	0.17	2.86	0.004

assessments made by individuals. Fear can affect intent and behavior if people conclude that the recommended behaviors can help them live better lives and reduce their fear (24). According to a previous study (13), if people feel threatened by a health threat and believe it to be serious, it can increase their health concerns and therefore their motivation to engage in healthy behaviors, which increases the likelihood of participating in screening.

Similar to perceived severity, perceived susceptibility was found to affect cervical cancer screening behavior through intention. People's perceived susceptibility to diseases varies depending on their perceptions and attitudes. The existing evidence also suggests that perceived susceptibility facilitates screening activities such as Pap smear tests (6).

The indirect effect of perceived susceptibility on behavior via its effect on intention through fear was found to be insignificant (perceived susceptibility → fear → intention → behavior), which is consistent with the findings of a study conducted by Bakht et al (6). According to a previous study (28), most Iranian women believe that they are not susceptible to cervical cancer because they have no family history of this cancer. Therefore, they consider themselves immune to this disease, which can act as a barrier to screening.

The results obtained from the fitted model also showed that self-efficacy has a strong effect on the intention to engage in the behavior. This construct expresses people's perception of their ability to perform a Pap smear. According to Bandura and Adams (29), self-efficacy is the most important precondition for behavior change. These researchers reported that self-efficacy has a strong effect on health behavior and a person with low self-efficacy is less likely to engage in healthy behaviors. This finding is consistent with the results of previous studies (22,30).

In the present study, a significant relationship was also observed between emotional social support and self-efficacy. Social support can affect a person's relationship with others by making them feel valued, which in turn increases the sense of self-efficacy. Ultimately, a high sense of self-efficacy in combination with sufficient social support can help people change their behavior and lifestyle (31). This result is consistent with the findings of previous studies (32,33). Emotional social support was found to have a significant indirect relationship with behavior through intention. In a study, it was reported that encouragement from family members, friends, and especially spouse to participate in cervical cancer screening programs was of particular importance and had a significant positive effect on women's intentions (34). Women who discussed the issue of cervical cancer screening with their spouses were more likely to have a higher intention to participate in screening (35). This finding is consistent with the results reported by several researchers (4,36,37).

In the present study, the findings also showed that emotional social support affects behavior indirectly

through fear and intention (emotional social support fear → intention → behavior). This finding is consistent with the results of previous studies (38,39). It can be inferred that receiving attention from trusted people and talking about concerns with those who listen can be effective in reducing a person's fear and anxiety.

The research findings showed that the indirect relationship between response cost and behavior through intention is not significant, which is inconsistent with the finding of other studies (6,29,40). For example, Bakht et al (6) reported a significant relationship between response costs and cervical cancer screening behaviors. This discrepancy appears to be due to differences in demographic characteristics of the studied populations including age, income status, and education level because women who participated in the present study had higher levels of education and better socioeconomic status than those in the study by Bakht et al (6).

According to the fitted model, the indirect relationship between response efficacy and behavior was significant (response efficacy → intention → behavior). The more confident a person is in that an adaptive response can lead to a risk reduction, the greater the likelihood that the person will intend to engage in screening behavior. Other studies conducted in this field have also reported a significant relationship between response efficacy and the likelihood of healthy behaviors (22,41-45).

The results of the path analysis indicated that the PMT explains 48% of motivation variance and 51% of cervical cancer screening behavior. This theory could predict a screening behavior up to 25% in a previous study (19). The difference may be due to differences in the study population and statistical methods.

Since this study was cross-sectional, it is impossible to draw a causal conclusion from the findings. Additionally, considering that the study was conducted among women living in an urban area in Karaj, it is recommended to exercise caution when generalizing the results to other populations. Finally, since the data were collected by self-administered questionnaires, there might be some bias in the responses given by the participants.

Conclusion

The findings of this study suggest that the intention has a strong effect on cervical cancer screening behavior. Moreover, perceived self-efficacy was found to be the strongest indirect predictor of behavior. Based on these results, it is recommended to pay more attention to these factors in intervention studies. The research findings also show a significant direct relationship between emotional social support and self-efficacy, indicating that interventions can be designed in such a way as to utilize emotional social support to improve self-efficacy in the service of their objectives.

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Authors' Contribution

MK: the lead researcher, was responsible for data collection and analysis and drafting of the manuscript. LS: the main supervisor, directed the research team and contributed to research design and data analysis. SP contributed to research design and drafting and review of the manuscript. AM and ANN contributed to data analysis and revision of the manuscript. All authors read and approved the final version of manuscript.

Conflict of Interests

The authors declare no conflict of interest.

Ethical Approval

The Ethics Committee of Islamic Azad University – Karaj branch approved the study. (Ethical Code: IR.IAU.K.REC.1399.031). All participants signed the written consent forms. All participations were assured regarding their privacy.

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