Oncology
and Radiotherapy©
18(8) 2024: 001-012 • RESEARCH ARTICLE

Healthcare workers' perspectives regarding the human papillomavirus vaccine in the Khobar network, Saudi Arabia

Amal A. Alotaibi[1], Hajar G. Alruwaili[1], Elhadi Miskeen[2], Nasser H. Bukhamseen[3]

[1] Department of Preventive Medicine and Public Health Resident, King Salman Armed Forces Hospital, Tabuk, Saudi Arabia
[2] Department of Obstetrics and Gynecology, College of Medicine, University of Bisha, Bisha, Saudi Arabia
[3] Department of Preventive Medicine, Khobar Network Aqrabia Primary Healthcare Center, Khobar, Saudi Arabia

ABSTRACT

Background: It has been suggested that the Human Papillomavirus (HPV) vaccine and screening tests for HPV are necessary to prevent HPV infection. However, low rates of HPV vaccination have been reported in developing countries. The objectives of this study are to assess healthcare workers' Knowledge, Attitude, and Practice (KAP) about HPV and its vaccine in Saudi Arabia.

Methods: A cross-sectional study was conducted in Khobar city among a representative sample of the Khobar network of healthcare professionals (n=542). A self-administered questionnaire was employed for data gathering. It consisted of four main parts: socio-demographic characteristics, assessing knowledge regarding cervical cancer, HPV, and HPV vaccines (12 closed-ended questions), assessing attitude towards the HPV vaccine (8 close-ended questions), and assessing practice/behaviour concerning the HPV vaccine (7 close-ended questions).

Results: A total of 223 healthcare workers were included in the study. Almost half (50.2%) of them were females. Their age ranged between 23 years and 60 years, with a mean Standard Deviation (SD) of 38.0 years ± 9.2 years. Overall, 42.9% of the participants expressed inadequate knowledge about cancer cervix, human papillomavirus, and its vaccine. Participants who attended any training activity in cancer cervix prevention and screening were less likely than their peers to express inadequate knowledge (Adjusted odds ratio "aOR"=0.30; 95% confidence interval "CI": 0.16-0.51, p<0.001). Bachelor holders and those with higher education were less likely than those with intermediate diplomas to express inadequate knowledge (aOR=0.54; 95% CI: 0.29-0.94, p=0.048 and aOR=0.09; 95% CI: 0.03-0.26, p<0.001, respectively). The majority (82.1%) expressed a positive attitude toward cervical cancer and the HPV vaccine. With each year of increase in the participant's age, the likelihood of negative attitude towards cancer cervix and HPV vaccine decreased by 15% (aOR=0.85; 95% CI: 0.80-0.91), p<0.001). History of being ever vaccinated for HPV was reported by 55.2% of the participants. Females are significantly more susceptible to being unvaccinated for HPV (aOR=8.06; 95% CI: 4.17-15.57, p<0.001). Participants who attended any training activity in cancer cervix prevention and screening were at 74% lower risk for being not vaccinated for HPV than those who did not participate in such courses (aOR=0.27; 95% CI: 0.14-0.53, p<0.001).

Conclusion: There is an overall adequate knowledge about cancer cervix, HPV and its vaccine, positive attitude towards HPV vaccine, and promising practice of HPV vaccine up taking and recommendation to girls aged 16 years-21 years among healthcare workers. However, improving knowledge, attitude, and training of healthcare workers regarding the HPV vaccine are highly needed to overcome HPV infection and cancer cervix epidemics.

Keywords: cancer cervix, human papillomavirus, vaccine, healthcare workers, Knowledge, Attitude, and Practice (KAP), Saudi Arabia

Address for correspondence:

Amal Abdulrhman Alotaibi

Department of Preventive Medicine and Public Health Resident, King Salman Armed Forces Hospital, Tabuk, Saudi Arabia

E-mail: Amalalotaibi96@gmail.com

Word count: 4707 **Tables:** 11 **Figures:** 03 **References:** 34

Received: 08 August, 2024, Manuscript No. OAR-24-144910
Editor Assigned: 11 August, 2024, Pre-QC No. OAR-24-144910(PQ)
Reviewed: 27 August, 2024, QC No. OAR-24-144910(Q)
Revised: 05 September, 2024, Manuscript No. OAR-24-144910(R)
Published: 13 September, 2024, Invoice No. J-144910

INTRODUCTION

Cervical Cancer (CC) is the 4th common cancer among women on a worldwide level, and it also represents 9% of all female cancer deaths [1, 2]. In Saudi Arabia (KSA), it ranked as the 9th most common cancer among women in 2012 [3]. Its incidence rate was 2.2 per 100,000 Age-Standardized Rates (ASR), with 34.8% of those women dying due to the disease [1]. Recently, the World Health Organization (WHO) reported that in 2018, 316 women had cancer cervix and 158 died because of the disease [4, 5].

On a global level, Human Papillomavirus (HPV) is the most common Sexually Transmitted Disease (STD), and its certain oncogenic types are associated with cervical cancer and also other types of cancer, mainly HPV 16 and HPV 18 genotypes [6, 7].

There is a significant variability in the incidence of HPV infections across countries and communities as a result of differences in cultural norms and sexual behavior [5-8]. In the Kingdom of Saudi Arabia, HPV infection was responsible for nearly 76% of cases of CC [4].

HPV vaccination for both genders is an effective method to decrease the transmission of the disease [9]. In 2008, approved the first HPV vaccine to prevent 70% of cervical cancer cases and other diseases linked to HPV genotypes 16 and 18 by FDA (US) [10].

It has been suggested that there is a necessity for both HPV vaccine and screening tests for HPV to prevent HPV infection [11]. Low HPV vaccination rates have been reported in developing countries [12-14].

HPV vaccine exists now a days in 3 types on a worldwide level. The bivalent HPV vaccine protects against types 16 and 18, which are the 2 high-risk types commonly linked to cervical cancer. The quadrivalent HPV vaccine protects types 16, 18, 6, and 11, the strains most frequently associated with genital warts. The nonvalent HPV vaccine protects against the four types in the quadrivalent HPV vaccine in addition to 5 high-risk types 31, 33, 45, 52, and 58 [15].

HPV vaccines are currently available as regular immunization for females in 71 countries [16]. Two or three doses of HPV vaccination are usually recommended, according to the individual's age and immunological status. It is recommended for girls between 9 years and 13 years [17].

Healthcare workers are crucial in disseminating accurate

information about the HPV vaccine to patients. However, there is limited understanding of their Knowledge, Attitudes, And Practices (KAP) regarding HPV and its vaccine. This study aims to provide essential data that can inform educational programs for Saudi healthcare workers about HPV and its vaccination. Acknowledging the current low awareness and vaccination uptake rates for HPV in KSA reveals that fostering positive attitudes among healthcare providers can significantly impact cancer prevention efforts.

Understanding the knowledge level of healthcare workers concerning cervical cancer and its vaccines is vital for ensuring the effectiveness of national vaccination programs. Despite the availability of HPV vaccines in numerous Saudi health institutions, underutilization remains a challenge due to various factors, primarily a lack of adequate knowledge and misunderstanding about the vaccine. Therefore, it is imperative to assess healthcare workers' views and attitudes toward cervical cancer and its prevention to develop a robust national HPV vaccination policy.

This study aims to investigate the Knowledge, Attitude, and Practice (KAP) of healthcare workers regarding HPV and its vaccine in the Khobar network and to identify factors that influence their KAP levels. The results of this study will inform recommendations for enhancing healthcare workers' understanding and implementation of HPV vaccination strategies, ultimately contributing to the reduction of HPV-related infections and cervical cancer cases in Saudi Arabia.

SUBJECTS AND METHODS

Study design

A cross-sectional mixed qualitative and quantitative study design was adopted.

Study area

This study was conducted in Khobar City, in the Eastern Province of the Kingdom of Saudi Arabia. The population is about 457,748 based on the 2017 estimated census. In Khobar City, there is a network of healthcare centers and the Ministry of Health.

Study population

The Khobar network of healthcare professionals (n=542) includes 151 general practitioners, 73 family physicians, 32 consultants, and 286 nurses. The inclusion criteria included both genders, all nationalities, and not on vacation.

Sample size

The sample size was calculated using the Roasoft sample size calculator, with the assumptions that 542 healthcare professionals are eligible for inclusion during the period of data collection at the confidence level of 95%, margins of errors of 5%, and the expected Knowledge regarding HPV vaccine of 43.3%, based on a recent study carried out in Bangladesh among healthcare workers [18]. Accordingly, the minimal sample size required was 223 healthcare workers representing 41.1% of the total target population.

Sampling technique

A stratified random sampling technique with proportional was adopted to select the study sample from the four categories of healthcare workers. General practitioners (n=62), family physicians (n=30), consultants (n=13), and nurses (n=118). A random sampling was employed to choose individuals from a distinct list for each category of workers.

Data collection tool

Data collection was collected by using a self-administered questionnaire, which comprised four main sections:

- Socio-demographic characteristics (age, gender, marital status, highest qualification, job category, years of experience in primary care, and history of attending training courses in cancer cervix prevention and screening).
- Assessing knowledge regarding cervical cancer, HPV, and HPV vaccines (12 closed-ended questions). Correct answers were labeled with a score of "1," while incorrect answers and responses of "don't know" received a score of "0." The total score and its percentage were computed for every participant. Those who scored <60% were considered to have "inadequate knowledge" whereas those who scored 60% and above were supposed to have "adequate knowledge".
- Assessing attitude towards HPV vaccine (8 close-ended questions, including six questions with 5 Likert scale. Ranging from strongly agree to disagree strongly. The total score and its percentage were computed for every participant. Those who scored <60% were considered to have a "negative attitude," whereas those who scored 60% and above were supposed to have a "positive attitude".
- Assessing practice/behavior concerning the HPV vaccine (7 close-ended questions, including one with a 5 Likert scale).

The questionnaire was adopted from previous studies carried out in Riyadh, Saudi Arabia and Bangladesh [18, 19]. Three consultants in family medicine, preventive medicine, and immunology validated the resultant questionnaire.

Qualitative data

The qualitative component of this study aimed to explore the depth and complexity of healthcare workers' Knowledge, Attitudes, and Practices (KAP) regarding the Human Papillomavirus (HPV) vaccine. To achieve this, we employed a multi-method approach that included in-depth interviews, focus group discussions, and document analysis. These methods were selected to capture a rich and detailed understanding of the participants' experiences and perceptions. Healthcare workers from the Khobar network were purposively selected to participate in the study. The inclusion criteria ensured diversity in terms of gender, age, professional role, and experience. A total of 20 healthcare workers participated in the in-depth interviews, and two focus group discussions were conducted with 8 participants each.

In-depth interviews, Semi-structured interviews were conducted with healthcare workers to explore their understanding of HPV and the HPV vaccine, their attitudes toward vaccination, and their practices in recommending and administering the vaccine. The interviews lasted approximately 30 minutes-45 minutes and were audio-recorded with the participants' consent. Two focus group discussions were organized to facilitate a group dialogue on HPV vaccination. The discussions were guided by a discussion guide exploring themes similar to the in-depth interviews. The sessions

were moderated by trained researchers and were audio-recorded for later transcription and analysis.

Data analysis

All collected data were verified and coded before they entered a personal computer. Data entry and analysis were conducted by SPSS *vs.* 26. The chi-square test was used to assess the relationship between categorical variables. In contrast, an independent two-sample t-test was employed to compare the means of a continuous variable between 2 distinct groups. Multivariate logistic regression was utilized to define predictors of inadequate knowledge, negative attitude towards HPV vaccine, and not HPV vaccination after controlling for the confounding effect. A p-value of less than 0.05 was considered a significance level throughout the study.

All qualitative data were transcribed verbatim and analyzed using thematic analysis. This involved familiarizing with the data, generating initial codes, searching for themes, reviewing themes, and defining and naming themes. The analysis was conducted using N-Vivo software to facilitate the organization and management of the data.

Ethical consideration

Before conducting the study, the local ethics committee in the Khobar Ministry of Health approved-the Khobar Governmental Hospital IRB (IRB Protocol No: PRV-01). Written permission from the higher authorities in Khobar primary healthcare was obtained. Permission to use the questionnaire was obtained through an e-mail communication with the corresponding author of the research. Informed consent (verbal) was secured from all participants at the beginning of the study. All information was kept confidential and not accessed except for scientific research.

RESULTS

A total of 223 healthcare workers were included in the study. Almost half (50.2%) of them were females. Their age ranged between 23 years and 60 years, with a mean Standard Deviation (SD) of 38.0 years ± 9.2 years. Almost 2/3 of (63.2%) were married, 53.4% were bachelor holders, and 52.9% were nurses. More than 1/3 of (38.1%) have experience exceeding 10 years in primary care (Table 1).

History of attending any training activity in cancer cervix prevention and screening was reported by 41.3% of the participants (Figure 1).

Tab. 1. Socio-demographic characteristics of the participants (n=223)

	Frequency	Percentage (%)
Gender		
Male	111	49.8
Female	112	50.2
Age in Years		
Range	23 Years-60 Years	
Mean ± SD	38.0 ± 9.2	
Marital Status		
Single	64	28.7
Married	141	63.2
Divorced	16	7.2
Widowed	2	0.9
Highest Qualification		
Intermediate Diploma	68	30.5
Bachelor	119	53.4
Higher education (Master, PhD, Fellowship)	36	16.1
Job Title		
General Practitioner	62	27.8
Family Physician	30	13.5
Consultant	13	5.8
Nurse	118	52.9
Years of Experience in Primary Care		
≤ 5	74	33.2
06-10	64	28.7
>10	85	38.1

SD: Standard Deviation

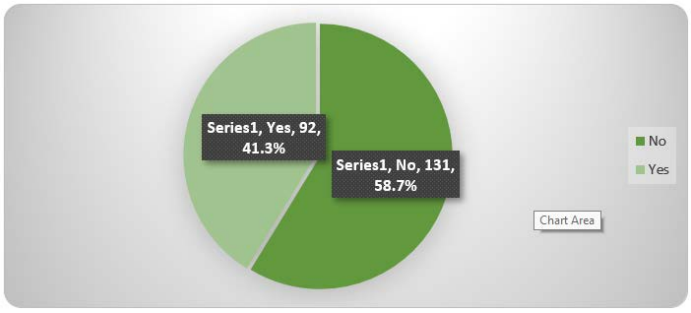

Fig. 1. Attending any training activity in cancer cervix prevention and screening among the participants

Knowledge regarding cervical cancer, Human Papillomavirus (HPV), and its vaccine, most of the participants knew correctly that HPV can cause cervical cancer (70.4%), HPV subtypes 16 and 18 are associated with cervical cancer (70%), and there is a vaccine against cervical cancer and an effective method of reducing the risk of cervical cancer (69.1%). Slightly more than 1/2 of (55.2%) of the participants recognized that the HPV vaccine cannot guarantee 100% protection from cervical cancer, and 62.3% knew that cervical cancer can be fatal (Table 2).

Tab. 2. Assessment of knowledge of the participants about cervical cancer, Human Papillomavirus (HPV), and its vaccine (n=223)

	Correct Answers		
	Responses	**No.**	**%**
Having Knowledge of the Existence of Cervical Cancer	Yes, little	103	46.2
	Yes enough	111	49.8
Cervical Cancer can be Fatal	Yes	139	62.3
Cervical Cancer is Normally Caused by an Infectious Agent	Yes	138	61.9
There is an Effective Method of Reducing the Risk of Cervical Cancer	Yes	154	69.1
Cervical Cancer is a Common Type of Cancer in Saudi Arabia	No	41	18.4
Having Knowledge about HPV*	Yes, little	110	49.3
	Yes enough	107	48
HPV can Cause Cervical Cancer	Yes	157	70.4
HPV Subtypes 6 and 11 are Associated with Cervical Cancer	No	122	54.7
HPV Subtypes 16 and 18 are Associated with Cervical Cancer	Yes	156	70
There is a Vaccine Against Cervical Cancer	Yes	154	69.1
The HPV Vaccine can Guarantee 100% Protection from Cervical Cancer	No	123	55.2
Pap Smear Testing is not Required Following HPV Vaccination	No	123	55.2

*Human Papilloma Virus

Overall, 42.9% of the participants expressed inadequate knowledge about cancer of the cervix, the human papillomavirus, and its vaccine, as shown in figure 2.

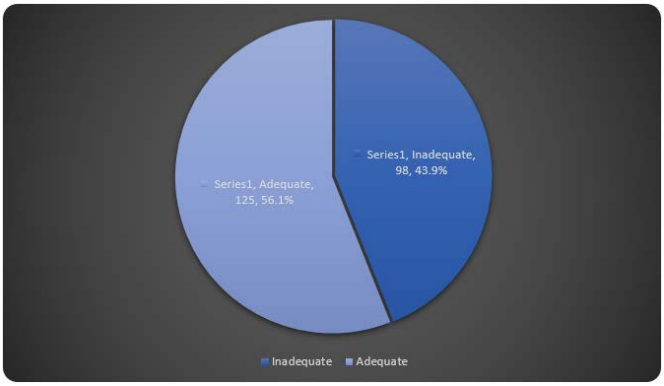

Fig. 2. Overall level of knowledge of the participants about cervical cancer, human papillomavirus and its vaccine (n=223)

Higher educated participants were more knowledgeable about cervical cancer, HPV, and its vaccine compared to others, p<0.001. Consultants were more knowledgeable than others, p=0.026. Participants who attended any training activity in cancer cervix prevention and/or screening were more knowledgeable than their counterparts (72.8% *vs.* 44.3%), p<0.001 (Table 3).

Tab. 3. Factors associated with knowledge about cancer cervix, human papillomavirus virus, and its vaccine: Univariate analysis (n=223)

	Knowledge About Cancer Cervix, Human Papilloma Virus and its Vaccine		p-value
	Inadequate	Adequate	
	N=98	N=125	
	N (%)	N (%)	
Gender			
Male (n=111)	53 (47.7)	58 (52.3)	0.255*
Female (n=112)	45 (40.2)	67 (59.8)	
Age in Years			
Mean ± SD	38.6 ± 9.8	39.3 ± 8.7	0.598**
Marital Status			
Single (n=64)	31 (48.4)	33 (51.6)	0.503*
Married (n=141)	61 (43.3)	80 (56.7)	
Divorced/Widowed (n=18)	6 (33.3)	12 (66.7)	
Highest Qualification			
Intermediate Diploma (n=68)	39 (57.4)	29 (42.6)	<0.001*
Bachelor (n=119)	55 (46.2)	64 (53.8)	
Higher Education (n=36)	4 (11.1)	32 (88.9)	
Job Title			
General Practitioner (n=62)	20 (32.3)	42 (67.7)	0.026*
Family Physician (n=30)	13 (43.3)	17 (56.7)	
Consultant (n=13)	3 (23.1)	10 (76.9)	
Nurse (n=118)	62 (52.5)	56 (47.5)	
Years of Experience in Primary Care			
≤5 (n=74)	33 (44.6)	41 (55.4)	0.141*
6-10 (n=64)	22 (34.4)	42 (65.6)	
>10(n=85)	43 (50.6)	42 (49.4)	
History of Attending any Training Activity in Cancer Cervix Prevention and/or Screening			
No (n=131)	73 (55.7)	58 (44.3)	<0.001*
Yes (n=92)	25 (27.2)	67 (72.8)	

*Chi-square test **Independent two-sample t-test

The multivariate analysis indicated that participants who attended any training activity in cancer cervix prevention and/ or screening were less likely than their peers to express inadequate knowledge about cervical cancer, HPV, and its vaccine (Adjusted odds ratio "aOR"=0.30; 95% confidence interval "CI": 0.16-0.51, p<0.001). Bachelor holders and those with higher education were less likely than those with intermediate Diplomas to express inadequate knowledge about cervical cancer, HPV, and its vaccine (aOR=0.54; 95% CI: 0.29-0.94, p=0.048 and aOR=0.09; 95% CI: 0.03-0.26, p<0.001, respectively). Participants' job was not significantly associated with cervical cancer, HPV, and its vaccine (Table 4).

Tab. 4. Predictors of inadequate knowledge about cervical cancer, human papillomavirus, and its vaccine among the participants: Multivariate logistic regression analysis

	Adjusted Odds Ratio	95% Confidence Interval	p-Value
History of Attending any Training Activity in Cancer Cervix Prevention and/or Screening			
No[a]	1	-	-
Yes	0.3	0.16-0.51	<0.001
Highest Qualification			
Intermediate Diploma[a]	1	-	-
Bachelor	0.54	0.29-0.94	0.048
Higher Education	0.09	0.03-0.26	<0.001

a: Reference category
Notes: The term of the job was removed from the final logistic regression model (not significant)

Attitude towards cervical cancer and HPV vaccine

The majority of participants (78.5%) felt that cervical cancer could directly affect them in the future. Almost 2/3 of (64.6%) would give their daughter the HPV vaccine. Most of them disagreed with the statement that most patients are not at risk of HPV infection and cervical cancer (52.9% and 67.2%, respectively). The majority

of them (75.4%) agreed that it is important for women to receive the HPV vaccine. More than 1/2 of the participants (55.2%) disagreed with the statement, "I do not have confidence in the safety of new vaccines," and 57.9% disagreed with the statement that "parents are worried that HPV vaccination might encourage the early initiation of sexual activity" (Table 5).

Tab. 5. Attitude of the participants towards cervical cancer, and human papillomavirus vaccine (n=223)

	Yes N (%)		No N (%)		Don`t Know N (%)
Could cervical cancer have a direct impact on you in the future?	175 (78.5)		9 (4.0)		39 (17.5)
Would you allow your daughter to be given the HPV vaccine?	144 (64.6)		11 (4.9)		68 (30.5)
	Strongly Agree	**Agree**	**Neutral**	**Disagree**	**Strongly Disagree**
Could vaccination against a sexually transmitted disease encourage the early initiation of sexual activity?	6 (2.7)	21 (9.4)	57(25.6)	87 (39.0)	52 (23.3)
Parents worry that HPV vaccination might encourage the early initiation of sexual activity	5 (2.2)	39 (17.5)	50 (22.4)	86 (38.6)	43 (19.3)
I do not have confidence in the safety of new vaccines	3 (1.3)	25 (11.2)	72 (32.3)	74 (33.2)	49 (22.0)
It is important for women to receive the HPV vaccine	74 (33.2)	94 (42.2)	51 (22.9)	3 (1.3)	1 (0.4)
Most patients are not at risk of HPV infection	1 (0.4)	17 (7.6)	87 (39.0)	100 (44.8)	18 (8.1)
Most patients are not at risk of cervical cancer	1 (0.4)	15 (6.7)	57 (25.6)	112 (50.2)	38 (17.0)

Most participants (82.1%) expressed a positive attitude towards cervical cancer and the human papillomavirus vaccine (Figure 3).

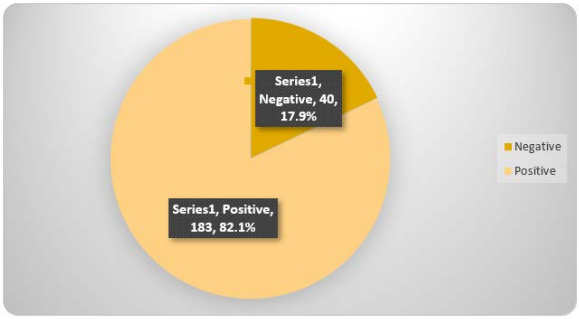

Fig. 3. Overall attitude of the participants towards cervical cancer and human papillomavirus vaccine

The age of participants who expressed a positive attitude towards cancer cervix and HPV vaccine was significantly higher than those who expressed a negative attitude (40.6 ± 9.0 *vs.* 31.7 ± 5.7), p<0.001. Participants with Intermediate Diploma had a higher rate of positive attitude towards cancer cervix and HPV vaccine than those with higher education, p=0.021. Participants with more years of experience in primary care had higher positive attitudes towards cancer cervix and HPV vaccine than others, p<0.001. Participants with a history of attending any training activity in cancer cervix prevention and/or screening were more likely than their peers to express a positive attitude towards cancer cervix and HPV vaccine (88% *vs.* 77.9%). However, this was borderline insignificant, p=0.051 (Table 6).

Tab. 6. Factors associated with attitude towards cancer cervix and human papillomavirus vaccine: Univariate analysis (n=223)

	Attitude towards Cervical Cancer and Human Papilloma Virus Vaccine		p-Value
	Negative N=40 N (%)	**Positive N=183 N (%)**	
Gender			
Male (n=111)	23 (20.7)	88 (79.3)	0.281*
Female (n=112)	17 (15.2)	95 (84.8)	
Age in Years			
Mean ± SD	31.7 ± 5.7	40.6 ± 9.0	<0.001**
Marital Status			
Single (n=64)	16 (25.0)	48 (75.0)	0.154*
Married (n=141)	20 (14.2)	121 (85.8)	
Divorced/widowed (n=18)	4 (22.2)	14 (77.8)	

Highest Qualification			
Intermediate Diploma (n=68)	5 (7.4)	63 (92.6)	0.021*
Bachelor (n=119)	28 (23.5)	91 (76.5)	
Higher Education (n=36)	7 (19.4)	29 (80.6)	
Job Title			
General Practitioner (n=62)	12 (19.4)	50 (80.6)	0.149*
Family Physician (n=30)	1 (3.3)	29 (96.7)	
Consultant (n=13)	2 (15.4)	11 (84.6)	
Nurse (n=118)	25 (21.2)	93 (78.8)	
Years of Experience in Primary Care			
≤ 5 (n=74)	24 (32.4)	50 (67.6)	<0.001
6-10 (n=64)	14 (21.9)	50 (78.1)	
>10 (n=85)	2 (2.4)	83 (97.6)	
History of Attending any Training Activity in Cancer Cervix Prevention and/or Screening			
No (n=131)	29 (22.1)	102 (77.9)	0.051*
Yes (n=92)	11 (12.0)	81 (88.0)	

*Chi-square test **Independent two-sample t-test

With each year of increase in the participant's age, the likelihood of negative attitude towards cancer cervix and HPV vaccine decreased by 15% (aOR=0.85; 95% CI: 0.80-0.91), p<0.001). Participants` history of attending training courses, experience, and qualifications are not significantly associated with attitude towards cancer cervix and HPV vaccine (Table 7).

Tab. 7. Predictors of negative attitude towards cervical cancer and human papillomavirus vaccine among the participants: Multivariate logistic regression analysis

	Adjusted Odds Ratio	95% Confidence Interval	p-Value
Age in Years	0.85	0.80-0.91	<0.001

The terms of training course, experience, and qualification were removed from the final logistic regression model (not significant).

Practice related to cancer cervix and HPV vaccine uptake

History of being ever vaccinated for HPV was reported by 55.2% of the participants. Almost a 5th of the participants (20.2%) often discussed sexual health with their patients, while 39.9% often discussed immunization or vaccination status with them. Nearly 3/4 of the participants (75.8%) recommended the HPV vaccine for girls aged 16 years-21 years, while almost 2/3 of (68.6% and 66.8%) recommended it for those aged 21 years-26 years and 12 years-15 years, respectively. Most of the participants (72.2%) disagreed with discussing their patient's sexual behavior before recommending HPV vaccination (Table 8).

Tab. 8. Practice related to cancer cervix and HPV vaccine uptake among the participants

	Frequency	Percentage (%)
Have you ever been Vaccinated for HPV?		
No	100	44.8
Yes	123	55.2
Do you Discuss Sexual Health with your Patients?		
Never	23	10.3
Rarely	50	22.4
Sometimes	105	47.1
Often	45	20.2
Do you Discuss Immunization or Vaccination Status with your Patients?		
Never	9	4
Rarely	28	12.6
Sometimes	97	43.5
Often	89	39.9
Should you Discuss your Patients 'Sexual Behavior prior to Recommending HPV Vaccination?		
Strongly agree	3	1.3
Agree	10	4.5
Neutral	49	22

Disagree	100	44.8
Strongly disagree	61	27.4
Do you Recommend HPV Vaccination for Girls Aged 12 years–15 years?		
No	74	33.2
Yes	149	66.8
Do you Recommend HPV Vaccination for Girls Aged 16 years–21 years?		
No	54	24.2
Yes	169	75.8
Do you Recommend HPV Vaccination for Women Aged 21 years–26 years?		
No	70	31.4
Yes	153	68.6

Males were more likely than females to be vaccinated for HPV (75.7% *vs.* 34.8%), p<0.001. The higher rate of HPV vaccination was observed among consultants (76.9%), while the lowest rate was observed among nurses (46.6%), p=0.037. Participants with a history of attending any training activity in cancer cervix prevention and/or screening were more likely than their peers to be vaccinated for HPV (70.7% *vs.* 44.3%), p<0.001. Participants who expressed adequate knowledge were more likely than those who expressed inadequate knowledge about cancer cervix, HPV virus, and its vaccine to be vaccinated for HPV (61.6% *vs.* 46.9%), p=0.029 (Table 9).

Tab. 9. Factors associated with history of ever been vaccinated for human papillomavirus among the participants: Univariate analysis (n=233)

	History of ever been Vaccinated for HPV		p-Value
	No N=100 N (%)	**Yes N=123 N (%)**	
Gender			
Male (n=111)	27 (24.3)	84 (75.7)	<0.001*
Female (n=112)	73 (65.2)	39 (34.8)	
Age in Years			
Mean ± SD	38.5 ± 9.4	39.4 ± 9.0	0.456**
Marital Status			
Single (n=64)	34 (53.1)	30(46.9)	0.278*
Married (n=141)	58 (41.1)	83 (58.9)	
Divorced/widowed (n=18)	8 (44.4)	10 (55.6)	
Highest Qualification			
Intermediate Diploma (n=68)	33 (48.5)	35 (51.5)	0.640*
Bachelor (n=119)	53 (44.5)	66 (55.5)	
Higher education (n=36)	14 (38.9)	22 (61.1)	
Job Title			
General practitioner (n=62)	22 (35.5)	40 (64.5)	0.037*
Family physician (n=30)	12 (40.0)	18 (60.0)	
Consultant (n=13)	3 (23.1)	10 (76.9)	
Nurse (n=118)	63 (53.4)	55 (46.6)	
Years of Experience in Primary Care			
≤ 5 (n=74)	34 (45.9)	40 (54.1)	0.951*
6-10 (n=64)	29 (45.3)	35 (54.7)	
>10(n=85)	37 (43.5)	48 (56.5)	
History of Attending any Training Activity in Cancer Cervix Prevention and/or Screening			
No (n=131)	73 (55.7)	58 (44.3)	<0.001*
Yes (n=92)	27 (29.3)	65 (70.7)	
Knowledge about Human Papilloma Virus Vaccine			
Inadequate (n=98)	52 (53.1)	46 (46.9)	0.029*
Adequate (n=125)	48 (38.4)	77 (61.6)	
Attitude Towards Cervical Cancer and Human Papilloma Virus Vaccine			
Negative (n=40)	16 (40.0)	24 (60.0)	0.497*
Positive (n=183)	84 (45.9)	99 (54.1)	

*Chi-square test **Independent two-sample t-test

Multivariate logistic regression analysis indicated that females were at significant risk of being unvaccinated for HPV (aOR=8.06; 95% CI: 4.17-15.57), p<0.001). Participants who attended any training activity in cancer cervix prevention and/or screening were at 74% lower risk for being not vaccinated for HPV than those who did not participate in such courses (aOR=0.27; 95% CI: 0.14-0.53), p<0.001. Participants who expressed adequate knowledge about cancer cervix, HPV, and its vaccine were at lower risk of being not vaccinated for HPV than those with inadequate knowledge; however, this did not achieve a statistical significance level (aOR=0.56; 95% CI: 0.94-3.46), p=0.078. Participants` jobs were not significantly associated with HPV vaccine uptake (Table 10).

Tab. 10. Predictors of not vaccinated for human papillomavirus among the participants: Multivariate logistic regression analysis

	Adjusted Odds Ratio	95% Confidence Interval	p-Value
Gender			
Male	1	-	<0.001
Female	8.06	4.17-15.57	
History of Attending any Training Activity in Cancer Cervix Prevention and/or Screening			
No.	1	-	<0.001
Yes	0.27	0.14-0.53	
Knowledge about Human Papilloma Virus Vaccine			
Inadequate	1	-	0.078
Adequate	0.56	0.94-3.46	

a: Reference category
Notes: Term of the job was removed from the final logistic regression model (not significant)

The qualitative analysis of the study on healthcare workers' Knowledge, Attitude, And Practice (KAP) regarding the Human Papillomavirus (HPV) vaccine reveals several key insights (Table 11).

Tab. 11. Qualitative findings

Theme	Result
Awareness of HPV and Cervical Cancer	Most healthcare workers are aware that HPV can cause cervical cancer, but there is a significant proportion who lack detailed knowledge about the virus and the vaccine
Perception of HPV Vaccine Effectiveness	There is a common perception that the HPV vaccine is an effective method of reducing the risk of cervical cancer, but there is also a misconception that the vaccine guarantees 100% protection
Attitude Towards HPV Vaccination	The majority of healthcare workers have a positive attitude towards the HPV vaccine and would recommend it to their patients and family members. However, there is a minority who express concerns about the safety and potential behavioral implications of the vaccine
Barriers to HPV Vaccination Uptake	Identified barriers include gender-specific hesitancy, lack of confidence in new vaccines, and cultural concerns. Females are less likely to be vaccinated, and there are worries about the vaccine encouraging early sexual activity
Influence of Training and Education	Healthcare workers who have attended training on cervical cancer prevention and screening demonstrate better knowledge and are more likely to be vaccinated against HPV. Higher levels of education are associated with better knowledge and more positive attitudes towards the vaccine
Recommendation Practices for HPV Vaccination	There is a willingness among healthcare workers to recommend the HPV vaccine, especially for girls aged 16-21, but there is variability in discussing sexual health and vaccination status with patients
Impact of Age and Experience on KAP	Older healthcare workers and those with more years of experience tend to have a more positive attitude towards the HPV vaccine and are more likely to recommend it

DISCUSSION

Locally, relatively limited studies have evaluated healthcare workers' knowledge, attitude, and practice regarding HPV infection and its vaccine. The present study revealed overall adequate knowledge (56.1%), positive attitude (82.1%), and promising practice of HPV vaccine up taking (55.2%) and recommendation to girls aged 16 years–21 years (75.8%) among healthcare workers. In another older Saudi study conducted in 2018 among primary healthcare physicians, a high score of knowledge about HPV infection and its vaccine, as well as a positive attitude regarding the HPV vaccine, were reported. However, only 16.5% of physicians routinely recommend the vaccine to their patients [20]. This finding could reflect better practices among healthcare workers in the last few years in KSA. In another more recent Saudi study conducted among physicians (2020), most expressed excellent knowledge regarding the cancer cervix and its HPV vaccine [18].

In the present study, 61.9% of healthcare workers recognized that an infectious agent usually causes cervical cancer, and 69.1% knew that there is an effective method of reducing the risk of cervical cancer. In another Saudi study, the majority of physicians (94%) were aware of the causative association between HPV infection and cervical cancer [18]. Anfinan (2019) revealed that the majority of surveyed 2000 physicians were knowledgeable regarding HPV, and 63.0% perceived HPV infection as a common infection, with 62% expressing overall adequate knowledge [21]. In India (2021), the majority of healthcare professionals (90.6%) were aware of cervical cancer, and 86.2% knew that HPV causes cervical cancer [22]. In Bangladesh (2022), a good level of knowledge was reported among 43.3% of healthcare workers [19]. In Norway (2017), less than half (47%) of the primary health care staff were knowledgeable regarding the etiological role of HPV in cancer cervix [23]. A recent systematic review revealed that healthcare professionals had satisfactory knowledge about HPV infection and its impacts on human health [24]. In Nigeria (2015), good knowledge was reported among 51.8%, 67.1%, and 21.1% of medical students regarding cervical cancer, HPV, and HPV vaccination, respectively [25]. Various studies should be compared in light of target population and culture differences.

In the current study, after controlling for the confounding effect, healthcare workers who attended any training activity in cancer cervix prevention and screening and highly educated individuals were more knowledgeable about cervical cancer, HPV, and its vaccine than their counterparts. In Riyadh, KSA (2020), more experienced physicians (>10 years of practice) had better knowledge of cervical cancer than others [18]. In another Saudi study, significant determinants for adequate knowledge were non-Saudi nationality, senior staff, and belonging to the Obstetrics/Gynecology specialty [21]. A recent systematic review indicated that healthcare professionals' knowledge of the HPV vaccine was affected by their specialty, gender, work environment, hours of work, and the time elapsed since their last HPV training [24]. In Norway (2017), public health nurses were more knowledgeable about cervical cancer and HPV vaccination than General Practitioners (GPs) [23].

The present study showed that 64.6% of healthcare workers would allow their daughters to be given the HPV vaccine, and the majority of them (75.4%) agreed that it is essential for women to receive the HPV vaccine. 82.1% agreed positively toward cervical cancer and the human papilloma vaccine. Similarly, in Riyadh, KSA (2020), the majority (80%) of physicians believe that it is essential for women to receive the HPV vaccine, and 82% reported that they would allow their daughters to be given the HPV vaccine [18]. Also, in KSA, Anfinan (2019) reported that 41.2% of physicians accepted to receive the HPV vaccine, 77.6% were willing to vaccinate their children, and 69.6% were willing to include the HPV vaccine in the local immunization program [21]. These findings are encouraging for Muslim communities where there is a concept that Islam religion may interfere in vaccination programs performed for sexually transmitted diseases [26].

This study found that older healthcare workers were more inclined to report a positive attitude toward the HPV vaccine. In another Saudi study, Anfinan (2019) observed that male, older, Saudi, and senior consultants other than those in obstetrics and gynecology specialties were more likely to have negative attitudes regarding vaccines [21]. In Bangladesh (2022), the attitude level of young medical professionals towards HPV vaccination was high (75.9%), particularly among females [19].

The present study showed that the history of being ever-vaccinated for HPV was reported by 55.2% of the participants. In another Saudi research, the rate of HPV immunization among physicians was 7.6% [21]. In Bangladesh (2022), a good level of HPV-related practice was observed among 11.8% of young medical professionals [19]. In Zambia (2022), 54.6% of the medical doctors would advise eligible individuals to take the HPV vaccine [27]. In India (2021), only 19.8% of healthcare professionals were vaccinated for HPV, and 77.2% were willing to be vaccinated and recommend HPV vaccination to their family members [22]. In Norway (2017), the majority of public health nurses (93%) and 68% of GPs would vaccinate their 12-years-old daughters [24]. In Nigeria (2015), only 39.6% of medical students accepted HPV vaccination [25]. Also, in Nigeria (2014), most of the healthcare professionals (81%) would approve the HPV vaccine for their teenage daughters [28].

In our study, the logistic regression multivariate analysis indicated that males, participants who attended any training activity in cancer cervix prevention and screening, and those who expressed adequate knowledge about cancer cervix, HPV, and its vaccine were at lower risk for being not vaccinated for HPV than their counterparts. In Norway (2017), public health nurses and younger participants were more willing to vaccinate their daughters [23]. In Nigeria (2014), single participants were more favorably disposed to vaccination of teenagers than the married [28]. In Nigeria, the principal reported barriers to HPV vaccination and recommendations were inadequate knowledge and high costs. In addition, good knowledge of HPV and HPV vaccination was significantly associated with vaccination acceptance [25].

The results of our qualitative analysis provide valuable insights into the current landscape of HPV vaccination among healthcare professionals. The findings highlight both encouraging trends and areas that require attention to improve the prevention and control of HPV-related diseases. A significant majority of healthcare workers in our study recognize the link between HPV and cervical cancer, which is consistent with findings from similar studies in other regions. For instance, studies in, Saudi Arabia, reported high levels of awareness among primary healthcare physicians about the causative association between HPV and cervical cancer [29-31]. Similarly, a study in India found that the majority of healthcare professionals were aware of cervical cancer and its relation to HPV [32-34]. This widespread awareness is a positive indicator of the potential success of HPV vaccination programs, as informed healthcare workers are more likely to engage in effective communication with their patients.

LIMITATIONS

The study has 2 important limitations that should be discussed. First, including only members of the Khobar network of healthcare professionals could influence the generalizability of findings over other healthcare workers. Second, the study's cross-sectional design could impact the causal relationships between the participants' knowledge, attitudes, and practice and their possible associated factors. Despite those limitations, the study's results could provide helpful information on this sensitive topic in our conservative culture.

CONCLUSION

The study revealed overall adequate knowledge about cancer cervix, HPV and its vaccine, positive attitude towards HPV vaccine, and promising practice of HPV vaccine up taking and recommendation to girls aged 16 years–21 years among healthcare workers. However, improving the knowledge, attitude, and training of healthcare workers regarding the HPV vaccine and overcoming obstacles of recommending and up taking it by healthcare workers are highly needed against HPV infection and cancer cervix epidemics.

ACKNOWLEDGMENTS

We would like to express our heartfelt gratitude to all the healthcare workers who participated in this study and generously shared their valuable time and insights. Your commitment to improving healthcare and cancer prevention is truly inspiring.

We would also like to extend our sincere thanks to the staff and management of the Khobar network for their support and collaboration during the research process. Your encouragement facilitated the successful completion of this study.

Special appreciation is due to the Department of Preventive Medicine of the Joint Program of Preventive Medicine Eastern Region for providing the resources and guidance necessary for conducting this research.

Finally, we would like to acknowledge the contributions of our academic mentors and colleagues who provided valuable feedback and assistance throughout the study, helping to refine our methodology and enhance the overall quality of our work. Thank you for your unwavering support.

FUNDING

No

AUTHOR CONTRIBUTION

All the authors contributed significantly to this work these sections; conceptualization, methodology, investigation, writing - original draft preparation, and visualization. All authors have read and agreed to the published version of the manuscript. Each individual has contributed sufficiently to the project to be included as authors, and all who qualify for authorship are listed.

CONFLICT OF INTEREST

Not declared

ABBREVIATIONS

CC, Cancer Cervix; KSA, Kingdom of Saudi Arabia; ASR, Age-Standardized Rate; WHO, World Health Organization; HPV, Human Papillomavirus; STD, Sexually Transmitted Diseases; KAP, Knowledge, Attitude, and Practice; SPSS, Statistical Package for Social Sciences

REFERENCES

1. Jradi H, Bawazir A. Knowledge, attitudes, and practices among Saudi women regarding cervical cancer, human papillomavirus (HPV) and corresponding vaccine. Vaccine. 2019;37:530-537.
2. Mruts KB, Gebremariam TB. Knowledge and perception towards cervical cancer among female Debre Berhan University students. Asian Pac J Cancer Prev. 2018;19:1771.
3. Al Khudairi H, Abu-Zaid A, Alomar O. Public awareness and knowledge of pap smear as a screening test for cervical cancer among Saudi population in Riyadh City. Cureus. 2017;9:984.
4. Faqih L, Alzamil L, Aldawood E, Alharbi S, Muzzaffar M, et al. Prevalence of human papillomavirus infection and cervical abnormalities among women attending a tertiary care center in Saudi Arabia over 2 years. Trop Med Infect Dis. 2023;8:511.
5. AlObaid A, Al-Badawi IA, Al-Kadri H, Gopala K, Kandeil W, et al. Human papillomavirus prevalence and type distribution among women attending routine gynecological examinations in Saudi Arabia. BMC Infect Dis. 2014;14:1-8.
6. Sahasrabuddhe VV, Luhn P, Wentzensen N. Human papillomavirus and cervical cancer: biomarkers for improved prevention efforts. Future Microbiol. 2011;6:1083-1098.
7. Forman D, de Martel C, Lacey CJ, Soerjomataram I, Lortet-Tieulent J, et al. Global burden of human papillomavirus and related diseases. Vaccine. 2012;30:12-23.
8. Mouallif M, Bowyer HL, Festali S. Cervical cancer and HPV: awareness and vaccine acceptability among parents in Morocco. Vaccine. 2014;32:409-416.
9. Quinn S, Goldman RD. Human papillomavirus vaccination for boys. Can Fam Physician. 2015;61:43-46.
10. Hariri S, Bennett NM, Niccolai LM. Reduction in HPV 16/18-associated high grade cervical lesions following HPV vaccine introduction in the United States–2008–2012. Vaccine. 2015;33:1608-1613.
11. Gervais F, Dunton K, Jiang Y, et al. Systematic review of cost-effectiveness analyses for combinations of prevention strategies against human papillomavirus (HPV) infection: a general trend. BMC Public Health. 2017;17:1-8.
12. Vu LT, Bui D, Le HT. Prevalence of cervical infection with HPV type 16 and 18 in Vietnam: implications for vaccine campaign. BMC Cancer. 2013;13:1-7.
13. Juntasopeepun P, Davidson PM, Srisomboon J. Issues and challenges in implementing cervical cancer screenings in the emergence of HPV vaccination in Thailand. Collegian. 2012;19:45-50.
14. Chow SN, Soon R, Park JS. Knowledge, attitudes, and communication around human papillomavirus (HPV) vaccination amongst urban Asian mothers and physicians. Vaccine. 2010;28:3809-3817.
15. Hirth J. Disparities in HPV vaccination rates and HPV prevalence in the United States: a review of the literature. Hum Vaccin Immunother. 2019;15:146-155.
16. Bruni L, Saura-Lazaro A, Montoliu A. HPV vaccination introduction worldwide and WHO and UNICEF estimates of national HPV immunization coverage 2010-2019. Prev Med. 2021;144:106399.
17. World Health Organization. Human papillomavirus vaccines: WHO position paper (2022 update)–Vaccins contre les papillomavirus humains: note de synthèse de l'OMS (mise à jour de 2022). Wkly Epidemiol Rec. 2022;97:645-672.
18. Almazrou S, Saddik B, Jradi H. Knowledge, attitudes, and practices of Saudi physicians regarding cervical cancer and the human papilloma virus vaccine. J Infect Public Health. 2020;13:584-590.
19. Chowdhury S, Ara R, Roy S. Knowledge, attitude, and practices regarding human papillomavirus and its vaccination among the young medical professionals and students of Bangladesh. Clin Exp Vaccine Res. 2022; 11:63-71.
20. Almughais ES, Alfarhan A, Salam M. Awareness of primary healthcare physicians about human papilloma virus infection and its vaccination: a cross-sectional survey from multiple clinics in Saudi Arabia. Infect Drug Resist. 2018; 11:2257-2267.
21. Anfinan NM. Physician's knowledge and opinions on human papillomavirus vaccination: a cross-sectional study, Saudi Arabia. BMC Health Serv Res. 2019;19:963.
22. Chellapandian P, Myneni S, Ravikumar D, et al. Knowledge on cervical cancer and perceived barriers to the uptake of HPV vaccination among health professionals. BMC Womens Health. 2021;21:65.
23. Nilsen K, Aasland OG, Klouman E. The HPV vaccine: knowledge and attitudes among public health nurses and general practitioners in Northern Norway after introduction of the vaccine in the school-based vaccination programme. Scand J Prim Health Care. 2017;35:387-395.
24. Thanasa E, Thanasa A, Kamaretsos E, Paraoulakis I, Balafa K, Gerokostas E, et al. Awareness regarding human papilloma virus among health professionals and will to accept vaccination: A systematic review. Cureus. 2022;14:30855.
25. Isara AR, Osayi N. Knowledge of human papillomavirus and uptake of its vaccine among female undergraduate students of Ambrose Alli University, Ekpoma, Nigeria. J Community Med Prim Health Care. 2021; 33:64-75.
26. Ling WY, Razali SM, Ren CK. Does the success of a school-based HPV-vaccine programme depend on teachers' knowledge and religion?—a survey in a multicultural society. Asian Pac J Cancer Prev. 2012; 13:4651-4654.
27. Lubeya MK, Zekire Nyirenda JC. Knowledge, attitudes and practices towards human papillomavirus vaccination among medical doctors at a tertiary hospital: A cross sectional study. Cancer Control. 2022; 29:10732748221132646.
28. Audu BM, Bukar M, Ibrahim AI. Awareness and perception of human papilloma virus vaccine among healthcare professionals in Nigeria. J Obstet Gynaecol. 2014; 34:714-717.
29. Aldarmahi A, Alzahrani H, Alqutub S. Exploring the attitudes and practices of female doctors towards cervical cancer screening in primary health care centers. J Med Life. 2023;16:773.
30. Hussain AN, Alkhenizan A, McWalter P, Qazi N, Alshmassi A, et al. Attitudes and perceptions towards HPV vaccination among young women in Saudi Arabia. J Family Community Med. 2016;23:145-150.
31. Aga SS, Yasmeen N, Khan MA. Cervical cancer and its screening: assessing the knowledge, awareness, and perception among health and allied students. Educ Res Int. 2022;2022:4608643.
32. Khanna D, Khargekar N. Knowledge, attitude, and practice about cervical cancer and its screening among community healthcare workers of Varanasi district, Uttar Pradesh, India. J Family Med Prim Care. 2019;8:1715-1719.
33. Montgomery MP, Dune T, Shetty PK. Knowledge and acceptability of human papillomavirus vaccination and cervical cancer screening among women in Karnataka, India. J Cancer Educ. 2015;30:130-137.
34. Chawla B, Taneja N, Awasthi AA, Kaur KN, Janardhanan R. Knowledge, attitude, and practice on screening toward cervical cancer among health professionals in India—A review. Women's Health. 2021;17:17455065211017066.