Knowledge of human papilloma virus (HPV), HPV-vaccine and pap smear among adult Saudi women

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ABSTRACT

Background: Saudi Arabia has no screening program for cervical cancer (CC). Few studies have explored the level of knowledge among Saudi women regarding CC screening and human papillomavirus (HPV) vaccination against CC. We investigate the awareness and knowledge of HPV and its Pap smear screening tool among Saudi women of reproductive age. Methods: This was a national online cross-sectional questionnaire-based survey of adult Saudi women. A snowball sampling technique was adopted. The first section includes questions regarding the socio-demographic data of the participants. The second section inquired about the knowledge of the women regarding CC, PAP smear test, and HPV (11 questions). The third section inquired about practice of the women regarding the PAP smear test (3 questions). Results: The study included 755 Saudi adult women; 64.5% heard of CC (69% from social media and the internet and 29.8% from healthcare workers. Only 21.2% showed adequate knowledge regarding CC, its vaccine, and Pap smear testing. Education and employment were associated with better knowledge. Most of the participants (81.1%) expressed a positive perception toward the importance of Pap smear, particularly higher educated women and women who got their information about CC from lectures or healthcare workers. Almost one-fifth of the participants (21.1%) reported performing of Pap smear and only 1.9% reported actual HPV vaccine uptake. Conclusion: Overall, women’s level of knowledge regarding CC, its prevention, and screening was adequate, and their attitude was positive. PAP smear and uptake of HPV vaccine was suboptimum.

Keywords: Attitude, cancer cervix, human papillomavirus, knowledge, Pap smear

Introduction

Worldwide, cervical cancer (CC) is considered a threatening public health problem as it kills a woman every two minutes[8] and ranks fourth among cancer in women globally with an estimated mortality of several hundred thousand deaths.[3,4] Human papillomavirus (HPV) is essential for the development of CC and can be detected in almost all cases.[2,4]

In the Kingdom of Saudi Arabia (KSA), CC is the 9th most common malignancy and the 6th cause of death in Saudi women aged between 15 and 44 years, with incidence remaining one of the lowest in the world.[5,6]

It is apparent that the situation in the world is worse than in Saudi Arabia. For instance, the crude estimate in Africa is 29.6%, 15.5% in Europe, and 28.9% in Russia.[7] Nonetheless, the highest prevalence was reported in Eastern Asia, China, and Korea (57.7%).[7] Most of the HPV infections are transient, and the virus alone is not sufficient to cause cervical neoplasia. When it persists, the duration from initial infection to development of high-grade cervical neoplasia and invasive cancer takes an average of 15 years.[8] CC is often asymptomatic in its early stages; therefore, screening is crucial.[8] CC has different histopathological types[9,10] that can be confirmed through biopsy and cervical cytology,[11,12] which constitutes the principal method for screening[13]
Several guidelines were developed for CC screening to match different ages and immunological conditions for women with established preventative benefits and cost-effectiveness.[16–19] Overall, there is a lack of national programs in Saudi Arabia, which may be contributed to a lower incidence of CC compared to the worldwide incidence. However, the dearth of Saudi Arabia-based research indicated that HPV prevalence and genotypes’ distribution in invasive CC followed the same global pattern. Therefore, a national screening program is required in Saudi Arabia as one previous study suggested that HPV prevalence is increasing.[20] Furthermore, to get the benefits from all these medical advances, appropriate education must be provided for the public. This information must be provided for women to encourage health-seeking behavior. Awareness among Saudi women regarding CC and screening programs is believed to be low. Mass screening can reduce CC-related mortality tremendously, but that requires positive engagement from a well-informed and motivated community.

The current investigation aimed to investigate the awareness and knowledge of HPV and its Pap smear screening tool among Saudi women of reproductive age. Our results are hoped to inform nationwide educational programs and improve vaccine uptake. Our findings are expected to be quite important for practicing family physicians as they are the first point of contact for women with cancer-related symptoms. Per the researcher’s knowledge, there were no similar recent studies in Taif; Saudi Arabia investigated this issue among women of reproductive age.

A range of studies were carried out regionally and globally to investigate knowledge and attitudes toward CC and CC screening with consistent results.

In Saudi Arabia, Alharbi et al. (2015)[21] reported that women in Makkah had good knowledge about CC. Only (13.8%) of the participants were aware of screening. Only 21.4% of women had undergone screening, while 79.5% have a positive attitude toward screening. Al Khudairi et al. (2017)[22] investigated Saudi women in terms of awareness, knowledge, and attitudes toward Pap smear. Nearly a half of women were unaware of Pap smear. Others heard about it during obstetric/gynecologic visits. Over 75% did not do a single Pap smear previously, 82% did not know the Pap smear timing, and 92.9% did not know the Pap smear frequency.

Alsous et al. (2021)[23] investigated awareness of nearly 3000 women in a multi-national cross-sectional study in four Arabic-speaking nations. Awareness and knowledge about HPV and its vaccine were poor. Younger, educated, and health care professional women who had a Pap smear in the last 3 years were more likely to be knowledgeable about the HPV.

In Oman (2017), Alwahaibi et al.[24] found that the knowledge rate of Pap smear among patients, university staff, and university students were 56.9%, 56.4%, and 23.6%, respectively. Pap smear uptake among knowledgeable women was 36.8%, 23.3%, and 0% among patients, staff, and students, respectively. Belief in having a healthy lifestyle was noted as the most common barrier against Pap smear.

In Iran (2015), Bahri et al.[25] found that 14.6% of his participants had very weak knowledge and 59.4% had weak knowledge. However, most of the women (87.3%) had a positive attitude toward the Pap smear test. Only 37.6% of women reported uptake of the vaccine.

In Iraq, Atoof et al. (2014)[26] uncovered low knowledge about Pap smear among college of nursing staff. Among the teaching staff, 40.5% had acceptable knowledge, 35% were aware of CC, and 7.2% performed a Pap smear test at least once; only 26.8% of women wanted to perform the pap smear test, and 50% did not perform the test because of fear.

In Zimbabwe, Mutamba et al. (2017)[27] showed that the attitudes of the majority of women (89%) toward Pap smear tests were positive. Only 16.8% engaged in active screening. The main barriers were lack of knowledge, belief that cancer was untreatable, and religious beliefs that prevented these women from seeking medical care.

Yu et al. (2016)[28] screened 1578 Chinese mothers having a 9–17-year-old daughter. Only one-fifth of them (19.3%) were aware of HPV. Overall, the level of HPV knowledge was poor. More educated mothers had the highest knowledge score. Almost a quarter of mothers (26.5%) accepted the uptake of vaccines to their daughters, and this increased with increasing in the daughter’s age, household income, and level of HPV knowledge. The highest acceptability was observed among housewives and not working mothers. The most common barrier was believing that their daughters are still young for having CC (31%), the vaccine is not widely used (24.9%), and vaccine safety (23%).

A meta-analysis performed by Zhang et al. (2016)[29] revealed pooled rates of HPV awareness and knowledge to be 16% and 17.6%, respectively. Expectedly, women (17.4%) were vastly more aware than men (1.8%) in terms of the HPV vaccine. Approximately two-thirds (67.3%) of the participants accepted personal vaccination, while 60.3% accepted daughter vaccination. Vaccine safety was the main reason for accepting vaccination among the adult population, whereas vaccine safety and efficacy were the main reasons for willingness to vaccinate daughters.

Ranabhat et al.’s (2014)[30] investigation detected a significant association between knowledge about Pap smear test and CC, having a favorable attitude toward the test, 36–50-years age group, and urban residency among Nepalese women. Pap smear utilization was not associated with age-at-marriage, parity, and age-at-first-child-birth. However, adjusting for all factors simultaneously, favorable attitude toward Pap smear test was the only variable that significantly influenced Pap smear uptake. Moreover, in Nepal (2013), Shrestha et al.[31] found that two-thirds (65.7%) of the attendees in a tertiary hospital were
aware of CC. However, only 42.9% and 18.1% had knowledge about screening for CC and Pap smear test, respectively. The majority (85%) had a positive attitude toward screening, but the uptake of Pap smear test was only 10.5%. It was found that advancing age and longer duration of marriage were significantly associated with better Pap smear knowledge, attitude, and practice.

In Nigeria (2013), Ahmed et al.\(^{[35]}\) reported a fair knowledge of CC and CC screening (43.5%). There was generally a good attitude to CC screening (80.4%), but their level of practice was low (15.4%). In Niger (2013), Owoeye and Ibrahim\(^{[33]}\) reported that 72% were aware of CC, while only 182 (50.6%) were aware of CC screening. Pap smear was the most popular screening test mentioned by respondents (41.2%). There was a significant association between awareness and practice of CC screening among staff and students.

In India, Aswathy et al. (2012)\(^{[36]}\) showed that most of the population (74.2%) knew that CC can be detected early by a screening test. However, only 6.9% had undergone screening. One-third of the population agreed to undergo the screening test but had not done it. In India, Shah et al. (2012)\(^{[37]}\) found that two-thirds of nurses (69%) had some knowledge of CC. Out of those who had some knowledge regarding CC, 61 (88.4%) had knowledge regarding Pap test as one of the preventive measures.

### Methodology

This was a cross-sectional study that was conducted online among Saudi women aged 18 and over living in different regions of Saudi Arabia. All women with internet access and who have Arabic language fluency were included. Exclusion criteria included pediatric population and known cases of HPV, cervical precancerous lesions, or CC.

The minimum sample size for this study has been decided according to Cochran's formula for estimating sample size equation\(^{[34]}\) as follows:

\[
n = \frac{Z^2 \times P \times Q}{D^2}
\]

where

- \(n\): Calculated sample size
- \(Z\): The \(z\)-value for the values of the standard normal variate at the confidence level of \(0.025\) (\(z_{0.025} = 1.96\)).
- \(P\): An estimated prevalence of awareness regarding HPV screening, assumed as 53.8% according to a recent Saudi study\(^{[22]}\)
- \(Q\): \((1 - 0.538) = 46.2\%\), that is, 0.462
- \(D\): The maximum acceptable error = 0.05.

Thus, the calculated minimum sample size was

\[
n = \frac{(1.96)^2 \times 0.538 \times 0.462}{(0.05)^2} = 382
\]

A snowball sampling technique was adopted used. The questionnaire was distributed through Google Forms. The link of the questionnaire was sent through WhatsApp and other social media to the contacts of the researchers. The respondents were asked to roll out the survey to as many individuals as possible, provided that they have the inclusion criteria. On clicking the link, the respondents got auto-directed to the study information and consent form. This method allowed us to collect data from different regions of KSA.

An online self-administered questionnaire utilized in previous studies\(^{[9,35]}\) was utilized with permission in the present study.

The questionnaire consisted of three main sections. The first section included questions regarding socio-demographic data of the participants (age, nationality, current marital status, education, job, and husband’s education and job). The second section inquired about the knowledge of the women regarding CC, Pap smear test, and HPV (11 questions). The third section asked about the practice of the women regarding Pap smear test (3 questions). Women’s responses to questions regarding their knowledge about HPV and Pap were scored. Right responses were given a score of 1 while wrong and not sure responses were given a score of 0. Then, the total score and its percentage were computed for comparisons. Women who scored below 50% were considered as having “inadequate knowledge,” whereas those who scored 50% or more were considered as having “adequate knowledge.”

Regarding perception, questions toward HPV and Pap smear were compared according to different socio-demographic characteristics.

### Ethical considerations

- The approval to conduct the study was taken from the regional research and ethics team in Al-Hada Armed Forces hospital, Taif.
- Participation in the study by filling in the study questionnaire was considered as consent.
- Data were treated confidentially and used only for the purpose of research.

### Data analysis

Data analysis was conducted using SPSS software version 26. Continuous variables (e.g., knowledge score) were presented as mean and standard deviation (SD), while categorical variables were presented as frequency and percentage. Student’s t test was utilized to compare the means of two independent quantitative variables. Chi-square test was utilized to test for the association and/or difference between categorical variables. Fisher’s exact test was applied in case of small frequencies. Significance was determined at \(P \leq 0.05\). No funding was sought for the current study. The authors declare no conflict of interest.
Results

The study included 755 Saudi adult women whose age ranged between 18 and 72 years with an arithmetic mean and standard deviation of 36.2 ± 11.5 years. Married women represented 60.7% of the respondents, and those having between one and four previous pregnancies represented 63.1% of them. Most of them (74.4%) were university/postgraduate educated, and almost half (50.1%) were working. Husbands of about two-thirds of ever-married women (67%) were university/postgraduates. See [Table 1] for a detailed account of sociodemographic results.

Awareness about cervical cancer

A history of hearing or reading about CC was observed among almost two-thirds of the respondents (64.5%) as illustrated in [Figure 1]. Among those women, the main source of awareness was the Internet/social media (69%), followed by healthcare workers (29.8%) [Figure 2].

Knowledge about cervical cancer and Pap smear

Table 2 summarizes the responses of the participants to questions regarding different aspects of CC, its vaccine, and Pap smear. Most of them (71.8%) could recognize that HPV-vaccinated women still needed to perform Pap smear. More than half of them knew Pap smear (59.9%) and this procedure is performed in the clinic (53.8%). Also, more than half of them (52.1%) could recognize that CC is a preventable disease. Only 41.3% knew correctly the recommended frequency of performing Pap smear testing, and 63.7% of the respondents knew that CC is caused by HPV. Only 32.3% of the participants could recognize that HPV should be taken by males and females from age of 9 till 45 years.

As seen in [Figure 3], overall adequate knowledge regarding CC, its vaccine, and Pap smear testing was observed among only 21.2% of the participants.

Factors associated with knowledge about cervical cancer and its prevention and screening

Socio-demographic factors

Higher educated women (university/postgraduate) were more knowledgeable about CC and its prevention and screening than lower educated (below secondary and secondary

| Table 1: Sociodemographic characteristics of the participants (n=755) |
|---------------------------------------------------------------|
| **Frequency** | **Percentage** |
| Age in years |
| Range | 18-72 | 36.2±11.5 |
| Mean±SD |
| Marital status |
| Single | 239 | 31.7 |
| Married | 459 | 60.7 |
| Divorced | 48 | 6.4 |
| Widowed | 9 | 1.2 |
| Number of pregnancies (n=480) |
| None | 36 | 7.5 |
| 1-4 | 303 | 63.1 |
| >4 | 141 | 29.4 |
| Educational level |
| Below secondary school | 30 | 4.0 |
| Secondary school/Diploma | 163 | 21.6 |
| University/postgraduate | 562 | 74.4 |
| Job status |
| Housewife/not working | 377 | 49.9 |
| Working | 378 | 50.1 |
| Husband educational level (n=508) |
| Below secondary school | 49 | 9.6 |
| Secondary school/Diploma | 119 | 23.4 |
| University/postgraduate | 340 | 67.0 |

| Table 2: Knowledge of the adult women about cancer cervix, human papillomavirus, vaccine, and Pap smear (n=755) |
|---------------------------------------------------------------|
| **Questions** | **Correct response** |
| **No.** | **%** |
| Is cancer cervix a preventable disease? (Yes) | 393 | 52.1 |
| Among risk factors of cancer cervix |
| Human papillomavirus infection | 481 | 63.7 |
| Smoking | 155 | 20.5 |
| What are the symptoms of cancer cervix |
| Pain during intercourse | 28 | 3.7 |
| Vaginal bleeding (after intercourse/between menstrual periods/after menopause) | 156 | 20.7 |
| Pelvic/back pain | 76 | 10.1 |
| Vaginal discharge (heavy/watery or bloody/ of bad odour) | 51 | 6.8 |
| Do you know Pap smear (Yes) | 452 | 59.9 |
| If Yes, where it can be performed (in the clinic) | 406 | 53.8 |
| When Pap smear can be done (Every 3 years) | 312 | 41.3 |
| Do you know HPV? (Yes) | 184 | 24.4 |
| Who should take HPV and when? (Males and females from age of 9 till 45 years) | 244 | 32.3 |
| Are vaccinated women still needed to perform Pap smear? (Yes) | 542 | 71.8 |
school graduated) (24% vs. 13.3% and 12.9%, respectively; \(P = 0.005\)). Also, working women were more knowledgeable than housewives/not working women (25.4% vs. 17%; \(P = 0.005\)) [Table 3 and Table 4].

Source of information

From [Table 5], the highest levels of knowledge about CC and its prevention and screening were observed among women who get their information from lectures (87.5%) and healthcare professionals (50%), while the lowest level was observed among those who got their information from family/friends and relatives (10.9%), \(P < 0.001\).

| Table 3: Association between socio-demographic characteristics of women and their knowledge regarding cancer cervix and Pap smear |
|---------------------------------------------------------------|
| Knowledge of cancer cervix/Pap smear | \(P\) | Inadequate \(n=595\) | Adequate \(n=160\) |
| Age in years | Mean±SD | 36.3±11.4 | 35.8±11.7 | 0.667* |
| Marital status | | | | |
| Single (n=239) | 184 (77.0) | 55 (23.0) | 0.272** |
| Married (n=459) | 368 (80.2) | 91 (19.8) | |
| Divorced (n=48) | 38 (79.2) | 10 (20.8) | |
| Widowed (n=9) | 5 (55.6) | 4 (44.4) | |
| Number of pregnancies (n=480) | | | | |
| None (n=36) | 30 (83.3) | 6 (16.7) | 0.442** |
| 1-4 (n=303) | 237 (78.2) | 66 (21.8) | |
| >4 (n=141) | 117 (83.0) | 24 (17.0) | |
| Educational level | | | | |
| Below secondary school (n=30) | 26 (86.7) | 4 (13.3) | 0.005** |
| Secondary school/Diploma (163) | 142 (87.1) | 21 (12.9) | |
| University/postgraduate (562) | 427 (76.0) | 135 (24.0) | |
| Job status | | | | |
| Housewife/not working (n=377) | 313 (83.0) | 64 (17.0) | 0.005** |
| Working (n=378) | 282 (74.6) | 96 (25.4) | |
| Husband educational level (n=508) | | | | |
| Below secondary school (n=49) | 39 (79.6) | 10 (20.4) | 0.243** |
| Secondary school/Diploma (119) | 101 (84.9) | 18 (15.1) | |
| University/postgraduate (340) | 264 (77.6) | 76 (22.4) | |

*Student’s \(t\) test, **Chi-square test

| Table 4: Association between the source of awareness about cancer cervix among women and their knowledge regarding cancer cervix and Pap smear (n=487) |
|---------------------------------------------------------------|
| Source of awareness | Knowledge of cancer cervix/Pap smear | \(P\) | Inadequate \(n=330\) | Adequate \(n=157\) |
| Internet/social media (n=215) | 164 (76.3) | 51 (23.7) | <0.001 |
| Family/relatives/friends (n=46) | 41 (89.1) | 5 (10.9) | |
| TV/Radio (n=9) | 7 (77.8) | 2 (22.2) | |
| Healthcare workers (n=76) | 38 (50.0) | 38 (50.0) | |
| Lectures (n=8) | 1 (12.5) | 7 (87.5) | |
| Two sources (n=105) | 61 (58.1) | 44 (41.9) | |
| >Two sources (n=28) | 18 (64.3) | 10 (35.7) | |

*Chi-square test

Perception toward the importance of Pap smear

As displayed in [Figure 4], most of the participants (81.1%) expressed a positive perception toward the importance of Pap smear.

Figure 2: Source of awareness about cancer cervix among women who heard or read about cancer cervix (n = 487)

![Figure 2: Source of awareness about cancer cervix among women](image)

Figure 3: Level of knowledge of the participants about cancer cervix, its screening, and prevention

![Figure 3: Level of knowledge of the participants about cancer cervix](image)

Figure 4: Perception of the participants regarding importance of Pap smear

![Figure 4: Perception of the participants regarding importance of Pap smear](image)
Higher educated women (secondary school/diploma or higher) perceived Pap smear as an important procedure compared to less educated women (below secondary school) (82.8% and 81.5% vs. 63.3%, respectively; \(P = 0.038\)) [Table 5].

Women who got their information about CC from lectures or healthcare workers perceived the importance of Pap smear more than those who got their information from family/relatives and friends (100% and 96.1% vs. 69.6%, respectively; \(P = 0.002\)) [Table 6].

### Table 5: Association between socio-demographic characteristics of women and their perception towards the importance of Pap smear

| Perception regarding the importance of Pap smear | \(P\)  |
|-----------------------------------------------|------|
| No/not sure \(n=143\) | Yes \(n=612\) |

| Age in years | Mean±SD | 36.4±10.9 | 36.1±11.6 | 0.822* |
|-------------|---------|-----------|-----------|--------|
| Marital status | Single (n=239) | 46 (19.2) | 193 (80.8) | 0.478** |
| | Married (n=459) | 90 (19.6) | 369 (80.4) | |
| | Divorced (n=48) | 5 (10.4) | 43 (89.6) | |
| | Widowed (n=9) | 2 (22.2) | 7 (77.8) | |

| Number of pregnancies (n=480) | None (n=36) | 7 (19.4) | 29 (80.6) | 0.292** |
|----------------------------|-------------|---------|-----------|--------|
| 1-4 (n=303) | 50 (16.5) | 253 (83.5) | |
| >4 (n=141) | 32 (22.7) | 100 (77.3) | |

| Educational level | Below secondary school (n=30) | 11 (36.7) | 19 (63.3) | 0.038** |
|-------------------|-------------------------------|-----------|-----------|--------|
| Secondary school/Diploma (n=163) | 28 (17.2) | 135 (82.8) | |
| University/postgraduate (n=562) | 104 (18.5) | 458 (81.5) | |

| Job status | Housewife/not working (n=577) | 81 (21.5) | 296 (78.5) | 0.075** |
|-------------|-------------------------------|-----------|-----------|--------|
| Working (n=378) | 62 (16.4) | 316 (83.6) | |

| Husband educational level (n=508) | Below secondary school (n=49) | 7 (14.3) | 42 (85.7) | 0.235** |
|--------------------------------|-------------------------------|-----------|-----------|--------|
| Secondary school/Diploma (n=119) | 18 (15.1) | 101 (84.9) | |
| University/postgraduate (n=340) | 72 (21.2) | 268 (78.8) | |

*Student’s \(t\) test, **Chi-square test

### Table 6: Association between the source of awareness about cancer cervix among women and their knowledge regarding cancer cervix and Pap smear (n=487)

| Source of awareness | Perception regarding the importance of Pap smear | \(P^*\) |
|---------------------|-----------------------------------------------|------|
| Internet/social media (n=215) | 28 (13.0) | 187 (87.0) | 0.002 |
| Family/relatives/friends (n=46) | 14 (30.4) | 32 (69.6) | |
| TV/Radio (n=9) | 2 (22.2) | 7 (77.8) | |
| Healthcare workers (n=76) | 3 (3.9) | 73 (96.1) | |
| Lectures (n=8) | 0 (0.0) | 8 (100) | |
| Two sources (n=105) | 11 (10.5) | 94 (89.5) | |
| >Two sources (n=28) | 5 (17.9) | 23 (82.1) | |

*Chi-square test

### History of performing Pap smear

As shown in [Figure 5], almost one-fifth of the participants (21.1%) reported performing of Pap smear. Out of them, 93.1% reported physicians as the source of advice to perform Pap smear as illustrated in [Figure 6].

The age of women who performed Pap smear was significantly higher than that of those who did not perform it (44.1 ± 10.4 vs. 34.1 ± 10.8 years), \(P<0.001\). The least educated women (below secondary schools) were more likely to perform Pap smear compared to university graduates/postgraduates (36.7% vs. 19%), \(P = 0.024\). Working women were more likely to perform Pap smear compared to housewife/not working women (24.1% vs. 18%), \(P = 0.042\). This is shown in [Table 7].

Women who were aware of CC were more likely to perform Pap smear than their counterparts (23.6% vs. 16.4%), \(P = 0.020\). Women who expressed adequate knowledge about CC were more likely to perform Pap smear than those who expressed inadequate knowledge (28.7% vs. 19%), \(P = 0.007\). Also, women who perceived Pap smear as an important procedure were more likely to perform it than others (24.5% vs. 6.3%), \(P<0.001\). This is demonstrated in [Table 8].

There was no statistically significant association between source of awareness about CC and history of performing Pap smear among the participated women as displayed in [Table 9].

### History of uptake of human papillomavirus vaccine

Only 14 women reported taking of HPV vaccine (1.9%) as displayed in [Figure 7]. Women with no history of pregnancies were more likely to take the HPV vaccine than their peers (8.3% vs. none), \(P = 0.001\), as illustrated in [Table 10].

Women who were aware of CC were more likely to take the HPV vaccine than their counterparts (2.7% vs. 0.4%), \(P = 0.018\). This is on display in [Table 11].
Table 7: Association between socio-demographic characteristics of women and their history of performing Pap smear

| Performance of Pap smear (n=596) | P*     |
|----------------------------------|--------|
| Age in years                     |        |
| Mean±SD                          | 34.1±10.8 44.1±10.4 <0.001* |
| Marital status                   |        |
| Married (n=516)                  | 323 (70.4) 136 (29.6) 0.626** |
| Divorced (n=48)                  | 34 (70.8) 14 (29.2)  |
| Widowed (n=9)                    | 5 (55.6) 4 (44.4)  |
| Number of pregnancies (n=480)    |        |
| None (n=36)                      | 30 (83.3) 6 (16.7) 0.094** |
| 1-4 (n=303)                      | 209 (69.0) 94 (31.0)  |
| >4 (n=141)                       | 91 (64.5) 50 (35.5)  |
| Educational level                |        |
| Below secondary school (n=30)    | 19 (63.3) 11 (36.7) 0.024** |
| Secondary school/Diploma (163)   | 122 (74.8) 41 (25.2)  |
| University/postgraduate (562)    | 455 (81.0) 107 (19.0)  |
| Job status                       |        |
| Housewife/not working (n=377)    | 309 (82.0) 68 (18.0) 0.042** |
| Working (n=378)                  | 287 (75.9) 91 (24.1)  |
| Husband educational level        |        |
| Below secondary school (n=49)    | 31 (63.3) 18 (36.7) 0.400** |
| Secondary school/Diploma (119)   | 87 (73.1) 32 (26.9)  |
| University/postgraduate (340)    | 245 (72.1) 95 (27.9)  |

Table 8: Association between participants’ awareness and knowledge about cancer cervix and history of performing Pap smear

| Performance of Pap smear (n=596) | P*     |
|----------------------------------|--------|
| Awareness about cancer cervix    |        |
| No (n=268)                       | 224 (83.6) 44 (16.4) 0.020 |
| Yes (n=477)                      | 372 (76.4) 115 (23.6)  |
| Knowledge level                  |        |
| Inadequate (n=595)               | 482 (81.0) 113 (19.0) 0.007 |
| Adequate (n=160)                 | 114 (71.3) 46 (28.7)  |
| Perceiving importance of Pap smear |        |
| No/not sure (n=143)              | 134 (93.7) 9 (6.3) <0.001* |
| Yes (n=612)                      | 462 (75.5) 150 (24.5)  |

Table 9: Association between the source of awareness about cancer cervix among women and their performance of Pap smear (n=487)

| Source of awareness              | Performance of Pap smear (n=487) | P*     |
|----------------------------------|----------------------------------|--------|
| Internet/social media (n=215)    | 166 (77.2) 49 (22.8) 0.790 |
| Family/relatives/friends (n=46)  | 31 (67.4) 15 (32.6)  |
| TV/Radio (n=9)                   | 7 (77.8) 2 (22.2)  |
| Healthcare workers (n=76)        | 61 (80.3) 15 (19.7)  |
| Lectures (n=8)                   | 6 (75.0) 2 (25.0)  |
| Two sources (n=105)              | 80 (76.2) 25 (23.8)  |
| >Two sources (n=28)              | 20 (71.4) 8 (28.6)  |

Table 10: Association between socio-demographic characteristics of women and their history of performing Pap smear

| Taking human papillomavirus vaccine | P     |
|-------------------------------------|-------|
| No (n=741)                          | 36.3±11.2 31.6±8.9 0.134* |
| Marital status                      |        |
| Single (n=239)                      | 234 (97.9) 5 (2.1) 0.962** |
| Married (n=459)                     | 451 (98.3) 8 (1.7)  |
| Divorced (n=48)                     | 47 (97.9) 1 (2.1)  |
| Widowed (n=9)                       | 9 (100) 0 (0.0)  |
| Number of pregnancies (n=480)       |        |
| None (n=36)                         | 33 (91.7) 3 (8.3) 0.001** |
| 1-4 (n=303)                         | 299 (98.7) 4 (1.3)  |
| >4 (n=141)                          | 141 (100) 0 (0.0)  |
| Educational level                   |        |
| Below secondary school (n=30)       | 30 (100) 0 (0.0) 0.273** |
| Secondary school/Diploma (163)      | 162 (99.4) 1 (0.6)  |
| University/postgraduate (562)       | 549 (97.7) 13 (2.3)  |
| Job status                          |        |
| Housewife/not working (n=377)       | 370 (98.1) 7 (1.9) NA |
| Working (n=378)                     | 371 (98.1) 7 (1.9)  |
| Husband educational level (n=508)    |        |
| Below secondary school (n=49)       | 48 (98.0) 2 (2.0) 0.593** |
| Secondary school/Diploma (119)      | 118 (99.2) 1 (0.8)  |
| University/postgraduate (340)       | 332 (97.6) 8 (2.4)  |

About two-thirds of the women in the present study could recognize the viral etiology of CC. Sait et al. (2009)[21] in an earlier study carried out in Saudi Arabia reported that the knowledge of the HPV as an etiological agent for CC was expressed by 14.4% of women. This finding showed an improvement in the level of awareness over time regarding the etiology of CC. Surprisingly, among medical students, 46.8% of females were unable to select the correct answer regarding HPV infection as the cause of CC.[6] Additionally, inadequate knowledge regarding the etiology of CC has been documented in other areas of the world.[39] Additionally, a recent study revealed poor awareness among women in fourteen Arabic countries (Iraq, Jordan, the United Arab Emirates (UAE), and Qatar).[21]

According to the American Cancer Society guidelines, CC screening should be carried out every year and that interval can

Discussion

CC can be prevented through the detection of its premalignant forms by early screening.[17] Awareness and knowledge regarding early diagnosis of CC through Pap smear test is very useful for women; therefore, the present study evaluated the attitude and knowledge of adult Saudi women regarding CC in general and its screening and prevention in particular among a representative sample through an online survey.

There was no statistically significant association between source of awareness about CC and history of up taking HPV vaccine among the participated women as seen in [Table 12].
be extended to 3 years. In the current study, knowledge of women regarding PAP smear was moderate as 59.9% of them were aware of it, and 53.8% could recognize that this procedure is performed in the clinic. Additionally, 52.1% could recognize that CC is a preventable disease, and only 41.3% knew correctly the recommended frequency of performing Pap smear testing. On the contrary, most of the participants in this study (81.1%) expressed a positive attitude toward the importance of Pap smear.

Despite this acceptable level of knowledge and good attitude toward the importance of Pap smear, only 21.1% of them had performed it, particularly older, working women and surprisingly, lower educated women. This can be explained by finding that the main motivator for doing Pap smear among those who performed it was physicians in the present study, and usually, physicians paid more attention in this regard to lower educated. In another Saudi study (2017), 46.2% of the women did not hear about Pap smear previously, most of them (75.2%) did not do a single Pap smear previously, and 75.5% reported that their physicians never advised them to do Pap smear. Additionally, regarding knowledge of Pap smear, 82% did not know when to start doing Pap smear, 92.9% did not know how frequently they should do Pap smear, and 93.9% did not know when to stop doing Pap smear. Also, Sait reported in an older study conducted among the Saudi general population (2009) that the main reason for not having a Pap smear was the lack of awareness, and among women who had not had a previous Pap smear, 18.3% stated that their physician had not recommended it. We think that females in our community believe that they are healthy as they think that they are living in a conservative community correlated with a decreased risk of CC. A similar finding was also observed from the study in Ghana where 47% of their subjects felt they were not at risk of the disease.

The same finding of acceptable knowledge and attitude but unacceptable practice of Pap smear performance has been observed locally and worldwide. In Makkah, only 13.8% of women were aware of CC screening, 21.4% had undergone Pap smear, while 79.5% have a positive attitude toward it. In Nigeria, a fair knowledge of CC screening (43.5%) was reported but their level of practice was low (15.4%). In another study carried out in Nigeria, only 15.5% of the women were aware of the availability of CC screening services and 4.2% had ever done the Pap smear test. The most important factors obstructing the use of available CC screening services were lack of knowledge (49.8%) and the feeling that they had no medical problems (32.0%). In India, 88.4% of women had knowledge regarding Pap test as one of the preventive measures and only 8% had undergone the Pap test. In another Indian study, 74.2%
of women knew that CC could be detected early by a screening test. Only 6.9% had undergone screening. Reasons mentioned for not performing screening were lack of knowledge (51.4%), not being aware of Pap test, and not necessary.[34] In Tanzania (2011), less than half of the nurses had adequate knowledge regarding CC and most of them (84.6%) had never had a Pap smear examination.[35] In Oman (2017), the knowledge rate of Pap smear among patients, staff, and students were 56.9%, 56.4%, and 23.6%, respectively. Of those who had adequate knowledge, 36.8% of patients, 23.3% staff, and 0% students performed Pap smear.[36] This gap between knowledge and attitude toward PAP from one side and performance from the other side should be investigated in depth to know the obstacles and put planes to overcome them.

In the present study, only 1.9% of women reported taking the HPV vaccine. Family physicians should be aware of the extremely low uptake of HPV vaccine among Saudi women at the reproductive age. Family physicians should offer routine encouragement of women to get their HPV jab during their visit to primary care facilities. Women with no history of pregnancies and those who were aware of CC were more likely to take the HPV vaccine than their peers. It has been recently reported that in most countries, the uptake of HPV was low in both males (0.76%) and females (2.93%) between 2006 and 2014. However, it has been slightly increased during the period 2015–2020 (5.31% among males and 5.22% among females).[37] Therefore, the low uptake of HPV should be investigated to know the reasons behind that in our community.

The strength of this study is due to the fact that it has included a sample from all areas of the Kingdom of Saudi Arabia with a sufficient sample size. However, it has two main limitations that should be discussed. First, it is conducted online, ignoring women with no online access who may have characteristics that distinguished them from our sample in relation to their level of knowledge, attitudes, and practice of CC screening and prevention, which consequently impacts the generalizability of results. Second, the cross-sectional design of the study limits our ability to make causal inferences among studied associated factors. However, despite these two limitations, the study may have importance for exploring this important issue in our conservative society.

In summary, we found worrying low levels of uptake of PAP smear and HPV vaccine among Saudi women. That was noted despite acceptable levels of positive attitude and knowledge regarding CC and its prevention and screening. The primary unique finding of our study is the discrepancy between positive attitudes toward the HPV vaccine and low levels of uptake. This should be explored in more depth in further research. Family physicians should build on the noted positive attitudes toward the HPV vaccine and attempt to convert that into actual uptake of the vaccine among women attending primary care services under their care.

**Conclusion**

It is concluded that most adult Saudi women are aware of CC and their main sources of information were Internet/social media, followed by healthcare workers. Overall, their level of knowledge regarding CC and its prevention and screening was adequate. Also, they expressed a positive attitude toward disease screening and prevention. However, the performance of the Pap smear screening test and uptake of the HPV vaccine were inadequate. Higher educated (university/postgraduate), working women, and those who get their information from lectures and healthcare professionals were more likely to perform PAP smear. Women with no history of pregnancies were more likely to uptake the HPV vaccine than their peers.

**Recommendations**

1. There is a need for decision-makers to include routine CC screening every 3 years into the health care for women aged between 21 and 65 years in the Kingdom of Saudi Arabia.
2. Health education of women attending outpatient clinics regarding CC screening.
3. Continuing education of physicians, particularly obstetricians and family physicians in KSA, may contribute to strengthening cervical cancer screening as a considerable proportion of patients depend on their recommendations.
4. There is a need for sensitization of physicians about CC and the importance of prevention and screening in practice.
5. Training curricula of medical students need to be revised to include more practical CC screening skills.
6. The sufficient attitude and acceptable knowledge and insufficient practice can be attributed to gaps in physicians' recommendation as a result of a defect in training curriculum and lack of clear policy guidelines on screening for CC.
7. Further research is recommended by including physicians to explain the reasons for low rates of performing CC screening procedures despite the positive attitude and acceptable knowledge.

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**Ethical approval**

The approval to conduct the study was taken from the regional research and ethics team in Al-Hada Armed Forces hospital, Taif.

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Declarations of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form, the patient (s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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Conflicts of interest

There are no conflicts of interest.

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