

HEALTH BELIEF MODEL CONSTRUCTS AND PAP SMEAR SCREENING BEHAVIOR AMONG FEMALE MEDICAL UNIVERSITY EMPLOYEES IN IRAN

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ABSTRACT

INTRODUCTION: Despite the national program of Pap smear test for detecting cervical abnormalities, performing this screening is undesirable for many of women. The present study aimed to evaluate the status of Pap smear screening and its determinants based on the health belief model.

MATERIALS AND METHODS: This cross-sectional study was conducted in Iran among 308 female employees aged 30 to 59 years at Rafsanjan University of Medical Sciences, RUMS using simple random sampling. The data was collected using a questionnaire developed based on HBM constructs and the self-report method. The data were analyzed using SPSS-24 software with the chi-square, independent t-tests, and Multiple Logistic Regression at a significance level of 0.05.

FINDINGS: The screening uptake was 57.5%. Women who had undergone cervical cancer screening reported significantly higher perceived benefits and self-efficacy, and significantly fewer perceived barriers compared to non-screeners ($P < 0.001$). Multiple logistic regression identified three significant predictors of screening behavior: perceived barriers ($OR = 0.864$, 95% CI: 0.829–0.900, $P < 0.001$), perceived severity ($OR = 1.066$, 95% CI: 1.003–1.137, $P = 0.048$), and years of marriage ($OR = 1.093$, 95% CI: 1.058–1.129, $P < 0.001$). Specifically, each one-unit increase in perceived barriers score, reduced the odds of screening by 13.6%, while each one-unit increase in perceived severity score increased the odds by 6.6%. Additionally, each additional year of marriage was associated with a 9.3% increase in the odds of screening.

CONCLUSION: Identifying perceived barriers and designing and implementing interventions to improve screening behavior based on behavior change theories such as the health belief model is recommended.

KEYWORDS: Cervical cancer, screening, Pap smear, health belief model, Iran.

(The Ethiopian Journal of Reproductive Health; 2026; 18; 57-67)

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INTRODUCTION

Globally, cervical cancer is the fourth most common cancer in women, with an estimated 660,000 new cases and 350,000 deaths in 2022¹. It is the most common cancer diagnosed among women in 28 countries and the leading cause of cancer death in 42 countries, most of which are in sub-Saharan Africa and Southeast Asia². Smoking, immunodeficiency, chlamydia infections, long-term use of oral contraceptives, multiple pregnancies, and low socio-economic status are risk factors for cervical cancer^{1, 3}.

Countries around the world are working to accelerate the elimination of cervical cancer in the coming decades¹. The Pap smear is a practical, reliable, and well-known tool for detecting cervical abnormalities. Studies have reported that 38–51% of patients with endometrial cancer have abnormal Pap smear results^{4, 5}. Guidelines in many countries recommend that women have a Pap smear every 3 to 5 years⁶. In the Islamic Republic of Iran, a cervical cancer screening program is also provided free of charge to eligible women (age 30 to 59, at least three years since sexual intercourse, no Pap smear test or one year after Pap smear test)⁷. However, in most Asian countries, the status of Pap smear screening has been reported to be less than 50%⁸. The results of studies indicate that the status of this screening in Iran is unfavorable^{9, 10}. For example, in the study by Vosoughirahbari et al., 15.7% of women in Chatroud city (near Rafsanjan) had undergone Pap smear screening⁹. Accordingly, it seems necessary to investigate the reasons for not performing screening. On the other hand, in line with different health behaviors, several factors influence the adoption of screening. Knowledge and attitude toward the Pap smear test, understanding of perceived benefits, and reducing barriers to screening are the most critical factors that play a role in screening for this disease⁸⁻¹⁰. Also, the individual's intention to take preventive action is an essential element in adopting preventive behaviors^{11,12}.

In the systematic identification of cognitive and perceptual factors related to the adoption of

behavior, the behavior change models/theories play a valuable role and can be the basis for designing appropriate and evidence-based interventions¹³. One of the behavior change models is the health belief model (HBM). The health belief model is proposed as a strong conceptual framework for explaining screening behaviors and educational evaluations and emphasizes disease prevention. Perceived susceptibility, severity, benefits, barriers, and self-efficacy perceived, and cues to action are the constructs of this model (Figure 1); this model can explain why some people perform preventive behaviors and vice versa¹³. In the study by Adegboyega et al., perceived barriers (lack of knowledge and time, feelings of shame and pain) were reported to be the strongest predictors of Pap smear screening adoption in a population of African and immigrant women in sub-Saharan Africa¹⁴. While the research by Adegboyega et al. successfully utilized the HBM to determine the predictors of screening behavior, it still lacks universality of some of the model's constructs. "Perceived barriers," for instance, are too dependent on local culture, local beliefs, and the healthcare infrastructure. In this sense, there is a lack of locally specific evidence. Screening behavior determinants studied in sub-Saharan Africa or Western regions cannot be directly applied to the southern Iranian population. Despite the importance of cervical cancer screening, context-specific evidence on the health belief factors influencing Pap smear uptake among female university employees in southern Iran remains limited. This study aimed to assess Pap smear screening practices among female employees of Rafsanjan University of Medical Sciences (RUMS) and identify the associated factors using the Health Belief Model (HBM). By examining the relationships between HBM constructs and screening behavior in a relatively health-literate population, the study seeks to improve understanding of the perceived and contextual barriers to screening. The findings may inform the development of locally appropriate strategies to promote cervical cancer screening and support evidence-informed planning by RUMS health authorities.

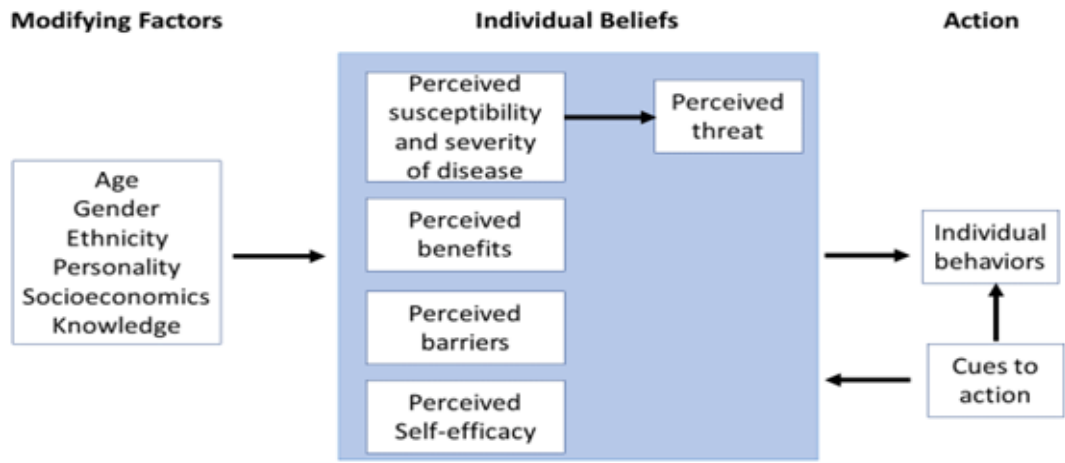


Figure 1: Health Belief Model Diagram (13)

Materials and Methods

Study Design and Setting

This descriptive cross-sectional study was conducted in 2024 among female employees of RUMS, Iran.

Participants and Sampling

The study population consisted of all female employees of RUMS aged 30-59 years (N=1450). A simple random sampling method was employed to select the study participants. The sample size was calculated based on the prevalence of Pap smear screening (P=0.30), with a 95% confidence interval (Z=1.96) and a marginal error (d) of 0.05. Using the Cochran formula for an infinite population $[n=(z_{(1-\alpha/2)}^2 \cdot p(1-p))/d^2]$, the required sample size was estimated as n0=323. Given the finite size of the source population (N=1450), the sample size was adjusted using the finite population correction (FPC) formula $[n=n0/[1+(n0-1/N)]]$. This calculation resulted in an adjusted sample size of 265. To account for a potential attrition rate of 20% and ensure sufficient statistical power, a final sample size of 320 was determined for distribution.

Eligibility Criteria

Inclusion and Exclusion Criteria

Participants were selected based on the following criteria:

Inclusion Criteria:

- Female employees of Rafsanjan University of Medical Sciences (RUMS).
- Age range of 30–59 years.
- Marital status: currently married, divorced, or widowed (to ensure sexual history).
- Willingness to participate and provide informed consent.

Exclusion Criteria:

- A documented history of cervical cancer .
- Inability to complete the questionnaire or incomplete responses.
- History of total hysterectomy.

Recruitment and Data Collection

Potential participants, selected via simple random sampling, were approached in person at their workplaces—including faculties, the central administration, hospitals, and primary health centers.

Study Instrument

The original questionnaire by Kasmaei et al.¹⁵ was developed and validated in Persian for the Iranian population. Perceived barriers and cues to action are highly dependent on local cultural norms, healthcare availability, and local beliefs. Therefore, a cultural adaptation and face validity assessment were performed prior to the data collection. To achieve this, the questionnaire was reviewed

independently by a panel of five local experts (two health education and promotion specialists, two midwives, and one epidemiologist) who are native to the southern region of Iran and actively work with the target population in Rafsanjan. Each item was assessed for clarity, cultural relevance and contextual appropriateness. The instrument consisted three main sections:

1. Demographic Characteristics: This section included 10 items such as marital status, age, years of marriage, number of pregnancies, work history, spouse's occupation, educational level of oneself and one's spouse, smoking, and history of illness in the family

2. Health Belief Model (HBM) Constructs: This section assessed the determinants of Pap smear screening behavior through several constructs. Scoring was based on a combination of multiple-choice and Likert-type scales. For the "Knowledge" construct with 21 items, correct answers were awarded 2 points, "don't know" answers 1 point, and incorrect answers 0 points (total score: 0–42). Other HBM constructs (perceived susceptibility, severity, benefits, self-efficacy and barriers) were assessed using a 5-point Likert scale (ranging from "strongly agree" to "strongly disagree"), except for "cues to action," which utilized a yes/no format. For all constructs—except for "perceived barriers"—higher scores indicated a stronger belief in the importance of cervical cancer prevention and Pap smear screening. The score ranges for the studied constructs varied according to the number of items in each dimension: perceived susceptibility and severity (6–30), perceived benefits and self-efficacy (5–25), perceived barriers (14–70), and cues to action (0–22).

3. Pap Smear Screening Behavior: This was assessed via a single self-reported yes/no question.

Validity and Reliability

The instrument's validity and reliability were previously established by Kasmaei et al.¹⁵. They reported satisfactory content validity, with Content Validity Ratio (CVR) and Content Validity Index (CVI) exceeding the minimum thresholds for nine

experts ($CVR \geq 0.78$ and $CVI \geq 0.79$). The original study reported acceptable internal consistency, with Cronbach's alpha coefficients ranging from 0.70 to 0.86.

In the current study, the instrument's reliability was re-evaluated. The Cronbach's alpha coefficients for the constructs were: knowledge (0.77), perceived susceptibility (0.76), perceived severity (0.88), perceived benefits (0.84), perceived barriers (0.88), self-efficacy (0.87), and cues to action (0.88). These values confirm the high internal consistency and reliability of the instrument within the present

Study population

Statistical Analysis

The data were analyzed with SPSS-24. The Kolmogorov–Smirnov test results confirmed that all continuous scores of HBM constructs were normally distributed. Independent samples t-tests were used to compare continuous variables between the screened and non-screened groups, and chi-square tests were used to compare screening proportions across categorical demographic variables. Multiple logistic regression was performed to identify predictors of Pap smear screening behavior while controlling for possible confounding variables. Data are expressed as mean $\pm$ standard deviation and frequency (percentage). Statistical significance was set at $p < .05$.

Ethical Considerations

This study was conducted in accordance with the ethical principles outlined in the Declaration of Helsinki. Ethical approval was obtained from the Ethics Committee of RUMS (Approval Code: IR.RUMS.REC.1401.136). Participants' informed consent was recorded before any data collection commenced. It was emphasized that their data would be kept anonymous and confidential and no personal identifiers would be used. Given the level of sensitivity surrounding the issue of health and participant health data, informants' data would be securely IT-encrypted and stored and only made available to the research team. Participants were informed of their right to withdraw from the study at any point without consequences.

RESULTS

A total of 322 questionnaires were distributed, of which 308 were completed and included in the final analysis, resulting in a response rate of 95.6%. Screening rates were slightly higher among married women (58.2%) compared to unmarried women (47.6%). However, the difference was not statistically significant ($P=0.368$). Women with different levels of education (postgraduate, bachelor's, associate, diploma) showed similar screening rates (about 55–65%). Spouse's education also showed no significant association with screening ($P=0.522$). Smoking status was a significant factor ($P=0.004$). Non-smokers had a higher screening rate (58.9%), while smokers had a much fewer screening rate (11.1%). Screening was somewhat higher in women

without a family history of cancer (58.1%) compared to those with a family history (41.7%). However this difference was not statistically significant ($P=0.259$). Screening percentages varied slightly by occupation, from 38.5% (unemployed spouse) to 73.3% (retired spouse). However, no significant association was found ($P=0.475$). Age, years of marriage, Number of pregnancies and Work history showed the strongest associations with screening behavior (all $P<0.001$). Demographic and reproductive factors (age, marriage duration, pregnancies, and work history) are strong predictors of Pap smear screening behavior. Smoking showed a significant negative association with screening participation. Education, marital status, family cancer history, and spouse's characteristics were not significant predictors (Table1).

Table 1: Acceptance rate of Pap smear screening among female RUMS employees based on demographic characteristics.

Variable	Status(n)% or M±SD	Pap smear Screening (n)%		P-value t or χ^2
		No	Yes	
Marital status	Single (21)6.8% Married (287) 93.2%	(11) 52.4 (120) 41.8	(10) 47.6 (167) 58.2	$P=0.368$ $\chi^2 = 0.89^{**}$
Education of oneself	Postgraduate education (89) 28.9% Bachelor's degree (154) 50.0% Associate's degree (23) 7.5%	(36) 40.4 (69) 44.8 (8) 34.8	(53) 59.6 (85) 55.2 (15) 65.2	$P=0.789$ $\chi^2 = 1.05^{**}$
Smoking	Yes (9) 2.9% No (299) 97.1%	(8) 88.9 (123) 41.1	(1) 11.1 (176) 58.9	$P=0.004$ $\chi^2 = 8.15^{**}$
History of cancer in the family	No (296) 96.1% Yes (12) 3.9%	(124) 41.9 (7) 58.3	(172) 58.1 (5) 41.7	$P=0.259$ $\chi^2 = 1.27^{**}$
Spouse's occupation	Retired (15) 4.9% Unemployed (13) 4.2% Self-employed (100) 32.5% Worker (16) 5.2% Farmer (9) 2.9% Employee (155) 50.3%	(4) 27.6 (8) 61.5 (46) 46.0 (6) 37.5 (3) 33.3 (64) 41.3	(11) 73.3 (5) 38.5 (54) 54.0 (10) 62.5 (6) 66.7 (91) 58.7	$P=0.475$ $\chi^2 = 4.53^{**}$
Education of spouse	Academic (177) 57.5% Diploma (88) 28.6% Middle school (25) 8.1% Primary education (18) 5.8%	(70) 39.5 (41) 46.6 (13) 52.0 (7) 38.9	(107) 60.5 (47) 53.4 (12) 48.0 (11) 61.1	$P=0.522$ $\chi^2 = 2.53^{**}$
Age	40.41±8.32	38.04±8.59	42.15±7.69	$P<0.001$ $t = -4.40^*$
Years of marriage	16.49±9.05	13.54±8.82	18.66±8.62	$P<0.001$ $t = -5.08^*$
Number of pregnancies	1.77±1.02	1.45±1.00	2.01±0.97	$P<0.001$ $t = -4.91^*$
Work history	15.18±9.17	13.06±9.28	16.74±8.79	$P<0.001$ $t = -3.55^*$

In this study, 131 female employees (42.5 percent) did not undergo Pap smear screening, and 177 (57.5 percent) reported having undergone this screening. In Table 2, the mean and standard deviation of the HBM constructs are presented by Pap smear screening status. Based on the findings, an independent t-test showed a significant difference between the mean score and standard deviation of perceived barriers, benefits, and self-efficacy between the two groups ($P < 0.001$), meaning that women who had done cervical cancer screening had higher perceived benefits and self-efficacy and fewer perceived barriers.

Barriers is the most dramatic difference. The "non-screened group" group reported significantly higher perceived barriers (36.67 ± 8.40) than the "Yes screening" group (28.94 ± 7.44). The "Yes screening" group perceived significantly greater Benefits (22.80 ± 2.34) from screening than the "non-screened group" group (21.51 ± 2.89). The "Yes screening" group had a much higher sense of Self-efficacy (19.24 ± 4.33) than the "non-screened group" group (16.77 ± 4.03).

The constructs with non-significant p-values ($p > 0.05$) show where the two groups are statistically similar. These factors do not appear to influence the screening decision. The difference in Knowledge scores is minimal and not significant ($p = 0.277$). There is virtually no difference in perceived susceptibility ($p = 0.988$). While the screened group has a slightly higher mean score in Severity, the difference is not statistically significant ($p = 0.126$). The difference in exposure to cues to action is not significant ($p = 0.510$) between the two groups.

Table 2: Mean and standard deviation of HBM constructs by screening status among RUMS Employees women

Construct	Pap smear Screening M $\pm$ SD		P-value
	No	Yes	
Knowledge	26.84 $\pm$ 5.09	27.59 $\pm$ 6.49	=0.277
Perceived Susceptibility	19.18 $\pm$ 4.04	19.19 $\pm$ 4.21	=0.988
Perceived Severity	23.08 $\pm$ 4.42	23.85 $\pm$ 4.28	=0.126
Perceived Barriers	36.67 $\pm$ 8.40	28.94 $\pm$ 7.44	<0.001
Perceived Benefits	21.51 $\pm$ 2.89	22.80 $\pm$ 2.34	<0.001
Perceived Self-efficacy	16.77 $\pm$ 4.03	19.24 $\pm$ 4.33	<0.001
Cues to action	6.36 $\pm$ 2.86	6.58 $\pm$ 2.94	=0.510

Multiple logistic regression was used to determine the effect of different variables on the chance of undergoing Pap smear screening. First, all demographic variables (marital Status, education of oneself, smoking, family history, spouse's occupation, education of spouse, age (years), years of marriage, number of pregnancies and work experience (years)) and HBM constructs (perceived susceptibility, severity, benefit, barrier, self-efficacy, cues to action and knowledge) entered into the model, and then all non-significant variables ($P > 0.2$) removed, and we kept variables whose p-value was less than 0.2 in the model using the backward method. Based on the values of Cox & Snell R Square=0.290 and Nagelkerke R Square=0.390 and $P = 0.766$, the model had a good fit. Finally, the perceived barriers (OR=0.879, $P < 0.001$, 95% C.I; 0.829-0.900), perceived severity (OR=1.066, $P = 0.048$, 95% C.I; 1.003-1.137) and years of marriage (OR=1.093, $P < 0.001$, 95% C.I; 1.058-1.129) were predictors of cervical cancer screening. A one-unit increase in perceived barriers score is associated with a 13.6% decrease in the odds of screening. A one-unit increase in perceived barriers score is associated with a 13.6% decrease in the odds of screening. Conversely, a one-unit increase in perceived severity and each additional year of marriage were associated with a 6.6% and 9.3% increase in the odds of screening, respectively (Table 3).

Table 3: Multiple logistic regression of demographic variables and health belief model on Pap smear cancer screening

Variable	Variable Levels	Univariable LR Crude OR (95% CI)	p	Multiple LR Adjusted OR (95% CI)	p
Marital Status	Single	Ref	-		
	Married	1.531 (0.630, 3.720)	0.347		
Education of oneself	Postgraduate education	Ref	-		
	Bachelor's degree	0.837 (0.493, 1.420)	0.509		
	Associate's degree	1.274 (0.489, 3.316)	0.620		
	Diploma	0.906 (0.431, 1.905)	0.794		
Smoking	No	Ref	-		
	Yes	0.100 (0.012, 0.822)	0.032		
Family History	No	Ref	-		
	Yes	0.515 (0.160, 1.660)	0.266		
Spouse's occupation	Retired	Ref	-		
	Unemployed	0.227 (0.046, 1.125)	0.069		
	Self-employed	0.427 (0.127, 1.432)	0.168		
	Worker	0.606 (0.132, 2.793)	0.521		
	Farmer	0.727 (0.121, 4.388)	0.728		
	Employee	0.517 (0.158, 1.697)	0.277		
Education of spouse	Academic	Ref	-		
	Diploma	0.750 (0.448, 1.256)	0.274		
	Middle school	0.604 (0.261, 1.399)	0.240		
	Primary education	1.028 (0.380, 2.779)	0.957		
Age (years)		1.064 (1.034, 1.095)	0.000		
Years of marriage		1.070 (1.040, 1.100)	0.000	1.093 (1.058, 1.129)	0.000
Number of pregnancies		1.796 (1.399, 2.306)	0.000		
Work Experience (years)		1.046 (1.020, 1.073)	0.001		
Perceived Susceptibility		1.000 (0.947, 1.057)	0.988		
Perceived Severity		1.042 (0.988, 1.097)	0.127	1.066 (1.003, 1.137)	0.048
Perceived benefit		1.208 (1.103, 1.323)	0.000		
Perceived barrier		0.879 (0.847, 0.912)	0.000	0.864 (0.829, 0.900)	0.000
Self-efficacy		1.148 (1.084, 1.216)	0.000		
Cues to action		1.027 (0.950, 1.110)	0.509		
Knowledge		1.021 (0.983, 1.061)	0.276		

DISCUSSION

Our findings revealed that while 57.5% of participants had undergone screening, a substantial proportion (42.5%) remained unscreened. More importantly, the HBM constructs of perceived barriers, perceived benefits, and self-efficacy showed the strongest differences between the screened and non-screened groups, with perceived barriers and perceived severity (along with years of marriage) emerging as the most significant predictors in the final regression model.

The most dramatic and consistent finding across our analyses was the powerful role of perceived barriers. Women who did not undergo screening reported significantly higher barriers (36.67 ± 8.40) than those who did (28.94 ± 7.44), and each unit increase in the barriers score reduced the odds of screening by 13.6% ($OR=0.864$). This corroborates the meta-analysis by Al-Ani et al.¹⁶ and the study by Adegboyega et al.¹⁴, where barriers were the strongest predictors. In our specific context, qualitative assessments^{17,18} revealed that the most influential barriers were feelings of shame and embarrassment, lack of time, and insufficient guidance from healthcare staff. Consistent with other studies¹⁹, these are deeply rooted in the local cultural norms of southern Iran, where discussions of reproductive health are often stigmatized. Similarly, self-efficacy—the confidence to overcome these barriers—was markedly higher in the screened group (19.24 vs. 16.77), reinforcing that practical empowerment (e.g., knowing how to schedule an appointment, overcoming fear of pain) is just as critical as mere awareness.

Contrary to some previous studies²⁰⁻²², perceived susceptibility and cues to action did not differ significantly between the two groups in our sample. We propose three explanations for this unexpected finding. First, the population effect: our participants were employees of a medical university, inherently possessing higher-than-average health literacy. Consequently, awareness of cervical cancer risk and the existence of screening programs is near-universal (a "ceiling effect"). Because almost everyone knows

they are susceptible, susceptibility no longer acts as a discriminating factor between those who do and do not get screened. Second, the nature of cues to action: we measured general cues such as media messages and public awareness campaigns. However, in a high-knowledge population, these generic cues are too passive and widely distributed to trigger behavior change. What is likely missing are interpersonal cues—specifically, direct, strong recommendations from trusted physicians or peers. Third, the decision to screen in this population appears to be driven not by fear of disease (severity), but by logistical and emotional friction (barriers). Women know the disease is serious, but this knowledge is overshadowed by practical hurdles.

The screening rate in our study (57.5%) is higher than that reported in many other Iranian studies, such as the 15.7% reported by Vosoughirahbari et al.⁹ and the 28.5% by Miri et al.¹⁹. This improvement likely reflects the national program's maturation and the specific advantages of our target population (education and workplace access). However, our rate remains significantly lower than that of developed countries like Canada, where national organized screening programs achieve coverage exceeding 70%²³. This gap highlights structural differences: while Canada benefits from centralized recall systems and publicly funded, easily accessible clinics, our population still faces fragmented services, even within a medical university setting.

When comparing our findings to other developing regions, the heterogeneity becomes apparent. Studies in Ethiopia²² reported that knowledge and perceived benefits were significant predictors, whereas these were non-significant in our cohort. This discrepancy likely stems from differences in baseline knowledge—in regions with very low literacy, knowledge is a primary barrier; once it reaches a saturation point (as in our population), behavioral constructs like self-efficacy and barriers take precedence. Similarly, studies in sub-Saharan Africa^{24, 25} show mixed results, with barriers consistently emerging as dominant, but susceptibility and severity varying widely depending on cultural perceptions of cancer as a "death

sentence." In our context, the cultural stigma surrounding gynecological examinations appears to function as the overriding determinant, a feature also observed in conservative Middle Eastern and South Asian settings^{10, 20}.

Our findings provide a clear framework for intervention. Given that barriers and self-efficacy are the primary modifiable determinants, health education programs must move beyond simply providing information. Effective strategies should include:

- 1) Behavioral skills training to build self-efficacy (e.g., role-playing how to request a Pap smear, demonstrating the procedure to reduce fear of pain);
- 2) Reducing structural barriers through on-site screening at the workplace, offering flexible hours, and providing clear, empathetic guidance from female healthcare providers to mitigate shame;
- 3) Social modeling, where colleagues and managers share their positive screening experiences to normalize the behavior; and
- 4) Targeted outreach to younger and newly married women (as years of marriage was a significant predictor), who are currently less likely to screen but represent a prime window for primary prevention.

Limitations

This study has several limitations. First, the cross-sectional design precludes causal inference regarding the associations between Health Belief Model (HBM) constructs and Pap smear screening behavior. Second, self-reported screening status may be subject to recall and social desirability biases; future studies should consider verification through medical records or health information systems. Third, the inclusion of female employees from a single medical university in southern Iran, predominantly with higher educational attainment, may limit the generalizability of the findings to other populations. Finally, although the questionnaire underwent cultural adaptation and face validity assessment, confirmatory factor analysis was not performed to establish its construct validity in this population.

The most influential barriers reported by participants included feelings of shame and embarrassment, lack of time, and insufficient guidance from healthcare staff. To address these, we recommend a multi-pronged approach:

- (a) establishing on-site screening services at the workplace during working hours to eliminate time and access barriers;
- (b) ensuring that screenings are conducted by female healthcare providers to reduce cultural discomfort and embarrassment.

To improve Pap smear screening uptake, interventions should strengthen perceived severity, benefits, and self-efficacy through locally relevant risk communication, clear information about the benefits and procedure, and practical guidance on accessing screening. Personalized recommendations from trusted healthcare providers and SMS reminders may further encourage participation. Future research should use mixed-methods approaches across diverse Iranian settings to explore contextual factors influencing screening and conduct confirmatory factor analysis to establish the construct validity of the HBM instrument in this population.

CONCLUSION

42.5% of female medical university employees in southern Iran had not undergone Pap smear screening. Perceived barriers, severity, and years of marriage were the strongest predictors of screening behavior. These findings underscore the necessity of designing theory-driven interventions that prioritize overcoming cultural and practical barriers, rather than merely increasing knowledge, to effectively promote cervical cancer screening in this and similar Middle Eastern contexts.

Abbreviations

RUMS Rafsanjan University of Medical sciences
HBM Health Belief Model.

Declarations

Ethics approval and consent to participate

Ethical considerations were followed according

to the Declaration of Helsinki. This article is derived from research project 401132 and Ethical approval for this study was granted by the Ethics Committee Board of the Rafsanjan University of Medical Sciences under certificate code IR.RUMS.REC.1401.136. Informed consent was obtained from all participants prior to their involvement in the study. The purpose and procedures of the study, including the voluntary nature of participation, the right to refuse or withdraw at any point without penalty, and the measures taken to ensure confidentiality, were clearly explained to all potential participants. Verbal informed consent was obtained from each employee who agreed to participate. Participants were assured that their decision to participate or not would not affect their employment status or access to services. All collected data were anonymized to protect the privacy and confidentiality of the participants.

Consent for publication

Not applicable.

Availability of data and material

The authors confirm that the data supporting the findings of this study are available.

Competing interests

The authors declare no competing interests.

Funding

Rafsanjan University of Medical sciences.

Authors' contributions

MN, conceived the project idea. MN, and MHB, and MA, designed the study methodology, MKJ, and FS, collected the data, and MN, analyzed the data. M.N and M.A was also the project supervisor and executive director, MA revised the manuscript, and all authors: contributed to the writing of the article.

Acknowledgements

The present article results from research project 401132 and conducted with financial support from RUMS. Accordingly, the university authorities and employees thanked for their support and participation in the research.

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REFERENCES

- World Health Organization (WHO), Health topic, cervical cancer. Key facts [8 July 2025]. Available at: <https://www.who.int/news-room/fact-sheets/detail/cervical-cancer>
- Bray F, Ferlay J, Soerjomataram I, Siegel RL, Torre LA, Jemal A. Global cancer statistics 2018: GLOBOCAN estimates of incidence and mortality worldwide for 36 cancers in 185 countries. *CA: a cancer journal for clinicians*. 2018; 68(6):394-424.
- Zahid HM, Qarah AB, Alharbi AM, Alomar AE, Almubarak SA. Awareness and Practices Related to Cervical Cancer among Females in Saudi Arabia. *Int J Environ Res Public Health*. 2022; 19(3):1455.
- Khumthong K, Aue-Aungkul A, Kleeboaw P, Chumworathayi B, Temtanakitpaisan A, Nhokaew W. Association of Abnormal Pap Smear with Occult Cervical Stromal Invasion in Patients with Endometrial Cancer. *Asian Pac J Cancer Prev*. 2019; 20(9):2847-2850.
- Chauhan NK, Singh K, Kumar A, Kolambakar SB. HDFCN: A Robust Hybrid Deep Network Based on Feature Concatenation for Cervical Cancer Diagnosis on WSI Pap smear Slides. *Biomed Res Int*. 2023; (1): 4214817.
- Maj C, Poncet L, Panjo H, Gautier A, Chauvin P, Menvielle G, et al. General practitioners who never perform Pap smear: the medical offer and the socio-economic context around their office could limit their involvement in cervical cancer screening. *BMC Fam Pract*. 2019; 20(1):114.
- Ministry of Health and Medical Education (MOHME), Deputy Health, Office of Non-Communicable Disease Management, Cancer Department, Guidelines for the National Early Cancer Detection Program in Iran, 2022. [8 July 2025]. Available at: <https://salmas.umsu.ac.ir/>
- Maleki A, Ahadinezhad B, Alizadeh A, Khosravizadeh O. Barriers and facilitators of pap-smear test uptake in Asia: a systematic review. *BMC Public Health*. 2025; 25(1):1961.
- Vosoughirahbari V, Ahmadi Tabatabaei SV, Mazar L, Asadpour M. The effect of educational intervention based on Transtheoretical model on Pap smear test in eligible women in Chatroud health houses. *Journal of Preventive Medicine*. 2021; 8(4):14-24
- Alavi A, Shahsavari S, Mahboobi M, Banihashemi SH. Factors Related to Cervical Cancer Screening Among Women in Bandar Abbas, Iran: A Cross-sectional Study. *Journal of Preventive Medicine*. 2022; 9(4): 360-75.
- Alissa NA. Knowledge and intentions regarding the Pap smear test among Saudi Arabian women. *Plos One*. 2021; 16(6): e0253850.
- Miles TT, Riley-Powell AR, Lee GO, Gotlieb EE, Barth GC, Tran EQ, et al. Knowledge, attitudes, and practices of cervical cancer prevention and pap smears in two low-income communities in Lima, Peru. *BMC women's health*. 2021 Apr 21; 21(1):168.
- Glanz K, Rimer B, Viswanath K. *Health Behavior and Health Education. Theory, Research, and Practice*". 5ed. USA; Wiley. 2015.
- Adegboyega A, Kang J, Aroh A, Williams LB. Perceived barriers to pap screening influence adherence to screening recommendations among black women. *Journal of Women's Health*. 2024; 33(11):1482-91.
- Kasmaei P, Bab Eghbal S, Atrkar Roshan Z, Estebsari F, Mehrabian F, Karimi M. The effect of health belief model on rural women's Pap smear test. *Nursing and Midwifery* 2014; 12(5): 401-8.
- Al-Ani A, Hammouri M, Sultan H, Al-Huneidy L, Mansour A, Al-Hussaini M. Factors affecting cervical screening using the health belief model during the last decade: A systematic review and meta-analysis. *Psycho-Oncology*. 2024; 33(1): e6275.
- Marashi T, Irandoost SF, Yoosefi Lebni J, Soofizad G. Exploring the barriers to Pap smear test in Iranian women: a qualitative study. *BMC women's health*. 2021 Aug 6;21(1):287.
- Bayrami R, Taghipour A, Ebrahimipour H. Personal and socio-cultural barriers to cervical cancer screening in Iran, patient and provider perceptions: a qualitative study. *Asian Pacific Journal of Cancer Prevention*. 2015;16(9):3729-34.
- Miri MR, Moodi M, Sharif-Zadeh GR, Malaki Moghadam H, Miri M, Norozi E. Cognitive predictors of cervical cancer screening's stages of change among sample of Iranian women health volunteers: A path analysis. *PloS one*. 2018; 13(3): e0193638.
- Yirsaw AN, Tefera M, Bogale EK, Anagaw TF, Tiruneh MG, Fenta ET, et al. Applying the Health Belief Model to cervical cancer screening uptake among women in Ethiopia: a systematic review and meta-analysis. *BMC cancer*. 2024; 24(1):1294.
- Safitri A, Demartoto A, Prasetya H. Meta-Analysis: Factors Related to Pap Smear Service Utilization Using Health Belief Model. *Journal of Health Promotion and Behavior*. 2024; 9(1):14-27.
- Belay AS, Asmare WN, Kassie A. Cervical cancer screening utilization and its predictors among women in bench Sheko Zone, Southwest Ethiopia: using health belief model. *BMC cancer*. 2023; 23(1): 472.
- Abdel-Rahman O. Patterns and trends of cancer screening in Canada: results from a contemporary national survey. *Journal of the National Comprehensive Cancer Network*. 202; 19(1):68-76.
- Nyaaba JA, Akurugu E. Knowledge, barriers and uptake towards Cervical Cancer screening among female health workers in Ghana: A perspective of the Health Belief Model. *International Journal of Africa Nursing Sciences*. 2023; 19:100587.
- Maseko TN, Huang HC, Lin KC. Cervical cancer screening behavior of African women: The Rosenstock health belief model assessment. *Health Care for Women International*. 2021; 42(7-9):976-91.
- Akokuwebe ME, Idemudia ES, Lekulo AM, Motlogeloa OW. Determinants and levels of cervical Cancer screening uptake among women of reproductive age in South Africa: evidence from South Africa Demographic and health survey data, 2016. *BMC Public Health*. 2021; 21(1):2013.