Cognitive Factors and Health Literacy as Determinants of Pap smear Screening among Married Women: A Cross-sectional Study

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Background and Objectives: Pap smear screening is one of the most effective methods for the early diagnosis of cervical cancer in women, thereby preventing complications. Hence, this research aimed to investigate cognitive factors and health literacy as determinants of Pap smear screening among married women.

Materials and Methods: This cross-sectional research was conducted between June to October 2023 in Sarab, Iran. Multistage cluster sampling was used to recruitment of 259 participants. The inclusion criteria were women who were not pregnant, had been married for at least three years and had given their consent to participate in this study. The city of Sarab includes four health centers, each of which was considered as a cluster. To measure the data, valid and reliable instruments of Health Literacy (HL) for Iranian Adults (HELIA), Perceived barriers and Self-efficacy as cognitive factors were used. P-value less than 0.05 was considered significant.

Results: According to the results, significant differences in the Pap smear screening behavior by age groups (p-value < 0.001), history of urinary infection (p-value < 0.001) and number of children (p-value = 0.020). The differences in Pap smear screening by perceived barriers as cognitive factor was statistically significant (p-value < 0.001). Logistic regression analysis showed two variables with significant odds ratios. The participants who perceived fewer barriers (OR= 0.867; 95% CI = 0.819, 0.917), and higher level of self-efficacy (OR= 0.941; 95% CI= 890, 0.995) to perform the test were more likely to have a Pap smear screening in the previous three years.

Conclusion: According to the results, it is suggested to health care providers focus on these factors to design the intervention programs in health centers in order to Pap smear screening behavior for married women based on cognitive factors including perceived barriers, self-efficacy and HL

Keywords: Cognitive Factors, Health Literacy, Pap smear Screening, Iran

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Introduction

Cervical cancer is a significant public health issue, ranking as fourth most common cancer among women worldwide. In 2022, approximately 660,000 new cases of cervical cancer were reported globally, with 94% of the estimated 350,000 fatalities occurring in low- and middle-income countries (1). This alarming statistic underscores the urgent need for effective screening and preventive measures in these regions, where healthcare resources may be limited.

According to the latest update by the World Health Organization (WHO), cervical screening and the management of precancerous conditions are essential for women's health. It is recommended that women undergo screening for cervical cancer every 5 to 10 years, beginning at the age of 30 (1). Papanicolaou test, or Pap smear, has demonstrated significant effectiveness in public health. This screening method is not only cost-efficient but also has the potential to detect early-stage cervical cancer in asymptomatic women (2, 3). Despite its effectiveness, regular Pap screening tests are known to significantly decrease the likelihood of cervical cancer diagnosis by as much as 96%. However, a major challenge in the developing world is the low rate of regular cervical cancer screening among women (4, 5). A meta-analysis study focusing on Pap smear test uptake in Iran over a decade (2012-2022), involving 28,754 women from 33 articles, revealed a combined percentage for one-time and regular screenings of 46.52% and 17.80%, respectively (6). This highlights the critical role of HL, defined by the WHO as the result of individuals' experiences, social connections, and learning over time. HL enables individuals to access, comprehend, evaluate, and utilize information and services to enhance their own health and the well-being of others (7). It is associated with hospitalization rates, frequent use of emergency services, medication adherence, understanding health information, decision-making, and health-promoting behaviors such as performing monthly breast self-examinations and preventive screenings (8-15).

Research consistently demonstrates that perceived barriers and self-efficacy are critical cognitive factors influencing health behaviors across various populations. Research examining cognitive factors in Pap smear testing reveals that perceived barriers and self-efficacy are significant predictors of cervical cancer screening behavior. In Taiwan, barriers related to worry, embarrassment, stigma, and lack of female physicians were particularly significant, while all self-efficacy measures showed importance across various stages of behavioral change (16). Similarly, among Iranian women health volunteers, perceived benefits, barriers, and self-efficacy emerged as key predictors of screening stages, though uptake remained very low at only 3% for regular testing (17). Psychometric testing

among Black women confirmed that both barriers and self-efficacy scales are reliable and valid predictors of Pap testing adherence (18). In line with the Health Belief Model (HBM), perceived barriers can directly result in individuals refraining from engaging in preventive behaviors (19). These barriers encompass beliefs regarding the practical and emotional challenges associated with recommended actions that could hinder the adoption of desired behaviors (20). Research findings show a direct correlation between perceived barriers and adherence to cervical cancer screening protocols (21). Barriers to accessing preventive services can be categorized into those related to healthcare provision and women's beliefs. Key barriers identified include accessibility to healthcare facilities and the availability of quality services, particularly for women in rural areas who face long journeys to healthcare centers (22-24). Financial barriers significantly affect adherence, especially among financially vulnerable and medically underserved groups, as these structural barriers relate to costs that hinder access to healthcare services (25, 26). Additionally, factors such as educational level, employment status, health insurance coverage, disease history, doubts about screening efficacy, fear of cancer diagnosis, and previous Pap testing influence perceived barriers for women aged 21-65 (27). Healthcare providers play a crucial role in supporting less educated and never-screened women overcome these barriers and understand the importance of cervical cancer screening (28). This highlights the need for culturally sensitive and literacy-appropriate educational resources and interventions to increase awareness and improve screening practices in this population (29, 30).

Self-efficacy, defined as the belief in one's ability to effectively carry out necessary behavior to achieve desired outcomes, is another critical factor (31). Literature indicates that self-efficacy influences women's performance regarding Pap smear tests, which are affected by various individual, cultural, and social factors (17). Previous studies have shown that improving educational status not only significantly increases knowledge of Pap smear tests but is also associated with women's attitudes and self-efficacy towards screening (32). Furthermore, strengthening self-efficacy is likely to increase the inclination to undergo Pap smear tests (33). Therefore, this study was conducted in 2023 to investigate cognitive factors and health literacy as determinants of Pap smear screening among married women in Sarab County, northwest Iran. Specifically, this research aims to explore the relationships between HL, perceived barriers, self-efficacy, and participation in Pap smear screening.

Materials and Methods

Study design and participants

This was a cross-sectional study conducted between June and October 2023 among the women who referred to the health centers in Sarab. Sarab (37°56’32”N, 47°32’10”E) is a

city in the Central District of Sarab County, East Azerbaijan province, the northwestern part of Iran. The citizens in Sarab are Azerbaijani and speak in the Turkish language. The 2016 census measured the population of the city as 45,031 people in 13,953 households (34).

Multistage cluster sampling was used to recruitment of 259 participants. The city of Sarab includes 4 health centers, each of which was considered as a cluster. In each health center, we randomly selected four blocks from the population of health service providers. The selection of participants within these blocks was performed using simple random sampling techniques based on generated random numbers by excel software of health records. Based on data from a previous study on a similar population in Iran (30), the sample size was determined using a single population proportion formula based on 95% confidence interval. To ensure adequate power for the study, we included an additional 20% in our sample size to account for potential non-response. The final sample was 259. The inclusion criteria were women who were not pregnant, had been married for at least 3 years and had given their consent to participate in this study. Participants who met the inclusion criteria were randomly selected from these centers based on health records. Respondents were invited to participate in the study by telephone call. The participants were informed about the research objectives and they signed an informed consent form. The questionnaires were completed through interviews with women in a consultation room at the health center. All interviews were conducted by a trained interviewer to make the participants feel comfortable.

Measures

Data were collected using a demographic information questionnaire, Health Literacy for Iranian Adults (HELIA) scale, Perceived barriers and Self-efficacy scale.

Demographic information questionnaire

Including age, education level, economic status, history of urinary infection and number of children.

Health Literacy scale

The validated Health Literacy for Iranian Adults (HELIA) (35) was utilized in our study. This particular questionnaire comprised 47 items and was structured around five dimensions and explaining 53.2% of the variance, Reliability with Cronbach's alpha values ranging from 0.72 to 0.89 for the dimensions of the tool. Firstly, the assessment of Reading health information (4 items) was conducted using a five-interval Likert scale, with a scale from 1 (completely difficult) to 5 (completely easy), resulting in a total

score ranging from 4 to 20. Higher scores denoted a heightened proficiency in reading health-related materials. Secondly, the dimension of Understanding health information (7 items) was evaluated on a 5-point scale ranging from 1 (completely difficult) to 5 (completely easy), with scores ranging from 7 to 35. Elevated scores indicated a superior level of comprehension. Thirdly, the Appraisal of health information (4 items) was rated on a 5-point scale from 1 (never) to 5 (always), with total scores ranging from 4 to 20. Increased scores reflected a stronger capability in evaluating health information. Furthermore, the assessment of Ability to access health information (6 items) was appraised using a five-interval Likert scale (always=5, most of the time=4, sometimes=3, seldom=2, and never=1), with scores ranging from 6 to 30. A higher score signified an enhanced ability to access health-related resources. Lastly, Decision making (12 items) was evaluated through a five-interval Likert scale (always=5, most of the time=4, sometimes=3, seldom=2, and never=1), with scores ranging from 12 to 60. Higher scores were indicative of a more optimal decision-making capacity. The reliability of the questionnaire's dimensions was determined through Cronbach's alpha, which yielded values > 0.7 (ranging from 0.72 to 0.89) (35).

Perceived barriers

The perceived barriers of conducting Pap smear included 6 items. One example items of the perceived barriers were "I am too busy to find enough time to go for Pap smear test" respectively. There was a five-point Likert scale for the items of the perceived susceptibility and perceived severity scales ranging from 1 to 5 (1 = totally disagree through 5= totally agree). Lower scores on the barriers was desired (36).

Self-efficacy

The scale of self-efficacy to go Pap smear test included 10 items. "I am confident that I can encounter with unexpected problems, effectively" is an example of these items. In this scale, the answers were on a four-point Likert scale ranging from one to four (1 = totally confident through 4= totally unconfident). Higher scores meant more self-efficacy (36).

Pap smear Screening Behavior

Finally, performing the Pap test was measured by the checklist using one question: "Have you had a pap smear test in the previous three years?" The answer should be yes (1) or No (0) (36).

Statistical analysis

Continuous variables were presented as means ± SD and categorical variables were expressed as number and percentage. The frequency of Pap test performance according to the demographic variables was examined using the chi-square test. The mean scores of HL, Perceived barriers and Self-efficacy were compared between two groups with and without Pap Smear Screening using Independent t-test and Spearman's rank correlation test was used for evaluation of their coefficients. In addition, logistic regression model with Enter method was used to determinate of factors associated with performing a Pap smear test. Shapiro-wilk test was applied to check the normality of the data. The data analysis was performed by SPSS21 and p-value less than 0.05 was considered as significant level.

Results

In this study 259 married women were enrolled. The participants' age ranged from 20 to 64 years with the mean age of 35.92 (± 12.9) years. About more than half of the participants (64.1%) had illiterate and elementary level. The history of urinary infection was informed by 28.9% of the subjects. Majority of the participants (46.2%) reported their economic status as moderate. As well as, 56.0% of participants were reported a Pap smear test in the previous three years. The frequency and relative frequency of the Pap smear screening behavior according to demographic characteristics are presented in Table 1. Current study found significant differences in the Pap smear screening behavior by the age groups (p-value < 0.001), history of urinary infection (p-value < 0.001) and number of children (p-value = 0.020) **(Table 1).**

Table 1. Comparison of Pap smear screening participants and non-participants by their demographic characteristics (N = 259)

Variables		Pap test in 3 previous years		Total	df	Chi^2	P-value*
		No	Yes	n. (36)			
		n. (36)	n. (36)				
Age groups	20 to 35	80 (30.9)	66 (25.5)	146 (56.4)	1	15.8	0.001
	36 and higher	34 (13.1)	79 (30.5)	113 (43.6)			
	Total	114 (44)	145 (56)	259 (100)			
Education level	Illiterate and elementary	67 (25.9)	99 (38.2)	166 (64.1)	2	3.02	0.220
	Secondary	28 (10.8)	24 (9.3)	52 (20.1)			
	Diploma and higher	19 (7.3)	22 (8.5)	41 (15.8)			
	Total	114 (44)	145 (56)	259 (100)			
Economic status	Poor	43 (16.6)	58 (222.4)	101 (39.0)	2	0.23	0.890
	Medium	36 (13.9)	42 (16.2)	78 (30.1)			
	Good	35 (13.5)	45 (17.4)	80 (30.9)			
	Total	114 (44)	145 (56)	259 (100)			
Urinary infection history	No	90 (34.7)	86 (33.2)	176 (68.0)	1	11.30	0.001
	Yes	24 (9.3)	59 (22.8.1)	83 (32.0)			
	Total	114 (44)	145 (56)	259 (100)			
Children number	2 and less	72 (27.8)	72 (27.8)	144 (55.6)	1	4.7	0.03

	3 and more	42 (16.2)	73 (28.2)	115 (44.4)			
	Total	114 (44)	145 (56)	259 (100)			

*P-value based on chi-square test

Table 2 shows the means and standard deviations (SD) of HL, perceived barriers and self-efficacy between groups of a having/not having of a Pap smear test in previous three years. The differences in Pap smear screening by perceived barriers was statistically significant. Women with at least a Pap smear test in previous three years had lower level of perceived barriers to Pap smear screening. So that the mean of Perceived Barriers was 12.97± 4.86 and 16.22 ± 5.18 in with and without Pap smear test groups respectively (p=0.001).

Table 2. Comparison of cognitive variables, and health literacy between women according to history of Pap smear test (N= 259)

Variables	History of Pap test Mean (± SD)		Mean difference (SE)	df	t	P-value*	95% Confidence Interval of the Difference	
	No	**Yes**					**Lower**	**Upper**
HL	113.97 ± 30.10	112.51 ± 30.35	1.46 (3.78)	257	0.387	0.699	-5.99	8.92
Perceived Barriers	16.22 ± 5.18	12.97 ± 4.86	3.25 (0.62)	257	5.2	0.001	2.02	4.45
Perceived Self-efficacy	28.82 ± 5.11	27.71 ± 5.83	1.10 (0.79)	257	1.6	0.106	-0.25	2.47

* P-value was calculated based on independent t test.

Table 3 shows the bivariate correlations using Spearman's rank correlation coefficient among Pap smear screening, HL, perceived barriers, and self-efficacy. A statistically significant negative correlation was found between Pap smear screening and perceived barriers (r = -0.308). Additionally, perceived barriers had significant negative correlations with HL (r = -0.179) and self-efficacy (r = -0.161), while a significant positive correlation was observed between HL and self-efficacy (r = 0.478).

Table 3. Bivariate correlations of cognitive variables, health literacy and Pap smear screening behavior

Variable	1	2	3	4
1= HL	1			
2= Perceived Barriers	-0.179*	1		
3= Perceived self-efficacy	0.478*	-0.161*	1	
4= Pap Smear Screening Behavior	-0.024	-0.308*	-0.099	1

*P-value < 0.05

Logistic regression analysis was used to determinate of related factors to Pap smear screening. The results of analysis showed two significant odds ratios: The participants who perceived fewer barriers (OR= 0.867; 95% CI = 0.819-0.917; p-value = 0.001) and those with higher level of self-efficacy (OR= 0.941; 95% CI= 890-0.995; p-value = 0.031) were more likely to have undergone a Pap smear screening in the previous three years **(Table 4).**

Table 4. Logistic regression analysis to determinants of Pap smear screening behavior

Variable	P	Odds Ratio (OR)	CI 95%		Regression Coefficient (β)	Standard Error
			Lower	Upper		
HL	0.860	0.999	0.989	1.009	0.001	0.010
Perceived Barriers	0.001	0.867	0.819	0.917	-0.143	0.045
Perceived self-efficacy	0.031	0.941	0.890	0.995	-0.062	0.025

*P-value < 0.05

Discussion

Pap smear screening is one of the most effective methods for early diagnosis of cervical cancer in women, thereby preventing complications. But sometimes women refuse to do this test. Hence, this research aimed to investigate cognitive factors including perceived barriers and self-efficacy and health literacy as determinants of Pap smear screening among married women. Current study found significant differences in the Pap smear screening behavior by the age groups, history of urinary infection and number of children. In line with this research, a study in Iran demonstrated age group and history of urinary infection related to Pap smear screening. So that one unit increase in age, odds cervical cancer screening behavior 6% decreased statistically significant (30). Consistent with the results of studies showed age between 35-39 years and 40–49 years related to cervical cancer screening (37, 38). In study conducted by Koca and Acıkgoz in 2022 reported 50-59 age group and had a childbirth experience associated with higher Pap smear test (39). A systematic review conducted in 2023 reported older age was associated with altering preventive behaviors and intentions toward cervical cancer (40). A scoping review reported age was one of the affecting factors in cancer screening participation (41). As can be seen, various results of students have shown the relationship between age group and Pap smear screening. In Iran, this is probably because as women get older and approach menopause and they have completed their families, they have less motivation to do Pap smear test. Also, women are likely to complete their family at older age and lose the tendency to self-care in the Pap smear screening. This might be due to having the uncomfortable experience of previous urinary infection followed by the fear of serious injuries that lead to women's tendency to undergo Pap test screening.

HBM construct analysis

In this research the bivariate correlations of results showed the differences in Pap smear screening by perceived barriers was statistically significant. Women with at least a Pap smear test in previous three years had lower level of perceived barriers to Pap smear screening. As a result of this research, statistically significant negative correlation was found between Pap smear screening and perceived barriers. Also, perceived barriers had statistically significant negative correlations with HL and self-efficacy. Between HL and self-efficacy was statistically significant positive correlation. This means that

improving HL, self-efficacy and decreasing barriers of Pop smear screening can lead to raising Pop smear screening behavior. The results of a study in Iran demonstrated HL associated with undergoing Pap smear (12). It was seen in the results of a study that HL and stigma both had indirect effects on Pop smear screening, mediated by differences in self-efficacy and higher HL and self-efficacy related to Hepatitis B virus (HBV) screening (42). This result is in line with previous studies done in Iran that revealed response cost despite women's self-efficacy was barrier in following regular Pap smear test (43, 44). According to the study in Sudan, there was a relationship between perceived barriers and willingness to perform the pap (45). Hence, cervical cancer screening programs should consider addressing the country-specific barriers in the design of interventions to increase Pap smear test. It should be noted that until the barriers of Pop smear screening behavior are not removed, only improving self-efficacy and health literacy will not be effective. Some of the barriers of Pop smear screening are modifiable, such as poor awareness of screening, poor perceived susceptibility to cervical cancer and perceived severity, fear, lack of access to healthcare worker and receiving advice (43-46), which can be easily overcome. Also, regarding the cost of Pap smear test (43, 44), health centers can help women by lobbying with relevant organizations to reduce barriers. By reducing the perceived barriers by emphasizing modifiable factors and increasing HL as a factor related to the perceived barriers, it can be hoped that willing to perform Pap smear screening in women will increase.

The logistic regression analysis of this study demonstrated the participants who perceived fewer barriers (OR= 0.867), and higher level of self-efficacy (OR= 0.941) to perform the test were more likely to have a Pap smear screening in the previous three years. These results were in line with the systematic review and meta-analysis results in 2023 (40). In studies conducted in Iran (47), Korean American women (48), Indonesia (49) and Thailand (50) reported the perceived barriers, and perceived self-efficacy were the determinants of Pap smear screening behavior. In addition, the studies in South Korean (51), Indonesia (52), Iran (43, 44) reported self-efficacy was affecting factor in Pap smear screening. A study conducted by Gemeda et al revealed women who had high self-efficacy were 4 times more likely to perform cervical cancer screening compared to those who had low self-efficacy (38). From the results of this study, it can be concluded that if women have confidence in their capacity, the barriers to performing Pap smear screening behavior are reduced and HL increased, they may be more willing to perform healthy behaviors, including Pap smear screening behavior. If the factors affecting Pap smear screening collaborate well, they will affect Pop smear screening behavior. In addition, to improve the Pap test screening behavior among women, intervention programs designed

by healthcare providers that focus on sociodemographic-specific approaches could be established and reduced the perceived barriers.

Study Limitations and Strengths: We applied the cognitive factors including perceived barriers and self-efficacy and HL as determinants of Pap smear screening among married women. Because cognitive factors including women's perceived barriers and self-efficacy are often ignored. Also, the results of this study can help health care providers focus more on perceived barriers, self-efficacy and HL. The setting of study was in health centers that married women are more likely to visit health centers for Pap smear tests, so it was easy to reach the target group.

There were some limitations in this study. The self-reporting measures used in the study might be biased in responders. The participants might not give the correct answers to questions or they might an answer that is acceptable to the researcher or society. This limitation reduced by explaining the aims and importance of the study in detail. Data were collected in a city located in Northwest of Iran that participants speak Turkish; thus, the results of it need to be generalized more carefully. Future studies could address various groups of women in other area of Iran and other countries.

Conclusions

In total, among the demographic factors, the determinants of Pap test screening behavior in Iranian women were age groups, history of urinary infection and number of children. These results show that it is better to focused on demographic variables in designing health interventions related to Pap smear screening test. In determinants of Pap smear screening among married women, cognitive factors including perceived barriers and self-efficacy and HL played an important role. Healthcare providers and policymakers can apply the results of this research to design, implement and steadily sustain the programs are highly advised for promoting cognitive factors, HL and Pap smear screening behavior among married women.

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Consent for publication: Not applicable.

Ethics approval and consent to participate: The present study was conducted in terms of the principles of the revised Declaration of Helsinki, which is a statement of ethical principles that directs physicians and other participants in medical research involving human subjects. The participants were assured about their anonymity

and confidentiality of their information. Moreover, the Ethics Committee of the Sarab Faculty of Medical Sciences (Ethics Code: IR.SARAB.REC.1402.003) approved this research. Written consent was obtained from the participants. All methods were performed in accordance with the relevant guidelines and regulations, and all the research methods met the ethical guidelines described in the Declaration of Helsinki.

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