RESEARCH ARTICLE

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Disparities in the Uptake of Cervical Cancer Screening in Kuwait: A Cross-Sectional Analysis of the Nationwide WHO STEPS Survey

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Abstract

Objective: Cervical cancer is projected to increase by 48% in Kuwait by 2035. Detecting cervical cancer early can prevent its progression. Given the paucity of prior research in Kuwait, we aimed to investigate cervical cancer screening (CCS) prevalence using a representative sample and assess disparities in CCS uptake among Kuwaiti women. **Methods:** We obtained a representative Kuwaiti sample (n=3915) through WHO's STEPwise approach to noncommunicable disease risk factor surveillance (STEPS). Demographic, socioeconomic, and health data were analyzed for women aged 18-69 (n=2292) with available CCS information. Results were age-weighted, and analysis included descriptive statistics, bivariate analysis, and multivariable logistic regression adjusted for sociodemographics and health status. **Results:** Weighted CCS prevalence was 15.2% (95% CI [13.7-16.7]). Older women had higher odds of CCS; 60-69 age group was four times more likely to be screened than the 18-29 group (OR 4.0 [2.6-9.4]). Married (OR 5.0 [2.6-9.4]), divorced/widowed (OR 5.2 [2.6-11.3]) women, retirees (OR 2.1 [1.3-3.5]), those with high school degree or higher (OR 2.7-2.8 [1.1-7.0]), and those with hypertension (OR 1.7 [1.1-2.4]) had higher odds of screening. Overweight/diabetic women had 40% lower odds of CCS (OR 0.6 [0.4-0.9]), and non-Capital residents had 60% lower odds (OR 0.4 [0.3-0.6]). **Conclusions:** CCS uptake among Kuwaiti women is minimal, with disparities in age, education, residence, marital status, employment, and health issues. Efforts are needed for organized, widely promoted, physician-endorsed screening programs addressing such disparities and Kuwait's cultural norms.

Keywords: Cervical cancer- cancer screening- Kuwait- papanicolaou test- prevalence

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Introduction

Cervical cancer is the 4th most prominent cancer among females worldwide and varies between 8th and 10th among countries in the Gulf Cooperation Council (GCC), a regional, intergovernmental, political, and economic union comprised of Kuwait, Bahrain, Saudi Arabia, Oman, Qatar, and the United Arab Emirates (UAE) [1, 2]. In Kuwait, specifically, the age adjusted incidence rate of cancer of the cervix uteri is 3.4 and the mortality rate (per100,000) is 1.2 [3]. The incidence and mortality of cervical cancer in Kuwait are expected to rise by 39.3% and 64.7%, respectively, by 2030 [4]. Unlike most other types of cancer, cervical cancer is preventable through the early detection and treatment of precursor lesions [5]. In Kuwait, patients diagnosed at an early localized stage had higher probabilities of survival, with a 5-year survival rate of over 90% [6]. Cervical cancer in Kuwait is most commonly diagnosed at the regional stage, which has a lower overall probability of survival [6]. Therefore, early detection of cervical cancer through effective early screening is crucial for reducing the significant projected increases in cervical cancer incidence and mortality rates in the country [7-10].

Guidelines and practices for cancer screening vary by country. Papanicolaou cytological tests (Pap smear) are widely accepted as the gold standard screening test due to their profound effect on cervical cancer mortality in nations that have adopted screening programs. However, due to the role of HPV in increasing the risk of developing cervical cancer, HPV DNA testing is also an alternative screening tool [11]. The latest 2020 American Cancer

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Society (ACS) guidelines recommend cervical cancer screening with an HPV test alone every five years for females aged 25 to 65. When HPV testing alone is not available, it is recommended that an HPV test and a Pap test are performed together, or a Pap test is conducted solely every three years [12]. The previous 2012 ACS guidelines recommended an earlier age for starting screening, where females 21-29 years were recommended to have a Pap test every three years, and those 30-65 to have an HPV/Pap co-test every three years. Kuwait offers screening tests through both (Pap tests) and HPV DNA tests through some governmental and private hospitals and polyclinics [13]. However, due to cultural reasons, testing in Kuwait and other Arab countries normally begins after the woman is married as opposed to the age recommended by the ACS [14, 13].

In the GCC, besides the availability of opportunistic Pap smear screening, the UAE is the only one of the six GGC countries that has a national cervical screening program [15]. In Kuwait, early detection tests are performed when recommended by gynecologists as part of routine check-ups every 5 years or when requested by the patients, thus excluding an extensive section of the community [13]. A study conducted in 2006 among 300 married Kuwaiti women found that about 80% had not heard of the cervical cancer screening test. Women who had not undergone a Pap smear before claimed that it was because a physician did not suggest the test [16]. The uptake of screening for other cancers in Kuwait, such as breast cancer, is also deficient [17]. This lack of knowledge and uptake of screening, accentuates the need for increased education and promotion of such practices to improve screening uptake in the country.

Presently, there is limited literature on the uptake of cervical cancer screening in Kuwait. One study, by So et al., assessed the uptake of cervical cancer screening in Kuwait, by using a nationally representative sample, however, the study sample included only women aged 25-49 and the study was implemented in 2008/2009 [18]. This study, therefore, aims to report a more recent prevalence of cervical cancer screening among Kuwaiti females and expand the age range from 21-69 years old by using a representative sample of Kuwaiti females collected during 2014 through the Eastern Mediterranean Approach for Control of Non Communicable Diseases (EMAN) Study; a project supported by the Kuwait Ministry of Health and the World Health Organization (WHO) [19]. To gain better knowledge of women's screening behaviors and examine disparities in the country, sociodemographic factors associated with women who have undergone cervical screening will also be assessed.

Materials and Methods

The EMAN study incorporated the WHO STEPwise approach to Surveillance (STEPS) methodology for data collection that included a structured demographic and medical history questionnaire, physical and biochemical measurements, and questions adapted to the country's local needs. A sampling frame was obtained through the Public Authority of Civil Information (PACI) database that includes all registered residents in Kuwait. A random sample of 4,391 Kuwaitis between 18-69 years was selected, representing all governorates. The sample was stratified into four age groups (18-29, 30-44, 45-59, 60-69) with an equal representation of sexes in each group. Telephone calls were first made to brief each participant about the aim of the study and its procedures and to invite them to visit a selected primary health care center at a scheduled time for the interview.

Data Collection

The WHO and the Regional Office for the Eastern Mediterranean (EMRO) trained the EMAN project members in the STEPwise strategy, interview procedures, and data collection. Face-to-face interviews with each participant were conducted using the WHO STEPS Instrument for Chronic Disease Risk Factor Surveillance questionnaire (version II). The questionnaire was translated into Arabic, then adapted for specific country characteristics before retranslation to English. The adapted version was then reviewed and approved by the STEPS Coordinating Committee. Data were collected between March and September 2014. A response rate of 89.2% was attained, and women were more likely to participate than men (95.8% and 80%, respectively). As for age, younger participants in the 18-29 years group had a lower response rate (79%) than the older age group of 45-69 years (98.4%). Using the questionnaire, interviewers collected information on the participants' demographics and medical history, including other variables such as cancer screening.

The questionnaire described possible screening techniques, and cancer screening was evaluated using the following question: Have you ever had a screening test for cervical cancer using any of these methods described above? (Yes/No/I do not know). Independent variables used in the analysis were age (18-29, 30-44, 45-59, 60-69 years), governorate (Capital, Hawalli, Mubarak Alkabeer, Ahmadi, Fawraniya and Jahra), marital status (single, married, divorced or widowed), level of education (no formal education, intermediate or less, high school, university, post-graduate), work status (worker, student, homemaker, retired, unemployed), smoking status (never smoked, past smoker, current smoker), BMI (normal, overweight, obese), history of cardiovascular disease (CV) (Yes/No), diabetes (Yes/No), hypertension (Yes/No) (Table 1).

Statistical Analysis

The data for each case was weighted to adjust for differences in the sample regarding age, sex distribution, and non-response. The sample weights were determined through multiplication of the sample selection weight (population n/sample n), the non-response weight (1/response rate), and the population weight (population proportion/sample proportion). The sample weights were applied using the Stata Statistical Package (version 16) survey (svy:) commands to obtain estimates and 95% confidence intervals. For this study, only data for females were included in the analysis (n= 2,292). The six governorates were also combined into three groups

Table 1. Participant Characteristics by Screening Status. STEPS Survey, Kuwait, 2014

Characteristic	Total (n=2,292)				Not screened[a] (n=1,939; 84.8%)			Screened[a] (n=353; 15.2%)			P-value[b]
	Unweighted		Weighted								
	n	%	n	%	n	%	[95% C.I.]	n	%	[95% C.I.]	
Age Group					1,939			353			
21-29	736	32.1	781	31.8		42.2	[40.0, 44.5]		15.4	[11.7, 19.9]	<0.001
30-44	958	41.8	1,014	41.2		34.6	[32.6, 36.7]		32.6	[28.0, 37.4]	
45-59	491	21.4	531	21.6		18.3	[16.7 , 20.1]		38.9	[33.9, 44.1]	
60-69	107	4.7	134	5.5		4.9	[3.9 , 6.1]		13.2	[9.7 , 17.7]	
Governate					1,939			352			
Capital	564	24.6	591	24.0		22.5	[20.7 , 24.5]		38.6	[33.6, 43.8]	<0.001
Hawalli & Mubarak	641	28.0	699	28.4		28.5	[26.5, 30.6]		24.1	[19.9, 28.9]	
Ahmadi, Farwaniya, Jahra	1,087	47.4	1,170	47.6		49.0	[46.7 , 51.2]		37.3	[32.4, 42.5]	
Marital Status					1,939			352			
Single	517	22.6	542	22.1		28.3	[26.2, 30.4]		4.5	[2.7, 7.4]	<0.001
Married	1,545	67.4	1,654	67.3		62.6	[60.4 , 64.8]		78.9	[74.1, 83.0]	
Divorced/Widowed	229	10.0	262	10.7		9.1	[7.9 , 10.5]		16.5	[12.9, 21.0]	
Level of Education					1,868			333			
No formal education	72	3.3	85	3.6		3.6	[2.8 , 4.6]		4	[2.3, 7.0]	0.043
Intermediate or less	284	12.9	326	13.8		12.2	[10.7 , 13.8]		17.9	[14.0, 22.6]	
High School	362	16.5	380	16.1		16.9	[15.2, 18.7]		17.6	[13.9, 22.2]	
University	929	42.4	978	41.4		42.3	[40.1, 44.6]		35.6	[30.6, 40.9]	
Post-graduate	554	25.2	596	25.2		25.0	[23.1, 27.1]		24.9	[20.5, 29.9]	
Work Status					1,939			353			
Worker	1,676	73.1	1,777	72.3		72.8	[70.7 , 74.8]		61.4	[56.1, 66.5]	<0.001
Student	145	6.3	152	6.2		8.6	[7.3, 10.0]		1	[0.3, 3.1]	
Homemaker	313	13.7	367	14.9		12.9	[11.4, 14.5]		21.4	[17.3, 26.2]	
Retired	131	5.7	134	5.5		4.3	[3.4, 5.3]		15.8	[12.2, 20.2]	
Unemployed	27	1.2	29	1.2		1.5	[1.0, 2.2]		0.3	[0.1, 2.4]	
Smoking Status					1,939			353			
Never smoked	2,185	95.3	2,349	95.5		95.3	[94.3, 96.2]		95.3	[92.6, 97.1]	0.659
Past smoker	27	1.2	27	1.1		1.3	[0.9 , 2.0]		0.8	[0.3, 2.5]	
Current Smoker	80	3.5	83	3.4		3.4	[2.6, 4.3]		3.9	[2.3 , 6.5]	
BMI					1,733			322			
BMI<25	480	23.4	507	23.0		25.6	[23.5, 27.8]		17.5	[13.6, 22.1]	<0.001
Overweight	680	33.1	719	32.6		34.4	[32.1, 36.7]		23.3	[19.0, 28.2]	
Obese	894	43.6	982	44.5		40.1	[37.8, 42.4]		59.3	[53.7 , 64.6]	
History of CV Disease					1,939			353			
No	2,169	94.6	2,323	94.5		95.5	[94.5, 96.4]		89	[85.2, 92.0]	<0.001
Yes	123	5.4	135	5.5		4.5	[3.6, 5.5]		11	[8.0, 14.8]	
History of Diabetes					1,939			353			
No	2,060	89.9	2,202	89.6		90.4	[89.0, 91.7]		83.9	[79.4, 87.5]	0.001
Yes	232	10.1	257	10.5		9.6	[8.3 , 11.0]		16.1	[12.5, 20.6]	
History of Hypertension					1,939			353			
No	1,948	84.9	2,071	84.2		87.4	[85.8 , 88.8]		70.7	[65.6, 75.3]	<0.001
Yes	344	15.1	388	15.8		12.7	[11.2, 14.2]		29.3	[24.7, 34.4]	
Total Participants					1,939			353			

[a] All estimates are weighted to adjust for age distribution of the Kuwaiti female population; [b] P-value for trend between patients screened versus unscreened (weighted); n, number of participants; CI, confidence interval; BMI, body mass index

to reflect the similarities between residents of Hawalli, Mubarak AlKabeer, and the residents of Ahmadi, Farwaniya and Jahra, while using the Capital as the baseline reference group.

Proportions were used to summarize participant characteristics. Differences between proportions, e.g., not screened vs. screened, were assessed using chi-square and chi-square test for trend. The prevalence of cancer

screening was defined as the percentage of participants who answered yes to the screening question, weighted for the age distribution of the Kuwaiti female population. Logistic regression analysis was used to identify participant characteristics associated with screening for cervical cancer. The backward elimination method was used to obtain the best-fitted model, and variables with p-values <0.05 were considered significant. The resultant model met the requirements for logistic regression models, as determined by goodness of fit and model specification tests.

Results

Participant characteristics

A total of 2,292 participants were included in the analyses. The majority (41.2%) were aged 30-44 years, married (67.3%), attained university-level education (41.4%), were employed (72.30%) and resided in the governorates of Ahmadi, Farwaniya or Jahra (47.6%). Most of the women had never smoked (95.5%), were obese (44.5%), and did not have a history of cardiovascular disease (94.5%), diabetes (89.6%), or hypertension (84.2%) (Table 1).

A total of 353 (15.4%) women were screened for cervical cancer during the study period. Compared to women who were not screened, a larger proportion of women screened were aged 45-59 years (38.9% vs. 18.3%) or 60-69 years (13.2% vs. 4.9%), lived in the Capital governorate (38.6% vs. 22.5%), were married (78.9% vs. 62.6%) or divorced/widowed (16.5% vs. 9.1%), and were homemakers (21.4% vs. 12.9%) or retired (15.8% vs. 4.3%). More screened women were also obese (59.3% vs. 40.1%), had a history of CV disease (11.0% vs. 4.1%), hypertension (16.1% vs. 9.6%), and diabetes (29.3 % vs. 12.7%). A greater proportion of unscreened women were aged 21-29 (42.2% vs. 15.4%), lived in Ahmadi, Farwaniya or Jahra governorate (49.0 % vs. 37.3%), attained university-level education (42.3% vs. 35.6%), and were workers (72.8% vs. 61.4%). Smoking status was similar between women screened and not screened (Table 1).

Prevalence of screening for cervical cancer among adult Kuwaiti women

The weighted prevalence of cervical cancer screening was 15.2% (95% CI: 13.7-16.7%) (Table 2). Screening was most common among women aged 60-69 years (32.7%, 95% CI: 24.5-42.1%), who were divorced or widowed (24.5%, 95% CI: 19.2-30.7%), had intermediate education (20.5%, 95% CI: 16.1-25.8%), were retired (39.9%, 95% CI: 31.7-48.6%), and resided in the Capital governorate (23.4%, 95% CI: 20.1-27.1%). High screening prevalence was also observed among obese participants (21.3%, 95% CI: 18.7-24.2%), those with a history of CV disease (30.5%, 95% CI: 22.9-39.4%), hypertension (29.3%, 95% CI: 24.7-34.4%), and diabetes (23.1%, 95% CI: 18.0-29.1%). Cervical cancer screening prevalence was similar between non-smokers and past/current smokers (15.2% and 15.3% respectively).

Factors associated with screening for cervical cancer among adult Kuwaiti women

Cervical cancer screening significantly differed by age, with higher rates in older women (Table 3). The odds ratio

Table 2. Prevalence of Cervical Cancer Screening (weighted for age distribution of the Kuwaiti female population, n=2,292)

Characteristic	Subgroup Weighted Prevelance of Screening		
	n	%	[95% CI]
Overall	353	15.2	[13.7, 16.7]
Age (years)			
18-29	45	6.1	[4.6 , 8.1]
30-44	138	14.4	[12.3 , 16.8]
45-59	135	27.5	[23.7 , 31.6]
60-69	35	32.7	[24.5, 42.1]
Governate			
Capital	135	23.4	[20.1, 27.1]
Hawalli & Mubarak	84	13.1	[10.7 , 16.0]
Ahmadi, Farwaniya, Jahra	134	12	[10.2, 14.1]
Marital Status			
Single	15	2.8	[1.7, 4.6]
Married	283	18.4	[16.5, 20.4]
Divorced/Widowed	54	24.5	[19.2, 30.7]
Level of Education			
No formal education	12	16.5	[9.5 , 27.0]
Intermediate of less	56	20.5	[16.1, 25.8]
High School	59	15.5	[12.2 , 19.6]
University	121	12.9	[10.8 , 15.2]
Post-graduate	85	14.9	[12.1, 18.1]
Work Status			
Worker	227	13.1	[11.6, 14.8]
Student	3	2.1	[0.7 , 6.3]
Homemaker	71	22.9	[18.5, 28.0]
Retired	51	39.9	[31.7, 48.6]
Unemployed	1	3.9	[0.6 , 23.2]
Smoking Status			
Never smoked	336	15.2	[13.7, 16.7]
Past smoker	3	10	[3.2 , 27.2]
Current Smoker	14	17.1	[10.3 , 27.0]
BMI			
BMI<25	56	11.1	[8.6 , 14.2]
Overweight	78	11.1	[8.9 , 13.6]
Obese	188	21.3	[18.7 , 24.2]
History of CV Disease			
No	316	14.3	[12.9, 15.8]
Yes	37	30.5	[22.9 , 39.4]
History of Diabetes			
No	301	14.2	[12.8 , 15.8]
Yes	52	23.1	[18.0 , 29.1]
History of Hypertension			
No	253	12.6	[11.2 , 14.2]
Yes	100	29.3	[24.7 , 34.4]

n, number of participants; CI, confidence interval; BMI, body mass index

(OR) for screening was 2.5 (95% CI: 1.5-4.0) for ages 45-59 and 4.0 (95% CI: 2.0-8.0) for ages 60-69. Married or divorced/widowed women had higher screening rates than those who were single; OR 5.0 (95% CI: 2.6-9.4) and 5.4 (95% CI: 2.6-11.3), respectively. Compared to women with no formal education, women with a high school, college, or post-graduate education had about 2.8 times the odds of getting screening (95% CI: 1.2-6.7, 1.1-7.0, and 1.1-7.1, respectively). Retired women were more likely to be screened (OR 2.1, 95% CI: 1.3-3.5). Conversely, screening was 60% less likely among Hawalli, Mubarak, Ahmadi, Farwaniya, or Jahra residents compared to the Capital; OR for both was 0.4 (95% CI: 0.3-0.6).

Women with a history of hypertension exhibited higher odds of cervical cancer screening compared to those without such history (OR 1.7, 95% CI 1.1-2.4). Conversely, overweight women and those with a history of diabetes mellitus were 40% less likely to be screened than those with a normal BMI or no diabetes; OR 0.6 (95% CI 0.4-0.9), and 0.6 (95% CI 0.4-1.0), respectively. Screening status remained consistent across smoking status and the presence of CV disease history (Table 3).

Table 3. Adjusted Odds Ratio (OR) of Cervical Cancer Screening (weighted for the age distribution of the female Kuwaiti population) in association with population characteristics. STEPS Survey, Kuwait, 2014.

Characteristic	Adjusted OR of cervical screening		
	OR	[95% CI]	p-value
Age (years)			
18-29	1	[Reference]	
30-44	1.5	[1.0 , 2.3]	0.049 *
45-59	2.5	[1.5 , 4.0]	<0.001 *
60-69	4	[2.0 , 8.0]	<0.001 *
Governate			
Capital	1	[Reference]	
Hawalli & Mubarak	0.4	[0.3 , 0.6]	<0.001 *
Ahmadi, Farwaniya, Jahra	0.4	[0.3 , 0.6]	<0.001 *
Marital Status			
Single	1	[Reference]	
Married	5	[2.6 , 9.4]	<0.001 *
Divorced/Widowed	5.4	[2.6 , 11.3]	<0.001 *
Level of Education			
No formal education	1	[Reference]	
Intermediate or less	1.7	[0.8 , 3.8]	0.173
High School	2.8	[1.2 , 6.5]	0.022 *
University	2.7	[1.1 , 6.8]	0.030 *
Post-graduate	2.7	[1.1 , 7.0]	0.034 *
Work Status			
Worker	1	[Reference]	
Student	0.5	[0.1 , 2.2]	0.324
Homemaker	1.6	[1.0 , 2.8]	0.06
Retired	2.1	[1.3 , 3.5]	0.002 *
Unemployed	0.7	[0.1 , 6.0]	0.746
Smoking Status			
Never smoked	1	[Reference]	
Past smoker	0.6	[0.2 , 1.9]	0.359
Current Smoker	1.4	[0.7, 3.1]	0.358
BMI			
BMI<25	1	[Reference]	
Overweight	0.6	[0.4 , 0.9]	0.017 *
Obese	1	[0.7 , 1.5]	0.897
History of CV Disease			
No	1	[Reference]	
Yes	1.4	[0.9 , 2.4]	0.163
History of Diabetes			
No	1	[Reference]	
Yes	0.6	[0.4 , 1.0]	0.040 *
History of Hypertension			
No	1	[Reference]	
Yes	1.7	[1.1 , 2.4]	0.008 *

OR, odds ratio; CI, confidence interval; BMI, body mass index

Discussion

Our study estimated cervical cancer screening prevalence using data from the latest WHO project that incorporated standardized WHO STEPS survey methods. This internationally comparable tool enables countries to collect and disseminate core information on noncommunicable diseases (NCDs). Our reported results are weighted to address the unique age distribution of Kuwaiti females, enhancing the credibility and representativeness of our findings. Gaining insight into the nation's cervical screening practices is essential for discerning the population's requirements, gauging their awareness, and outlining prospective objectives to enhance screening adoption, early detection, and cervical cancer prevention. Assessing screening uptake also plays a pivotal role in evaluating the optimal utilization of healthcare resources and the provision of comprehensive support to women in their battle against cancer.

The weighted prevalence of cervical cancer screening among Kuwaiti women aged 18-69 was low (15.2%), slightly below the 2008/2009 estimate for women aged 25-59 (17.7%) [18]. While differences in research questions exist (Pap smear during most recent exam vs. ever having screening in the current study), age-group disparities likely contributed. The average marriage age in Kuwait is 27.5 years [20], and for cultural and religious reasons, unmarried Kuwaiti women are assumed to be sexually inactive and hence unlikely to be screened. Inclusion of the 18-24 age group, who are less likely to undergo screening may thus explain our lower reported rate. Another 2009 Kuwaiti study found a higher prevalence of CCS (37%) due to non-Kuwaiti females' inclusion [21]. A review of Arab countries also reported low uptake [22]. Despite Kuwait's high-income status and state-funded healthcare system, treatment-focused rather than preventive care might underlie the low rate [23, 24].

Our findings reveal that the weighted prevalence of ever having undergone cervical screening was highest among older women (60-69 years old). Age was a significant factor, with a fourfold increase in screening likelihood for women aged 60–69 compared to those aged 18–29. Additionally, retirees were twice as likely

to be screened as working women. This suggests that older Kuwaiti women, especially those in retirement, exhibit greater awareness of the importance of cervical cancer screening, potentially due to having more time for regular medical check-ups. Conversely, younger women's relatively better health might reduce their interaction with healthcare providers. These observations challenge earlier U.S. research, which found lower screening rates among older women [25, 26].

Cultural disparities in premarital sexual activity offer a plausible explanation for these differences. Kuwait's religious and cultural values, where premarital virginity holds significance, could contribute. In contrast to our findings, previous Kuwaiti [21] and Western studies have identified higher screening rates among married or divorced/widowed women. These trends align with broader research where marital status independently predicts screening rates for various cancers [27]. Efforts to enhance cervical cancer screening in Kuwait should thus consider strategies targeting younger, unmarried women. Initiating vaccination programs during late childhood or early adolescence and emphasizing the critical role of regular Pap tests in preventing adverse outcomes for women developing cervical cancer are key recommendations [28].

In contrast to prior research that found no discernible link between educational attainment and cervical screening [21], our results indicate higher screening rates among women with a higher level of education. This aligns with earlier research showing a 96% increased likelihood of Pap tests over three years for women with a higher level of education compared to those with lower education [29]. Enhanced health information processing among those with more education could explain this trend, as understanding the risks and benefits of medical proceduresis crucial for informed decision-making. Conversely, limited education might hinder effective patient-doctor communication, potentially affecting health outcomes [30] and underpinning our findings.

While the 2008/2009 Kuwaiti study showed no link between area of residence and screening [18], our study found a distinct association—women residing outside the Capital were 60% less likely to undergo screening. These findings suggest potential sociodemographic disparities across Kuwait's governorates, influenced by varying social and cultural norms. Residing farther from the capital could correlate with more traditional and conservative attitudes, potentially reducing willingness to engage in screenings that might be seen as indicative of promiscuity. Further research is warranted to delve into the sociodemographic factors driving these health disparities that impact individuals' health-seeking behaviors.

Our findings highlight that women with a history of hypertension displayed higher likelihood of cervical cancer screening, potentially attributed to more frequent medical check-ups wherein doctors recommend or offer screening. Conversely, overweight women or those with diabetes history were less likely to undergo screening compared to those with normal BMI. Smoking habits and cardiovascular history, however, showed no influence on screening status in our study. Although limited literature addresses these associations, some studies suggest links between personal history of diabetes, smoking, and lifestyle factors with cervical cancer [31], thus highlighting the need to include these vulnerable groups in screening programs. Notably, the correlation between smoking and cervical cancer is established [32], warranting awareness among women and physicians regarding tobacco's adverse effects on cervical carcinogenesis. It's worth noting that, culturally, smoking among women is frowned upon in Kuwait, potentially explaining our results, with under-reporting due to stigma or fear.

Employing a population-based sampling design and a globally recognized data collection tool, this study stands as a representative reflection of Kuwaiti demographics. The substantial sample size facilitates a comprehensive cross-sectional analysis, enabling the identification of prevalence and risk factors linked to cervical cancer in Kuwait. This research presents novel insights into cervical cancer screening practices in Kuwait, forming a robust basis for balancing benefits and risks in devising optimal screening strategies. A primary limitation, however, lies in the inability to encompass the entire female population of Kuwait. Considering the significant presence of non-nationals, future investigations should prioritize their inclusion to ensure comprehensive screening programs that encompass all at-risk females.

Our study significantly augments the limited research on screening practices in Kuwait, underscoring the pressing need for heightened awareness and well-promoted, physician-endorsed cervical cancer screening initiatives. The unveiled disparities in screening uptake, tied to factors like age, marital status, education level, retirement, domicile (Capital residence), and specific health conditions (e.g., hypertension), spotlight the urgency of addressing uneven access. While screening showed lower rates among overweight and diabetic women, other factors like smoking and cardiovascular history had no influence. This demonstrates the importance of targeted efforts to bridge disparities among vulnerable groups, acknowledging the pivotal role of social determinants in shaping health-seeking behaviors. Our findings bear profound implications for decision-makers, prompting a call for dedicated research tailored to Kuwait's unique social, religious, and cultural context, especially given the absence of cervical cancer screening programs.

Author Contribution Statement

Conceptualization J.L; formal analysis E.A, S.A; data collection E.A, E.T, R.A; writing-original draft preparation E.A, S.A; writing—review and editing E.A, S.A, E.T, J.L, E.T, R.A. All authors have read and agreed to the published version of the manuscript

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Approval

The study was approved by the Health Science Ethics Committee for Research at Kuwait University & the Kuwait Ministry of Health Ethics Committee.

Data Availability

The datasets were obtained from the Kuwait Ministry of Health. Requests for data access may be made to this ministry.

Ethical Declaration

The study conforms to the Declaration of Helsinki standards, and ethical approval was obtained through Kuwait's Ministry of Health Standing Committee for Coordination of Health and Medical Research as well as the Health Science Ethics Committee for Research at Kuwait University All participants provided informed consent after being informed about the survey's objectives, relative risks, and benefits.

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