RESEARCH ARTICLE

Perceived Risk of Cervical Cancer and Barriers to Screening among Secondary School Female Teachers in Al Hassa, Saudi Arabia

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Abstract

Background: No previous studies had addressed the perceived risk of cervical cancer (CC) and its influence on screening practices and perceived barriers in Saudi Arabia**. Methods:** This cross-sectional study was conducted on 506 randomly selected Saudi female secondary school teachers in Al Hassa, Saudi Arabia to assess their level of knowledge about risk factors and signs of CC in relation to perceived risk and to characterize CC screening compliance using a self-administered questionnaire. **Results:** Of the included female Saudi teachers, 65.4% and 63.4% were considered less-knowledgeable about CC risk factors and early signs and symptoms respectively. Only 17.2% reported being previously examined for CC. The majority of participants perceived themselves to be at an average or below average risk of CC. Residing in urban areas was the strongest predictor of CC screening (Odds ratio 'OR'= 3.39; 95% confidence intervals 'CI= 1.76-6.46; P=0.001). Awareness of risk factors was significantly associated with higher awareness of signs of CC (OR 2.5; 95% CI=, P=0.001). Exploratory factor analysis showed that personal fears (of screening being embarrassing) was the major factor that hindered CC screening with a high loading eigenvalue of 4.392, explaining 30.8% of the barriers toward utilization, followed by health care related factors. **Conclusion:** Secondary school teachers in Al Hassa, Saudi Arabia showed low perceived risk, poor awareness about risk factors, signs and symptoms of CC and limited uptake of screening practices. This underlines the need for education programs on CC targeting this group.

Keywords: Cancer cervix- risk factors- screening- barriers- perceived risk- Saudi Arabia

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Introduction

Cervical cancer (CC) is a major public health problem that continues to be one of the leading female genital cancers worldwide (Ali et al.,2012). It is the fourth most common cancer among women worldwide with an estimated 528,000 new cases and 266,000 deaths (GLOBOCAN, 2012), with vast majority occurring in developing countries (Abudukadeer et al., 2015). Moreover, the mortality rates for CC are expected to increase by 25 % during the next decade, despite the fact that this is one of the most preventable cancers (El Banna et al., 2014). In Saudi Arabia, it ranks the eighth most frequent cancer among women between 15 and 44 years of age, with 241 new cases and 84 deaths every year (Bruni et al., 2015). The incidence in Saudi Arabia is one of the lowest in the world at 1.9 cases per 100,000 women, accounting for 2.6% of diagnosed cancer cases in women. The number of new CC cases is 152 per year, and the mortality is 55 cases per year (GLOBOCAN, 2012). In Saudi Arabia it is anticipated that as the population ages, there will be a dramatic increase in the incidence of CC. The estimated number of new CC cases and deaths in the year 2025 are 309 and 117, respectively (GLOBOCAN, 2012). Risk factors of CC include infection with high-risk human papillomavirus (HPV), early age at the first sexual intercourse, multiple sexual partners, early age at first delivery, multi-parity, immunosuppression, co-infection with other sexually transmitted infections (STIs), cigarette smoking, long-term use of hormonal contraceptives, estrogen-only hormone replacement therapy and obesity (Parkin et al., 2001 ;WHO, 2007).

Although CC is one of the preventable and curable cancers, most women in developing countries, including Saudi Arabia, clinically presented with advanced stages that require extensive treatment with diminished survival (Alhamlan et al., 2015). Appropriate level of knowledge, attitude, and beliefs are key elements for adopting healthy lifestyle, influencing human behaviors, accepting newly introduced preventive measures and determining the stage at which cancer patient presents to health facility (Aswathy et al., 2012). Studies from many parts of the

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world (Dendash et al., 2005, Kietpeerakool et al., 2009; Ebu et al., 2012; Notara et al., 2012; Kamzol et al., 2013; Khan et al., 2014; Alhamlan et al., 2015; Koc, 2015) including Saudi Arabia (Gari et al., 2012; Al-Darwish et al., 2014), have shown the lack of awareness amongst populations towards CC symptoms and early signs, screening, and the role of human papilloma virus (HPV) vaccination in prevention. Cervical cancer's long latency and recognizable pre-cancerous lesions make screening a particularly effective way of prevention as these pre-cancerous lesions, once identified, can be expectantly managed or treated safely and inexpensively in an outpatient setting (Blumenthal and Gaffikin , 2005). It is important to create awareness among communities through educational programs on cancer prevention, preventable risk factors, benefits of early diagnosis, and availability of screening facilities (Abudukadeer et al., 2015). In the developed countries, CC screening programs have reduced the incidence of invasive lesions up to 80%. This decline has now reached a plateau as new cases still occur in patients who have failed to attend for screening or where the sensitivity of the tests have proven inadequate (Abudukadeer et al., 2015).

Since teachers play an effective role in communication, motivation and education of young students, assessment of their knowledge, attitude and behavior towards CC is essential to reduce its risk among future young generations. Though many studies have been done on CC in Saudi Arabia, these studies were carried out among health care workers and women attending the antenatal/ gynecology clinics (Alzahrani et al., 2010).

There is thus a paucity of work on CC awareness and screening barriers among teachers especially those at secondary schools who are in good position to educate young girls under their domain and, in turn, the society at large. Inevitably, they must have adequate awareness about the risk factors and the recommended screening guidelines towards CC if they are willing to contribute significantly to the education and prevention quest against the condition. The objectives of this cross-sectional study were to assess the level of knowledge of risk factors and signs of CC in relation to the perceived personal risk, to characterize CC screening takers and to explore possible screening barriers among a sample of female secondary school teachers in Al Hassa, Saudi Arabia.

Materials and Methods

Setting and design: A cross-sectional study that was carried out in Al Hassa Governorate, Eastern Province of Saudi Arabia; 50 km from the Arabian Gulf, 450 km from the capital Riyadh, and populated by about 1.5 million. Al Hassa is comprised of three regions; urban, populated by about 60% of the total population, rural consisting of 23 villages (35% of the population) and "Hegar" Bedouin scattered communities making up the remaining 5%. The Ministry of Health provides primary care through 54 PHCs, while the rest of the population are provided with similar services through other sectors e.g., National Guard, ARAMCO (oil company), military and others.

Target Population: In Al Hassa, there are 53 female public secondary schools with a total students' population of 25,933; 16,753 in urban and 9,180 in rural areas (as for academic year 2015), with an average teaching staff of 35 to 50 female Saudi teachers per school.

Sample size

Open Epi (http://www.openepi.com/SampleSize/SSPropor.htm) was used to calculate the required sample size. Assuming the unknown prevalence of the perceived barriers to cervical cancer screening of 50% (P) in the formula (n = [DEFF*Np(1-p)]/ [(d2/Z21-α/2*(N-1)+p*(1-p)]), with a precision of ±5%, and employing a 95% confidence interval and 80% power, the minimal sample size required should account for 484 participants. Adding 20% to compensate for potential non response, the final total sample size was estimated to be 580 female teachers.

Sampling method

An updated list of all female secondary schools in Al Hassa distributed by districts (in the urban setting: two major namely Hofuf and Mubaraz, composed of about 25 districts, while the rural areas included about 15 major villages) was used to randomly selecting 20 schools, 12 urban and 8 rural (schools at Hegar were excluded due to transportation problem). All Saudis teachers aged 25 years or more, married (or previously married) were targeted for inclusion. Non-Saudis and those assigned administrative or non-teaching jobs were excluded.

Data collection instrument

The data collection form was designed to gather information about:

a- Socio-demographics and health related: school name, age in years, residence, age at marriage, educational status, family income in Saudi Riyals, number of living children, use of hormonal contraception, and previous history of any gynecological problems and its nature.

b- Awareness and perceived risk of CC: two close ended question were used, have you ever heard about CC followed by perceived risk ''Compared to other women of your age, what do you think your chances of getting CC are?' with five possible options 'Much below average', 'Below average', 'Average', 'Above average' and 'Much above average' (scored -2,- 1, 0, +1 and +2, respectively). This item was adapted from the available literature (Hall et al., 2004; Marlow et al., 2009; Tomasz et al., 2012).

c- CC awareness measure: Cervical Cancer Awareness Measure (Cervical CAM) toolkit version 2.1, this instrument was developed by the UCL Health Behavior Research Centre, in collaboration with the Department of Health Cancer Team and The Eve Appeal. It is based on a generic CAM developed by Cancer Research UK, University College London, King's College London and Oxford University in 2007-08. The original Cervical CAM comprises nine questions with a total of 31 items: Warning signs (12 items with yes, no, and do not now options), Delay in seeking medical help (1 item), Age at risk of CC (1 item), Risk factors (12 items, with true, false and do not know options), Confidence detecting CC symptom (1 item, not at all confident, not very confident,

fairly confident and very confident), The availability of CC screening program (Knowledge; yes, no and do not know and age of screening), the availability of vaccination program (knowledge; yes, no and do not know option and age of vaccination). The psychometric evalufation of the Cervical CAM indicated that it has satisfactory internal reliability with Cronbach's alpha above 0.7 for all components. Test-retest reliability over a 1 week interval was found to be good, with all correlations above 0.7.

-The modified form used for data collection in this study included the following items: signs and symptoms of cervical cancer (11 items), knowledge about risk factors (9 items), confidence in detecting CC symptoms (1 item), availability of cervical cancer screening program (2 items), availability of vaccination program (2 items), role of Pap test in screening (one item), with a total of 26 items. The original form was translated by two language experts into Arabic and back translated to English by another two independent language experts.

-Two items were removed from the original form; one item assessing early signs/symptoms (persistent diarrhea is a sign of CC) with lowering of the internal consistency (α=0.571) and another one in the risk factors bundle (age at first sexual intercourse) in response to the conservative nature of Saudi society as revealed during the pilot testing. The internal consistency measure (Cronbach's alpha) of the modified instrument was .784 (26 items), for the signs section it was .861 (10 items) and for risk factor was .751 (9 items) as revealed from the pilot testing.

d- Perceived barriers to CC screening: Twenty one items were identified as possible barriers to the uptake of cervical cancer screening relevant to health facilities, personal and socio-cultural as reveled from the pilot testing, expert opinions and the available literature (JoWaller et al., 2009; Victoria et al., 2011; Szaboova et al., 2014 ; Marlow et al., 2015). Structured list of the possible barriers were prepared in close-ended questions format with yes, no or not sure, with instructions to the participants to choose all the possible barriers they perceived.

Data collection procedure

In response to the sensitivity of the topic, anonymous self-administered survey was followed for data collection. Data collection was carried out through the following steps: In Saudi Arabia, the educational system is divided gender-wise with independent directorates for each sections, communicating with females is not culturally acceptable, a letter issued for each principals in the selected school to orient them about the objectives, contents and administration of the data collection forms. Five teachers (three in urban and two in rural schools) were invited to supervise the data collection process after proper orientation about the contents and items of the data collection form and handling the completed forms.

Pilot testing

The provisional form of data collection was tested on 47 women attended for primary health services in a nearby primary center beyond the sample size with the following objectives: Acceptability of the questions especially in relation to risk factors.- Comprehension of the terms and questions and Ambiguity (if any). - The perceived barriers were initially formulated and listed from the available literature; further addition of the possible barriers was considered after testing. - Reliability analysis was carried out.

Data analysis

Out of 650 forms distributed at the selected schools, 603 forms retrieved (response rate of 92%). Forms with missing of one or more items were discarded (n=97); 506 forms were eligible for final analysis. Data analysis was carried out using SPSS 21.0 (SPSS Inc, IBM, U.S.A.). The perceived risk score based on the participants' responses into five options 'Much below average', 'Below average', 'Average', 'Above average' and 'Much above average' (scored -2, - 1, 0, +1 and +2, respectively). Awareness of early signs-symptoms (10 points) and risk factors (9 points): correct responses assigned one point while do not know or incorrect responses received nil. For the risk factors scores those attained ≥5 points were assigned as being knowledgeable (331/506 '65.4%' scored ≤4 points), while for the knowledge of early signs and symptoms we assumed a score of ≥7 as being knowledgeable (321/506 '63.4% attained a score of ≤6 points). These cut-offs were employed for the generation of logistic regression model to determine the possible predictors (socio-demographics, perceived level of risk, and other possible independent variables of the dependent variables (knowledge of risk factors and early signs and symptoms of cervical cancer). For categorical data, frequency, proportions and percentage were used for reporting, Chi square was used for comparison. For continuous data; mean, standard deviation, and median were used, t-test, Mann Whitney and Kruskall Wallis tests were used for comparison. Another logistic regression model was generated to determine possible predictors for screening (dependent variable) by inclusion of significant potential independent variables revealed at univariate analysis. P value of ≤ 0.05 was considered significant.

Exploratory Factor Analysis: A principal components analysis with an orthogonal (Varimax) rotation was used to identify the factors underlying the different perceived barriers to the uptake of cervical cancer screening among the sampled Saudi women. Eigenvalue of 1.0 was used for factor inclusion with examination of scree plots to confirm appropriate number of possible factors. The criteria used for item elimination to maintain simple structure included were the primary factor loading below 0.4 and/ or the presence of cross-loading (Kim and Mueller, 1978). Following the process of items elimination, the remaining items were included in the factor analysis with examination of their loadings. The retained factors were assessed for reliability using Cronbach's alpha as a measure of internal consistency (Cronbach, 1951) . The factorability of the 21 barriers was examined at the outset of the analysis. Criteria 31 employed to determine the factorability of the correlation (Hair et al., 1998) included: the result of the intercorrelation matrix which showed that 16 (out of 21 items) were correlated (correlation coefficient r= 0.30 with at least one item) suggested reasonable factorability. In

addition to the Kaiser-Meyer-Olkin measure of sampling adequacy (0.661) which was above the commonly recommended value of 0.6, with significant the Bartlett's test of Sphericity (Chi square =1023.03, P=0.001), confirming that each item shared some common variance with other items. Based on the above indicators, principal component analysis was warranted suitable for these 16 items.

Ethical considerations

Permissions were obtained from the local Health Authorities and our institutions. Participants were provided with full explanation of the study with the emphasis on their right of not to participate. Informed consent forms were obtained and data confidentiality was maintained all through.

Results

The age of the included teachers ranged from 23 to 57 years, mean of 37.9±8.2 years, 82.0% were above the age of 30 years, 64.2% were resided in urban areas, 86.8% had a college degree or higher, 88.7% were married and 11.3% were divorced or widowed. Their median age at marriage was 20.0 years (ranged 17-31 years). Of the included women, 87/506 (17.2%) reported being previously examined for CC (Table 1). Of the included sample, 18.0% perceived above average risk for developing CC (7.7% above average and 10.3% much above average), 50.0% perceived below average risk and 32.0% of average risk. Table 1 also depicts the perceived personal risk score for the development of CC in relation to the different socio-demographic variables. The risk score showed non-normality (Shapiro-Wilks of 0.88, P=0.001), with a mean of -0.46±1.23 (median of -0.50, interquartile range of 1.0 to 0.0). Perceived risk

Table 1. Socio-Demographics and Perceived Personal Risk to Cervical Cancer of the Included Secondary School Female Teachers in Al Hassa, Saudi Arabia

Characteristics	Number (total =506)	%	Perceived risk score	P value
Residence				
Urban	325	64.2	-0.47±1.21	0.147*
Rural	181	35.8	-0.49±1.22	
Education				
Technical diploma (secondary technical education)	67	13.2	-0.52±1.31	0.747*
College or higher	439	86.8	-0.46±1.23	
Marital Status				
Married	449	88.7	-0.69±1.20	0.008*
Divorced/Widowed	57	11.3	-0.24±0.84	
- Age at Marriage: mean ± SD (median)	21.0±4.7 (20.0)			
- Number of living children: mean± SD(median)	3.9±2.5(3.0)			
- Age in years: mean± SD	37.9±8.2			
Age groups (years)				
< 30	91	18	-0.20±0.06	0.006**
30 - < 40	178	35.2	-1.08±0.57	
≥ 40	237	46.8	0.60±0.84	
Family income: (monthly in Saudi Riyals)				
<6,000	143	28.3	-0.55±1.22	0.134**
6,000 - <10,000	235	46.4	-0.49±1.23	
≥ 10,000	128	25.3	-0.48±1.29	
Current use of hormonal contraception	139	27.5		
Perceived personal risk of cervical cancer				
Much below average	122	24.1		
Below average	131	25.9		
Average	162	32		
Above average	39	7.7		
Much above average	52	10.3		
Ever screened for cervical cancer				
Yes	87	17.2	0.41±1.41	0.002*
No	419	82.8	-0.54±1.17	

SD, standard deviation; Using pap any method of of examination; *Mann Whitney; ** Krusall Wallis tests significance; The perceived risk score ranged from much below average (-2); below average (-1); average (0); above average (1) and much above average (2)

Table 2. Correct Responses of Participants to the Possible Signs and Risk Factors of Cervical Cancer in Relation to the Perceived Cancer Cervix Risk

Possible signs	Perceived risk and Correct Responses: no. (%)				
	Below average (n=253)	Average risk (n=162)	Above average risk (n=91)	Total (n=506)	P value*
1- Vaginal bleeding between periods	114 (45.1)	63 (38.9)	59 (64.8)	236(46.6)	0.002
2- Persistent lower back pain	62 (24.5)	35 (21.6)	22 (24.2)	119(23.5)	0.828
3- Persistent vaginal discharge that smells unpleasant	86 (34.0)	35 (21.6)	26 (28.6)	147(29.1)	0.11
4- Discomfort or pain during sex	69 (27.3)	32 (19.8)	36 (39.6)	137(27.1)	0.018
5- Menstrual periods that are heavier or longer than usual	109 (43.1)	48 (29.6)	43 (42.3)	200(39.5)	0.003
6- Vaginal bleeding after the menopause	127 (50.2)	60 (37.0)	58 (63.7)	245(48.4)	0.001
7- Persistent pelvic pain	74 (29.2)	41 (25.3)	23 (25.3)	138(27.3)	0.607
8- Vaginal bleeding during or after sex	55 (21.7)	26 (16.0)	32 (35.2)	113(22.3)	0.001
9- Blood in the stool or urine	43 (17.0)	25 (15.4)	18 (19.8)	86(17.0)	0.533
10- Unexplained weight loss	70 (27.7)	45 (27.8)	33 (36.3)	148(29.2)	0.5
Total Score (total=10 points)					
Mean ±SD	5.5±2.3	5.6±2.2	6.3±2.1	5.7±2.2	0.018**
Median (IQR)	5.0 (3.0-7.0)	5.00 (3.0-7.0)	6.0 (3.0-8.0)	6.0(3.0-7.0)	
Risk factors					
1- Infection with HPV (human papilloma virus)	39 (15.4)	39 (24.1)	16 (17.6)		0.001
2- Smoking any cigarettes at all	159 (62.8)	87 (53.7)	37 (40.7)		0.001
3- Having a weakened immune system!	175 (69.2)	103 (63.6)	45 (49.5)		0.001
4- Long term use of the contraceptive pill	152 (60.1)	98 (60.5)	57 (62.6)		0.91
5- Infection with Chlamydia (a sexually transmitted infection)	35 (13.8)	39 (24.1)	19 (20.9)		0.001
6- Starting to have sex at a young age (before age 17)	29 (11.5)	14 (8.6)	9 (9.9)		0.647
7- Having many sexual partners	34 (13.4)	19 (11.7)	7 (7.7)		0.105
8- Having many children	134 (53.0)	91 (56.2)	43 (47.3)		0.279
9- Not going for regular screening tests	185 (73.1)	106 (65.4)	78 (85.7)		0.001
Total score (out of 9 points):					
Mean ±SD	3.73±1.76	3.78±2.19	3.70±2.11		
Median (IQR)	4.0 (2.5-4.5)	4.0 (2.0-5.0)			0.156**

HIV/AIDS, immunosuppressant drugs or having a transplant; * Chi square test for independence; ** Kruskal Wallis test; IQR, interquartile range

was significantly higher among married women aged ≥40 years, and with previous history of CC examination, with no significant difference in relation to residence, family income and educational status.

The mean total knowledge score for signs and symptoms was 5.7±2.2 (median=6, IQR: 3-7). Those with "Above average" perceived risk had significantly higher overall knowledge score of possible signs of CC compared to other groups (6.3±2.1 vs. 5.6±2.2 vs.5.5±2.3 for "Above average", "Average" and "Below average" respectively, P=0.018). Vaginal bleeding between periods and after menopause were the two most commonly correctly identified signs (46.6 % and 48.4% respectively). (Table 2). The mean total knowledge score for risk factors was 3.7 ±1.98 (median=4, IQR: 3-5), however, the scores were fairly similar among the three groups (3.70±2.11 vs. 3.78±2.19 vs. 3.73±1.76 for "Above average", "Average" and "Below average" respectively, p= 0.156). "Not going for regular screening" and "Having a weakened immune system" were the most commonly identified risks (72.9% and 63.8% respectively), whereas "Having many sexual partners" and "Starting to have sex at young age" were the least identified (11.9% and 10.3%, respectively). (Table 2) The majority of participants were not sure of their ability to know early signs and symptoms of CC (61.1%) (Table 3) regardless of the magnitude of perceived risk of CC (P=0.689). Only 26% of them were aware of CC screening program, and those with perceived cancer risk "Above average" were more likely to be aware of this service (29% vs. 24.7% vs. 26.9% for "Above average", "Average" and "Below Average" respectively, p=0.022). Most participants did not know the appropriate age for screening (70%) or the age for HPV vaccination (90.1%), and a small fraction of them (9.5%) was aware of the presence of a vaccine for CC. Pap test was identified as the chief test used for screening by 71.9% of participants, and those with perceived cancer risk "Average" were more likely to know so (64.8% vs. 75.9% vs. 71.9% for "Above average", "Average" and "Below average" respectively, p=0.001). Yet, only 14.6% of participants ever had a

Table 3. Experience and Knowledge of the Included Participants Towards Cervical Cancer Screening, HPV Vaccine and Pap Test in Relation to Their Perceived Risk (N=506)

Items	Responses: no.(%) Below average (n=253)	Average (n=162)	Above average (n=91)	Total	P value*
1- Ability to know early signs and symptoms of cervical cancer					
Excellent	4 (1.6)	2 (1.2)	4 (4.4)	10 (2.0)	0.689
Good	70 (27.7)	45 (27.8)	24 (26.4)	139 (27.5)	
Not sure	153 (60.5)	100 (61.7)	56 (61.5)	309 (61.1)	
Do not know	26 (10.3)	15 (9.3)	7 (7.7)	48 (9.5)	
2- Aware about cervical cancer screening program					
Yes	68 (26.9)	40 (24.7)	27 (29.7)	135 (26.7)	0.022
No	93 (36.8)	83 (51.2)	32 (35.2)	208 (41.1)	
Do not know	92 (36.4)	39 (24.1)	32 (35.2)	163 (32.2)	
3- Appropriate age for screening					
Do not know	168 (66.4)	122 (75.3)	64 (70.3)	354 (70.0)	0.079
15-<20	7 (2.8)	3 (1.9)	0	10 (2.0)	
20-<30	12 (4.7)	3 (1.9)	0	15 (2.9)	
30- 35	27 (10.7)	12 (7.4)	4 (4.4)	43 (8.5)	
40 or more years	21 (8.3)	22 (13.6)	23 (25.3)	66 (13.0)	
4- Vaccine for cervical cancer					
Yes	19 (7.5)	17 (10.5)	12 (13.2)	48 (9.5)	0.003
No	140 (55.3)	97 (59.9)	65 (71.4)	302 (59.7)	
Do not know	94 (37.2)	48 (29.6)	14 (15.4)	156 (30.8)	
5- Age at vaccination					
Do not know	232 (91.7)	145 (89.5)	79 (86.8)	456 (90.1)	0.081
<20	4 (1.6)	2 (1.2)	0	6 (1.2)	
20 to 30 years	6 (2.4)	6 (3.7)	3 (3.3)	15 (2.9)	
> 30 years	10 (4.0)	9 (5.6)	9 (9.9)	28 (5.5)	
6- Pap test is the chief test used for screening					
Do not know	36 (14.2)	27 (16.7)	32 (35.2)	95 (18.8)	0.001
Not sure	35 (13.8)	12 (7.4)	0	47 (9.3)	
Yes	18 (71.9)	123 (75.9)	59 (64.8)	364 (71.9)	
7- Ever having a Pap smear					
Yes	26 (10.3)	25 (15.4)	23 (25.3)	74 (14.6)	0.002

*Chi-Square test

Pap smear, and those with perceived cancer risk "Above average" were more likely to have had one (25.3% vs. 15.4% vs. 10.3% for "Above average", "Average" and "Below average" respectively, P=0.002).

Logistic regression model showed, living in urban areas was the strongest predictor of being screened for CC (Odds ratio 'OR' 3.39; 95% confidence intervals 'CI'= 1.76-6.46; p=0.001), whereas "Above Average" perceived cancer risk had modest predictive power (OR 1.72; 95% CI= 1.03-2.87; p=0.012). Awareness of risk factors was predicted mainly by higher awareness of signs of cancer (OR 2.5; 95% CI=, p=0.001) and by being screened for CC (OR 1.87; 95% CI= 1.14-2.94, p=0.036). Only higher awareness of cancer risk factors predicted awareness of its early signs (OR 2.49; 95% CI= 1.64-3.70, p=0.001) (Table 4).

Exploratory factor analysis: the three components model explained 67.9% of the variation in the perceived barriers towards CC screening (CCS) in the studied group. A predefined barrier was considered as being loaded on a specific component when its absolute factor loading was < 4. Exploratory factor analysis with three factors solution showed that personal fears (fear of screening being embarrassing or painful) was the major factor that hinder CCS with high loading eigenvalue of 4.392, explaining 30.8% of the barriers among the sample toward utilization of CCS. The second factor with high eigenvalue of 0.675, and explaining 21.2% of the barriers to CCS was related to health care, including items related to limited information on CC in the community and lack of screening sites in the community, the third factor included cultural and social factors mainly embarrassing to tell people about (Table 5).

Table 4. Possible Predictors Using Logistic Regression Models for Cervical Cancer Screening, Awareness of Risk Factors and Signs of Cervical Cancer among the Included Secondary School Teachers, in Al Hassa

Independent variables	Screening		Awareness of risk factors		Awareness of early signs	
	Odds ratio (95% C.I)	P value	Odds ratio (95% C.I)	P value	Odds ratio (95% C.I)	P value
Age groups: < 30 years	1		1		1	
30 to <40 years	0.93(0.26-3.30)	0.915	0.57(0.20-1.65)	0.583	1.82(0.71-4.66)	0.21
≥ 40 years	0.65(0.27-1.55)	0.33	0.74(0.36-1.52)	0.301	0.81(0.42-1.57)	0.537
Marital status: Married	1.11(0.61-2.04)	0.735	0.69(0.41-1.16)	0.404	0.89(0.57-1.40)	0.627
Educational level: (College or higher)	1.71(0.81-3.60)	0.159	1.68(1.01-3.04)	0.162	0.78(0.47-1.29)	0.332
Residence: (urban)	3.39(1.76-6.46)	0.001	1.20(0.66-2.29)	0.089	1.56(0.56-2.58)	0.397
Perceived risk: (above average)	1.72(1.03-2.87)	0.012	0.82(0.59-1.15)	0.147	1.18(0.88-1.58)	0.227
Risk factors awareness: (higher)	1.64(0.94-2.88)	0.082	- - -	--	2.49(1.64-3.70)	0.001
Signs of cancer awareness: (knowledgeable)	1.27(0.75-2.17)	0.376	2.50(1.65-3.80)	0.001	---	--
Cervical cancer screening: Yes	---	--	1.87(1.14-2.94)	0.036	1.30(0.78-2.21)	0.343
Percent predicted for the model	86		73.9		63.4	
Hosmer-Lemeshow Chi square (P value)	8.54 (0.335)		9.41(0.309)		10.82(0.212)	

Table 5. Perceived Barriers to Cervical Cancer Screening and the Results of Principal Components Analysis

Perceived barriers*	Perceived barriers No. (%)	Factors loadings ** Factor 1 Personal	Factor 2 Health care	Factor 3 Cultural and social	Communality
1- There are no screening sites in the community	307(60.7)		0.884		0.781
2- There is limited information on cervical cancer in the community	302(59.7)		0.887		0.733
3- The screening sites are too far from where I live	151(29.8)				
4- There are no health education programs to promote screening	416(82.2)		0.801		0.672
5- Lacking proper communication with providers	101(19.9)				
6- Providers are not trustworthy	56(11.1)				
7- I do not have signs or symptoms	239(47.2)				
8- I am not at risk of the disease	212(41.9)	0.474			0.503
9- Fears of the results of screening	255(50.4)	0.758			0.632
10- I do not know what the test is all about	218(43.1)	0.701			0.611
11- I do not know any of screening sites	227(44.9)	0.481			0.503
12- Screening is embarrassing	201(39.7)	0.893			0.692
13- Screening is painful	301(59.5)	0.805			0.701
14- I do not have time for testing	169(33.4)				
15- Previous bad experience with testing	122(24.1)				
16- Can't afford money for testing	98(19.4)				
17- Embarrassing to tell people about	269(53.2)			0.849	0.744
18- No idea about what other people think	198(39.1)			0.511	0.522
19- Stigma following the diagnosis	113(22.3)				
20- Unless there is an illness, community will not accept screening.	109(21.5)				
21- My husband and family would not allow me to go for screening	192(37.9)			0.711	0.639
Eigenvalue		4.392	2.29	1.641	
Cronbach's alpha		0.701	0.675	0.581	
% variance explained		30.8	21.2	15.9	

*Not mutually exclusive; ** Principal component analysis using Varimax with Kaiser Normalization; Kaiser-Meyer-Olkin for sample adequacy , 0.661; Bartlett's test for sphericity; Chi, 1023.03, P=0.001

Discussion

This cross sectional study revealed low perceived risk in addition to poor knowledge of CC related risk factors, signs and preventive measures among the studied secondary school female teachers in Al Hassa, Saudi Arabia. According to our protocol, 65.4% and 63.4% were considered not-knowledgeable of CC risk factors and early signs and symptoms respectively. In the present study, personal fears together with the health care-related factors constituted about 60% of barriers to utilizing CCS. The study findings will help to develop policies to enhance awareness of CC promoting its screening uptake and prevention among females.

The present study revealed that only 17.2% of respondents had ever screened for CC, this rate of screening is in close agreement with other studies reported rates from 12% to 27% (Gichangi et al., 2003; Gharoro and Ikeanyi, 2006; Mutyaba et al., 2006; Were et al., 2011). However , it is higher than the 5% prevalence of 5-year CCS reported by the WHO for developing countries (WHO, 1986), the 6% reported by a Kenyan (Sudenga et al., 2013) and Tanzanian (Cunningham et al., 2015) studies and the 7% by an Ugandan study (Twinomujuni et al., 2015). In contrast, higher rate was reported by the 2004 Nunavik Health Survey, where 82% of respondents reported having a Pap smear in the previous 2 years and 60% in the past 12 months (Dodin and Blanchet, 2007). This suboptimal uptake of CCS is unexpected since Saudi women had good access to conduct Pap smear tests at teaching hospitals in comparison to expatriates (Sancho-Garnier et al., 2013). However, this is probably because the majority of studied female teachers perceived themselves to be at average or below average risk of CC, which was previously found to be associated with lower uptake of CCS (Mutyaba al., 2006; Were et al., 2011). The finding that most studied teachers perceived their CC risk as average or below average is consistent with other studies measuring comparative risk perceptions for CC, other cancers and STIs (Eiser and Cole, 2002; Leval et al., 2011; Wolfers et al., 2011). In the studied cohort, perceived risk was significantly higher among married women aged ≥40 years, and those with previous history of CC examination, a finding similar to what was reported by other studies (Mingo et al., 2012; Staci et al., 2013). According to this observation, single, young women and those with no history of CC examination are good targets for programs designed to improve awareness of personal risk of CC.

The study showed that about two thirds of the respondents were not knowledgeable about CC related risk factors, signs and symptoms. This finding has been documented in several studies both in both developed and developing countries (Dendash et al., 2005., Kietpeerakool et al., 2009; Notara et al., 2012; Kamzol et al., 2013; Al-Shaikh et al., 2014; Aldhafar et al., 2016). The questions regarding risk factors for CC unmasked important knowledge gaps; nearly one-quarter knew that infection with HPV (human papilloma virus) is a risk factor for CC. However another study conducted in Saudi Arabia revealed higher correct answer 41% (Al-Darwish et al., 2014) probably because this study was conducted on college students, some of them were medical. Half of the participants identified that smoking is one of the risk factors for CC. A similar finding was described by Al-Darwish et al., (2014) who showed that 41.5% knew that smoking is one of the risk factors for CC, while in South African and Turkish studies, this figure dropped to only 18%, and 17% respectively (Hoque et al., 2008; Koc, 2015). The current study also revealed that "Not going for regular screening" and "Having a weakened immune system" were the most commonly identified risks, similar to another study conducted among female teachers in Saudi Arabia (Aldhafar et al., 2016). Although "Multiple sexual partners" and "Early onset of sexual intercourse" are known strong risk factors (WHO, 2007), both were the least identified ones. This is largely due to the traditional/religious practices in the community that forbid any illegal sexual relations. For CC signs, post-menopausal and inter-menstrual bleeding were the two most commonly correctly identified signs. This is consistent with a recent study conducted in Saudi Arabia among female school teachers (Aldhafar et al., 2016). Those with "Above average" perceived risk had significantly higher overall knowledge score of possible signs of CC compared to other groups, which emphasizes the effect of risk perception on knowledge (Marlow et al., 2009; Tomasz et al., 2012).

Several studies have reported that there is lack of the awareness regarding CC screening and availability of vaccine, among health professionals and in general public (Ilter et al., 2010; Zhao et al., 2012;Ortashi et al., 2013; Khan et al., 2014; Koc, 2015). In the present study, most participants were not aware about CC screening program, the appropriate age for screening or the age for HPV vaccination. The respondents' lack of knowledge regarding HPV infection could explain the lack of awareness regarding the availability of the vaccine; such that only 9.5% of them were aware of the presence of such vaccine.

This study also revealed a major defect in practice of CCS; although Pap test was identified as the chief test used for screening by 71.9% of participants, only 14.6% of them got Pap test done. The situation in United Arab Emirates is even worse, where a study conducted among school teachers showed that most of them never had a pap test despite good knowledge of CCS (Bakheit et al., 2004). This could be due to unawareness of the advantages of Pap smear test or due to poor health-seeking behavior. Considering that this study was done among secondary school teachers, 71% awareness of Pap smear test is still low. It was also found that the majority of participants were not sure of their ability to know early signs and symptoms of CC (61.1%), this is very poor indeed and not acceptable for a disease that is amenable to treatment following the early detection of the pre-invasive stage (El Banna et al., 2014).

In this study, regression model revealed that living in urban areas was the strongest predictor of being screened for CC. This is consistent with results obtained in other studies (Hislop et al., 2000; Yeung and Hendrickson, 2004). Access to CCS in rural areas has been shown

to be more difficult due to health centers are not being within walking distances, lack of public transportation, and cost (Mupepi et al., 2011; Cunningham et al., 2015). This is not the case in Saudi Arabia discussing costs and transportation but can be partially explained by the presence of CC screening sites and centers in urban areas compared to rural. The finding that perceived CC personal risk was a moderate predictor of uptake of cervical screening is corroborated by study conducted among Chinese women (Leung and Leung, 2010). It is therefore important for policy makers and program managers to consider improving the perception of women as an integral component of any program aimed at increasing the uptake of CCS. Leung and Leung, 2010 identified other predictors of being screened as age above 37 years, attendance of tertiary institution of learning, and good knowledge of risk factors. However, age, knowledge and levels of education were not found to be predictors in this study. Among the predictors of a better knowledge level were education level and income as revealed from different studies (Hussain et al., 2014; Khan et al., 2014). On the contrary, the current study revealed that only higher awareness of cancer risk factors predicted awareness of its early signs. It is therefore important that health promotion efforts focus on improving women's knowledge of risk factors.

In this study, the identified barriers to CCS were grouped into 3 categories; personal factors, health care related and cultural and social barriers. Personal factors included fear of screening being embarrassing or painful, fear of screening result, and insufficient information on screening test. Health care related barriers included lack of screening sites, limited information on CC, and lack of health education programs promoting CCS. Cultural and social barriers included embarrassment to tell people about CCS, husband and family not allowing screening, and not knowing what other people think. This is consistent with other findings from previous studies, where women boycotted screening due to attitudes of fear, lack of knowledge, inaccessibility of health services, cultural beliefs, and the belief that CC is an incurable disease (Bingham et al., 2003; Mutyaba et al., 2006; Mupepi et al., 2011; Daley et al., 2013; Khan et al., 2014; Marlow et al., 2015). Fort et al., (2011) emphasized that long waiting queues and procedural delays, bad behavior and attitude of physicians and providers, unreliable diagnosis and poor satisfaction in governmental hospitals, non-availability of staff, and the perception of good health were the most cited reasons for low screening uptake. There is a need to address misconceptions and fears about CCS activities together with the health system barriers in order to increase the uptake. That can best be done by providing the women with information about the benefits of early screening, early detection, and its association with lower incidence and mortality rates from cervical cancer (Spadea et al., 2008; Daley et al., 2013).

Study limitations

The results of the current study should be viewed in the lights of the following limitation, the cross-sectional of the used design allow for inevitable chances of recall bias.

The present study pointed out the low perceived risk, poor awareness of CC related risk factors and signs, early detection and low screening practices among and educated cohort of secondary school female teachers in Al Hassa, Saudi Arabia which solidifies the need for education programs on CC and its prevention in the lights of the revealed barriers especially the personal fears and those related to health care services. Initiation of culturally accepted CC screening awareness program addressing the numerous barriers women encountered is needed to promote their health and the future generations as they represent key persons for community change.

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