Cervical Cancer Screening Uptake Inequality

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ABSTRACT

Introduction: Cervical cancer is a significant public health concern and has caused numerous unfortunate deaths. The Pap smear (PS) test is a widely-recognized and affordable screening technique used to detect cervical cancer at an early stage.

Objective: This study aimed to investigate the inequality in cervical cancer screening uptake.

Materials and Methods: This cross-sectional research was conducted on 774 married 30–37 women selected by multi-stage cluster sampling. They were living in Kermanshah City, Iran, in 2019. Their socioeconomic status was evaluated using the principal component analysis (PCA) and was shown by the index and curve of concentration of socioeconomic inequality in PS. The obtained data were analyzed using the chi-square, t-test, logistic regression, and compensation statistical tests.

Results: The mean age of participants was 45.42±10.66 years. About 43.9% of women had education levels under a diploma. Also, 89.3% of women were married, and 58.1% had already done a PS test at least once. In addition, 26.5% of women had a regular PS test uptake. The concentration index for PS test uptake was 0.062 (P=0.115). Education level (OR=1.181, 95% CI; 1.022, 1.364, P=0.024) and a positive family history of cervical cancer (OR=3.591, 95% CI; 1.811, 7.120, P=0.001) had significant impacts on regular PS uptake.

Conclusion: A person's level of education and family history of cervical cancer were the most critical factors for getting regular PS test uptake. Furthermore, the concentration index showed that the frequency of PS test uptake was slightly higher in the rich group. Focusing interventions on less educated and disadvantaged women may provide useful insights to promote PS test uptake, thereby reducing inequalities. Moreover, using fear appeal strategies to promote PS test uptake may be beneficial.

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Highlights

• About 58.1% of women had a history of pap smear (PS) test uptake.

• Education level and a positive family history of cervical cancer had significant impacts on regular PS test uptake.

• The concentration index for PS test uptake in participants was 0.062.

Plain Language Summary

PS test is suitable for early detection of cervical cancer. This study examined PS test-taking disparities among 774 married women living in Kermanshah City, Iran. More than half of the women (58.1%) had undergone a PS test. The most important predictors of PS test uptake were level of education and a positive family history of cervical cancer. The concentration index showed that the frequency of PS test uptake was slightly higher in the rich group. Interventions focusing on less educated and disadvantaged women may provide useful insights to promote PS test uptake and reduce inequalities. Furthermore, using fear appeal strategies to promote PS test uptake may be beneficial.

Introduction

C ervical cancer is the fourth most frequent cancer in women and the third most common cancer in 146 countries, affecting women younger than 45 years old. Furthermore, more than half a million women are diagnosed with cervical cancer annually; cervical cancer resulted in the deaths of 311000 women worldwide in 2018, of which approximately 90% occurred in low- and middle-income countries [1]. Since the introduction of screening programs in high-income countries, the mortality rates of cervical cancer have dropped by more than half over the past 30 years, but it has not changed or increased in low-income countries [2, 3].

There are two very effective prevention strategies for cervical cancer: Human papillomavirus (HPV) vaccination and cervical screening with initial HPV testing followed by the treatment of precancerous lesions. Although the vaccination can prevent 70%-90% of cervical cancer, it cannot prevent cancer if the vaccine is injected in the precancerous phase [4]. Cervical screening is accessible and affordable, and more importantly, it is an effective method for early detection of cervical cancer, especially in developing countries [5]. Results have shown that regular pap smear (PS) test can help early treatment and thus reduce the incidence of cervical cancer in women aged 30-70 years old, especially in the range of 45-55 years old. Therefore, the widespread use of cervical cytology screening in developed countries has significantly reduced cervical cancer and its mortality [6, 7]. Inadequate resources for screening, insufficient education of women about the importance of screening, low socioeconomic status (SES), and low level of education are the most critical factors influencing PS test uptake in women [8-11].

Due to the importance of cervical cancer health issues and the existence of preventive strategies, screening should be done regularly to reduce the burden of the disease [12]. Performing PS test for early detection of cervical cancer is a practical, inexpensive, necessary, and available method that can significantly reduce the burden of cervical cancer [13]. Therefore, this study aimed to investigate the inequality in cervical cancer screening uptake in women in 2019.

Materials and Methods

This cross-sectional research was conducted from July to September 2019 among 774 women aged 30-75 years living in Kermanshah City, Iran. Samples were selected through multi-stage cluster sampling. First, Kermanshah was divided into 8 areas according to the municipal areas. Then, each area was divided into 10 blocks, and 2 blocks were randomly selected, and eligible households were included in the study from these blocks. Data collection was completed using a written questionnaire and holding interviews. For this study, it was determined that a sample size of 751 individuals was needed. This calculation was based on considering a 4% margin of error, a 50% prevalence rate, and a 25% allowance for dropped samples. Ultimately, data was gathered from 774 participants.

Cervical Cancer Screening Uptake. J Holist Nurs Midwifery. 2024; 34(3):254-261.

255

The questionnaire consisted of three parts. In the first part, demographic information was collected. The second section assessed socioeconomic status of the participants. In the third part, participants PS uptakes were assessed.

In section one, age, level of education, marital status, family size, and positive family history of cervical cancer were collected as demographic variables.

In section two, as the main variable of household economic status was calculated using principal component analysis (PCA) and considering participants' economic and social variables. Socioeconomic status information related to durable goods and social determinants included ownership of cars, refrigerators, televisions, freezers, washing machines, vacuum cleaners, cell phones, bicycles, laptops smear, etc. and the number of rooms in an apartment. Moreover, annual domestic and international travel was questioned. This questionnaire has been used in studies measuring inequality in Iran [14-17].

In section three, to assess whether participants had PS test uptake in the past, they answered the questions "Have you ever had PS test uptake for cervical cancer screening?" and "Have you regularly undergone PS test for cervical cancer screening?"

Four trained public health experts conducted interviews and gathered data for this study. The data were collected by visiting the participants in their homes.

The concentration index (Cn) is defined using a concentration curve. Cn is twice the area between the concentration curve and the isopleth line (45° line). If there is no socioeconomic inequality, Cn will be zero. In this convention, the index takes a negative value if the curve lies above the equivalence line, indicating a disproportionate concentration of the health variable among the poor. It takes a positive value if it lies below the equivalence line [18]. Cn is determined using the Equation 1.

1. $C_K = \dfrac{2}{\bar{\mu}} \operatorname{cov}(h_i, r_i)$

, where $\bar{\mu}$ is the mean health variable in the entire population and r_i each Pearson's rank in the socioeconomic quintile. $r_i=1/N$ for the poorest person and $r_i=N/N$ for the richest. h_i is the health variable for the person i. According to Equation 1, for binary dependent variables, the Cn may not fall in the -1 to +1 range, in which case the normalized Cn in Equation 2 should be used [19].

2. $C_n = \dfrac{(C_k)}{(1-\mu)}$

In descriptive analysis, numbers and percentages have been used for all nominal and sequential qualitative variables. Logistic regression was used to identify predictors of regular PS test uptake, and model 1 (crude analysis) was used for this analysis. Variables with P>0.25 were excluded from the adjusted model, whereas variables with P<0.25 were included in model 2 (adjusted analysis). It is worth mentioning that widowed women may have different property arrangements than married women. Married women are considered the reference group for the analysis. In this study, a significance level of 5% has been considered for the 95% confidence interval (CI) to confirm the statistical significance of the relationship PS. Data were analyzed using STATA software, version 14 including the chi-square test, t-test, logistic regression, and compensation statistical tests.

Results

The mean age of participants was 45.42±10.66 years. A total of 450 women (58.1%) had a history of PS test uptake. In addition, 205 women (26.5%) have a regular PS test uptake. Details of the participants' demographic characteristics are shown in Table 1.

The mean age of women with regular PS test uptake was 44.19±8.89 years. Initially, a logistic regression was conducted to analyze the data, and variables that were not statistically significant (family size and socioeconomic states) were removed from the model. The participants' education level (OR=1.181, 95% CI; 1.022, 1.364, P=0.024) and a positive family history of cervical cancer (OR=3.591, 95% CI; 1.811, 7.120, P=0.001) had significant impacts on their regular PS test uptake (Table 2).

Table 3 indicates that women in the rich category had a notably lower average age. Specifically, the mean age for poor, middle, and rich women was 48.23, 44.80, and 42.86, respectively, with a statistically significant difference. Moreover, when considering socioeconomic status, a higher proportion of married women were observed to belong to the rich group. Additionally, 54.3% of educated women were found in the rich category. It was determined that education level had a significant association with SES. Family size and positive family history of cervical cancer did not show a significant relationship with SES.

256

Cervical Cancer Screening Uptake. J Holist Nurs Midwifery. 2024; 34(3):254-261.

Table 1. Distribution of demographic variables of women (n=774)

Variables		No. (%)
Age (y)	30-39	275(35.5)
	40-49	259(35.5)
	50-59	137(17.7)
	60-69	82(10.6)
	≥ 70	21(2.7)
Marital status	Married	691(89.3)
	Widow	83(10.7)
Education	Illiterate	103(13.3)
	Primary	138(17.8)
	Secondary	99(12.8)
	High school	191(24.7)
	Academic	243(31.4)
Family size	1-3	370(50.3)
	4-6	347(47.2)
	>6	18(2.5)
Positive family history of cervical cancer	No	737(95.2)
	Yes	37(4.8)
Socioeconomic status	1st	277(35.8)
	2nd	253(32.7)
	3rd	244(31.5)

The concentration index for PS test uptake in the women was 0.062, which indicates the concentration of PS in the high socioeconomic status of the participants. Still, due to the low value of the index and the lack of statistical significance, it can be concluded that PS test uptake independently with SES has no significant relationship (Figure 1).

Table 2. Associated factors related to regular PS uptake among the participants (n=774)

Variables	Crude OR (95% CI)	SE	P	Adjusted OR (95% CI)	SE	P
Age	0.985 (0.970-1.000)	0.008	0.055	0.999 (0.979-1.019)	0.010	0.093
Marital status	0.796 (0.599-1.059)	0.189	0.118	0.836 (0.613-1.141)	0.159	0.258
Education level	1.192 (1.061-1.339)	0.059	0.003	1.181 (1.022-1.364)	0.074	0.024
Family size	0.998 (0.886-1.123)	0.232	0.971	-	-	-
Positive family history of cervical cancer	3.127 (1.607-6.085)	0.340	0.001	3.591 (1.811-7.120)	0.349	0.001
Socioeconomic status	1.048 (0.862-1.273)	0.212	0.637	-	-	-

Cervical Cancer Screening Uptake. J Holist Nurs Midwifery. 2024; 34(3):254-261.

257

Table 3. Relationship between the variables studied with the socioeconomic status of women (n=774)

Variables		No. (%)			P*
		Low	**Middle**	**High**	
Age (y)	30-39	82(29.8)	91(33.1)	102(37.1)	0.001
	40-49	74(28.6)	88(34)	97(37.5)	
	50-59	67(48.9)	44(32.1)	26(19)	
	60-69	40(48.8)	26(31.7)	16(19.5)	
	≥70	14(66.7)	4(19)	3(14.3)	
Marital status	Married	233(33.7)	228(33)	230(33.3)	0.001
	Widow	44(53)	25(30.1)	14(16.9)	
Education	Illiterate	63(61.2)	26(25.2)	14(13.6)	0.001
	Primary	74(53.6)	44(31.9)	20(14.5)	
	Secondary	54(54.5)	34(34.3)	11(11.1)	
	High school	51(26.7)	73(38.2)	67(35.1)	
	Academic	35(14.4)	76(31.3)	132(54.3)	
Family size	1-3	140(37.8)	124(33.5)	106(28.6)	0.131
	4-6	113(32.6)	116(33.4)	118(34)	
	>6	9(50)	2(11.1)	7(38.9)	
Positive family history of cervical cancer	No	259(35.1)	244(33.1)	234(31.8)	0.237
	Yes	18(48.6)	9(24.3)	10(27)	

*The chi-square test.
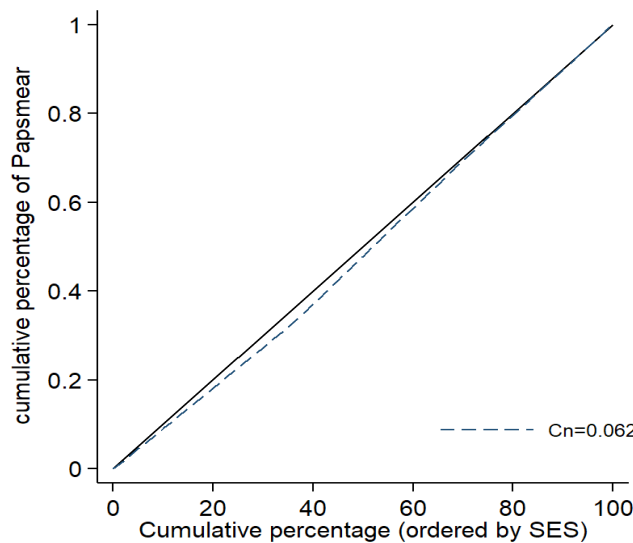
Figure 1. Concentration curve for PS uptake in women participating in the study

258

Cervical Cancer Screening Uptake. J Holist Nurs Midwifery. 2024; 34(3):254-261.

Discussion

This study aimed to determine the inequality of cervical cancer screening uptake. Although the numerical value of the concentration index in this study was positive, it was not significant. Given the cheapness and availability of this screening test in Iran, this result is not far-fetched.

It is important to note that a large number of women aged 60 and above were either illiterate or had only completed primary education. However, the research revealed that education was crucial in determining whether women underwent regular PS tests. Additionally, there was a significant connection between education and SES, with educated women generally having better SES. A study examining the barriers to PS uptake in low- and middle-income countries discovered that in Latin American countries, women with low SES had significantly lower rates of PS test uptake. However, age lacked a significant impact on uptake [20]. Moreover, our finding was in line with a study conducted in Brazil by Açucena Vieira Alves et al., which found that a higher level of education positively correlated to cervical cancer screening [21]. Furthermore, Ahmed et al., in a study among female university students in a multiethnic institution, indicated that the increase in PS test uptake was associated with increased knowledge about cervical cancer PS risk factors [22]. These results may highlight the role of information and communication inequality in addressing health disparities, which are important determinants. Compared to illiterate women, educated individuals prioritize their health more [23]. Our findings highlight the education to encourage women, especially older and less educated women, to undergo regular cervical cancer screening. Measures to improve education, especially among older women, are extremely difficult or even impossible. Instead, addressing inequities and communication gaps may be more effective in increasing the uptake of preventive services. Educating society about the benefits of cancer screening and more active health educators in Iranian health centers as the first line of health care would be beneficial. This approach could make a significant contribution to promoting better health outcomes.

In our study, we found women with a family history of cervical cancer had the highest rate of screening. This finding suggests that these women felt concerned about their health and were motivated to get screened to learn about their condition. Therefore, educating all women in the community about the significance of screening is crucial. Numerous studies conducted in Iran have indicated that having a family history of cancer plays a significant role in determining whether individuals undergo cancer screening [24-26]. This group appears to be more sensitive or perceive a greater risk than others. Using fear appeal strategies [26] to promote PS test uptake may be beneficial.

This study had several limitations. First, data collection was based on the questionnaire, which is usually prone to recall bias. When analyzing the results, it is essential to consider the bias. Second, due to the nature of the dependent variable, it was better to ask about the age of marriage, the number of pregnancies, and the method of contraception. Third, some important variables, such as the frequency of PS test uptake, were not examined; only the history of PS test uptake and its regular use were assessed. Finally, the current study was conducted among women in Kermanshah in the west of Iran; therefore, the generalizability of our findings is limited. However, the present study demonstrates the factors influencing the PS uptake for cervical cancer screening and may help plan for further in-depth research before developing health promotion programs.

Ethical Considerations

Compliance with ethical guidelines

The Research Ethics Committee of Kermanshah University of Medical Sciences, approved the study protocol (Code: IR.KUMS.REC.1398.301). Details of the study were provided to participants, including how the study was being performed, the confidentiality of information, and the purpose of the study before participation.

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Authors' contributions

Study design, conceptualization and data interpretation: Mehdi Mirzaei-Alavijeh and Farzad Jalilian; Data analysis: Mahin Amini; Initial draft preparation: Shima Khashij; Review and editing: Seyyed Nasrollah Hosseini; Final approval: All authors.

Conflict of interest

The authors declared no conflict of interest.

Cervical Cancer Screening Uptake. J Holist Nurs Midwifery. 2024; 34(3):254-261.

259

Acknowledgments

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260

Cervical Cancer Screening Uptake. J Holist Nurs Midwifery. 2024; 34(3):254-261.

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Cervical Cancer Screening Uptake. J Holist Nurs Midwifery. 2024; 34(3):254-261.

261