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Uptake of human papilloma virus vaccine and intention to vaccinate among women in Saudi Arabia

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ABSTRACT

Background: The burden of sexually transmitted diseases (STDs) is huge, and human papillomavirus (HPV) infection is one of the most common STDs. Considerable cases of HPV progress to cervical cancer and result in worse morbidity and mortality consequences. This study aims to estimate the HPV vaccine uptake rate and identify possible associated factors among women in Saudi Arabia. *Methods:* This is an analytical cross-sectional study. An online questionnaire was distributed between the 1st December 2021 and 1st January 2022 to collect data regarding participants HPV vaccine uptake, demographic characteristics, knowledge, attitude and practices. *Results:* A total of 609 female Saudi residents with a median age of 33 participated in the study. The majority appeared to have insufficient knowledge about HPV infection vaccine. Only 3% have been vaccinated against HPV, moreover 64% of those who did not take the vaccine reported that they were unaware of the vaccine availability. However, 86.5% are intending to vaccinate their daughters. Certain factors seemed to be associated with vaccine uptake such as, being in healthcare career (p-value= .049) and having a sufficient knowledge about HPV infection (p-value<.001). *Conclusion*: The reported HPV vaccine uptake among the study participants is only reaching 3%, and the main reason is lack of awareness among the general population. Promoting health and increasing public awareness regarding HPV vaccine through healthcare practitioners and social media may contribute profoundly to the vaccine uptake.

Keywords: human papillomavirus; HPV; Vaccine; uptake; Saudi Arabia

1. INTRODUCTION

Human papillomavirus (HPV) is the most common sexually transmitted infection (STI) worldwide (HPV Information Centre, 2021). In certain circumstances, untreated and neglected HPV infections can progress further and, consequently, lead into cancerous changes. Human papillomavirus (HPV) mostly is a self-limited disease, however, the infection may worsen over time to cause cancers (Forman *et al.*, 2012). HPV infections manifest in a variety of forms (Mennini *et al.*, 2017). Thirteen forms of highly vulnerable HPV genotypes are recognized to be the major

cause of most aggressive cervical cancer, and they are mostly responsible for infectious and pre-infectious lesions of the extra-genital areas (Li *et al.*, 2011; Guan *et al.*, 2012). The majority of extra-genital infections, such as anal cancer (88%), vulvar related cancers (43%), invasive vaginal infections (70%) and cancer related to the male reproductive system (50%) are caused mainly by HPV (Li *et al.*, 2011).

Cervical cancer is second in popularity among diseases that affect women across the world, and is ninth most popular form of cancer among Saudi Arabian women today (Forman *et al.*, 2012). Cancer has an accurate case rate of around 1 occurrence per 50,000 women per 5 years. Therefore, cervical cancer is the third most frequent reproductive infection among women in Saudi Arabia (HPV Information Centre, 2021). Each year in Saudi Arabia, an incidence of 75 cervical cancer cases are unveiled, with 23 women dying from the disease related complication (Nazer and Al-Badawi, 2012). The HPV burden in Saudi Arabia's general population is currently unknown. Therefore proper data application is not possible yet (HPV Information Centre, 2021). Due to the absence of a national screening program, understanding of HPV clinical consequences in HPV-detectable persons may be limited (Almehmadi *et al.*, 2019). In Saudi Arabia, the proportion of cervical cancer related complications in positively tested persons was found as above 90%, and the occurrence of cervical cancer was estimated to be 1.2 per 50,000 women (HPV Information Centre, 2021). In Western Asia, where Saudi Arabia is located, roughly 1.5 percent of the total available women in a given population density are expected to have HPV16/18 infection at any given situation, furthermore HPVs 16 and 18 are said to contribute greatly for 72.4 percent of invasive cervical infections (HPV Information Centre, 2021).

Cervical cancer can be avoided with the deployment of available prevention techniques such as vaccination (Cervical cancer, 2022). There are several types of HPV vaccines available in the market, for instance, Cervarix, Gardasil and Gardasil-9. The WHO advisory strategists, who are groups of experienced experts in immunization, released the first worldwide guideline on HPV vaccination in October 2008 (Cervical cancer, 2022). The WHO recommended that immunization is necessary for females in their teenage years. The 9vHPV vaccination builds high levels of immunity against the HPV-6, HPV-11, HPV-16, HPV-18, HPV-31, HPV-33, HPV-45, HPV-52, and HPV-58 infections, according to the extensive research of HPV infection types of cervical cancer (Guan *et al.*, 2012). In terms of primary HPV prevention, the 9vHPV vaccination is projected to minimize the available risk of cancer diagnosis by 10% due to availability of immunization compared to the 4vHPV vaccine, and by 52% in immunization unavailability (Mennini *et al.*, 2017). Evidence from a systematic analysis of literature published in 2020 analyzing the costs of the most recent 9-vHPV vaccine found that ten of the 12 studies included emphasized that 9vHPV immunization was cheaper but highly effective (Mahumud *et al.*, 2020).

In 2010, the Saudi Food and Drug Administration (SFDA) approved a preventive vaccination for women aged 12 to 28. The Saudi Ministry of Health included HPV vaccination to the Saudi national immunization schedule in 2019 as two doses given to females aged 11 and 12 years old. However, no immunization program has yet been developed. Effective immunization can help to prevent the increase in human cases of human papillomavirus (HPV) infections. There is currently limited data on the coverage of HPV vaccination among Saudi Arabian women. A few numbers of researches have looked into Saudi Arabian women level of awareness and knowledge of HPV vaccine (Almehmadi *et al.*, 2019; Jradi and Bawazir, 2019). These studies showed a significant lack of awareness, in addition to common myths and misconceptions about cervical cancer, Pap smears, HPV infection and its relation to cervical cancer, and HPV vaccine. Therefore, this study aims to estimate the prevalence of human papillomavirus (HPV) vaccine coverage and to investigate probable associated factors with the vaccine uptake among women in Saudi Arabia.

2. SUBJECTS AND METHODS

Study design

This is an analytical cross-sectional web-based study that was conducted and utilized a self-reported electronic survey widely disseminated through social media from 1st December 2021 until 1st January 2022.

Study population

Women living in Saudi Arabia between 1st December 2021 until 1st January 2022; Participating women should be willing and able to participate in the electronic survey.

Inclusion and exclusion criteria

Women living in Saudi Arabia, Saudis, and non-Saudis, who have access to the web, based electronic survey. Questionnaire responses with missing or invalid information were excluded from the study.

Sample size and sampling technique

Non-random, convenient sampling of women from different regions of Saudi Arabia using a web based survey. The questionnaire's link was widely distributed via social media platforms such as Snapchat, Twitter and WhatsApp.

Data collection tool

An online self-reported questionnaire was used for the data collection. The survey's questions were based on previously published literature and the recommendations of the Health Information National Trends Survey (HINT). The data collection tool was face-validated by 3 consultants who are experts in the field and translated through a forward-backward method. The questionnaire inquired (1) demographic data, (2) knowledge, awareness and attitude, (3) vaccine uptake and intention to vaccinate daughters.

Data collection technique

The survey link was widely disseminated through the social media. A web-based questionnaire was used for ease of data collection, to increase the response rate, and to ensure participants' privacy. Links for specific web pages linked to the study were provided for flexibility.

Ethical consideration

The initial approval for conducting the study was obtained from the Institutional Review Board (IRB) - at the Security Forces Hospital Program, in Makkah on 11 November 2021 (approval number: HAP-02-k-052). Data was secured and used conclusively for the study purposes. A written informed consent was included in the questionnaire and was obtained for each participant after a full explanation of the study was provided.

Statistical analysis

After the data were collected, they were entered and analyzed using IBM SPSS Statistics for MacOS, version 27 (IBM Corp., Armonk, N.Y., USA). All categorical variables were summarized as frequencies and percentages. Skewed distribution numerical variables were presented as median and interquartile range values. For bivariate analyses, chi-squared test and Fisher-Freeman-Halton Exact test were used to analyze categorical data. A p-value of <0.05 was considered statistically significant.

3. RESULTS

A total of 609 female individuals were entered and analyzed. The median age in this sample was 33 years old with an interquartile range (IQR) of 13 years. Most participating individuals were married representing 63.5% of the sample. Moreover, Saudi participants counted for most of the sample 94.3% and 85.1% of the participants were holding a bachelor's degree or higher. Individuals were asked if their career is related to medicine or if they have a first degree relative who is a medical practitioner, and their responses along with other demographic data (table 1).

Table 1 Demographic Characteristics

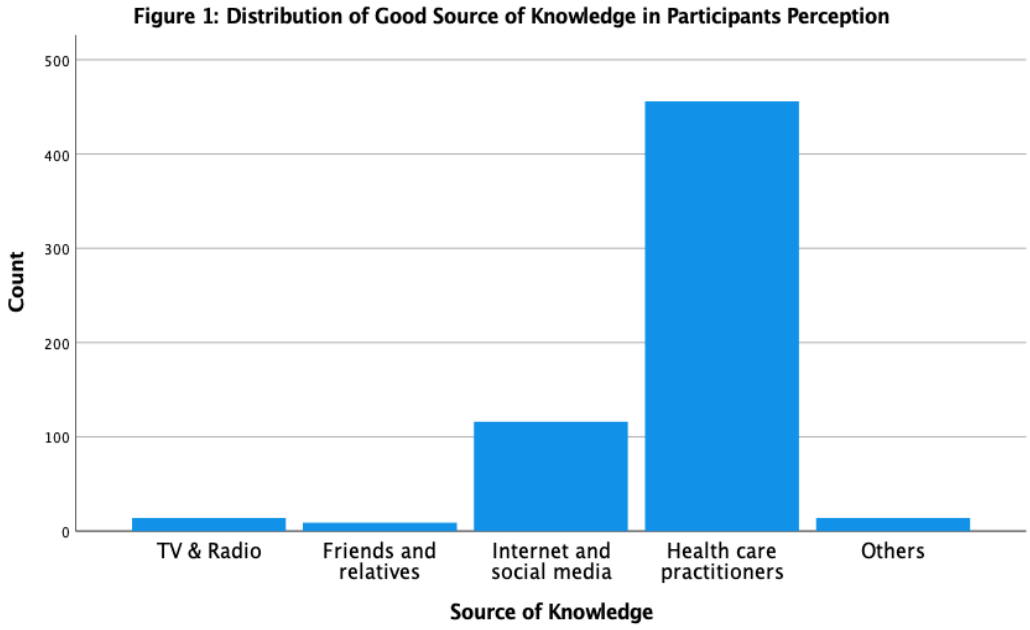
n=609		Count	%
Marital status	Single	156	25.6%
	Married	387	63.5%
	Divorced	54	8.9%
	Widow	12	2.0%
Nationality	Saudi	574	94.3%
	Non-Saudi	35	5.7%
Residence (region)	Makkah Almukarammah	302	49.6%
	Eastern region	73	12.0%
	Baha	5	0.8%
	Northern region	1	0.2%
	Riyadh	133	21.8%

	Qassim	15	2.5%
	Madinah	25	4.1%
	Tabuk	6	1.0%
	Jazan	14	2.3%
	Hail	8	1.3%
	Aseer	26	4.3%
	Najran	1	0.2%
Educational level	Elementary school	5	.8%
	Secondary school	14	2.3%
	High school	70	11.5%
	Diploma	2	.3%
	Bachelor or higher education	518	85.1%
Participant education or career is medical	No	428	70.3%
	Yes	181	29.7%
Participant has a 1st degree relative who is a medical practitioner	No	261	42.9%
	Yes	348	57.1%

The study respondents answered multiple questions that aimed to assess the participant's knowledge in two domains. The first domain was "evaluation of knowledge and misconceptions regarding Human Papillomavirus" in which the participants answered 11 questions. The second domain evaluated the participant's knowledge regarding HPV vaccine which was composed of 10 questions. Most participants showed insufficient level of knowledge in both domains (54.8%, 37.9% respectively). Furthermore, 53.6% of the respondents who heard about HPV knew about it through internet and social media (Table 2). However, when the total sample subjects were asked about which source they believe is a good source of knowledge, 74.9% chose health practitioners as a good source (Figure 1).

Table 2 Source of Knowledge Regarding HPV and Perception of Infection Vulnerability

		Count	%
How did you know about HPV?	TV & Radio	12	3.9%
	Friends and relatives	29	9.4%
	Internet and social media	165	53.6%
	Healthcare practitioners	47	15.3%
	My education or career	36	11.7%
	Other	19	6.2%
Are you prone to HPV infection?	Yes	114	18.7%
	No	155	25.5%
	I don't know	340	55.8%



Moreover, the rate of receiving HPV vaccine was estimated among the participants in addition to the rate of participants' intent to immunize their daughters against HPV infections. Among the total sample, only 18 (3%) participants did recall receiving HPV vaccine, and most of them (72.2%) received it in a private hospital. The majority of those who did not take the vaccine (64%), stated they were not aware of vaccine availability and considered it the key cause they had not receive the vaccine (Table 3).

Table 3 Receiving HPV Vaccine

		Count	%
Receive HPV	Yes	18	3.0%
	No	556	91.3%
	I don't know	35	5.7%
Why not taking the vaccine	Fear of side effects	20	3.4%
	Was not aware of vaccine availability	378	64.0%
	Cervical cancer is rare	2	0.3%
	My family refuses vaccine	3	0.5%
	Vaccine was not available in Primary Healthcare centers	98	16.6%
	Fear of needle	4	0.7%
	High price of vaccine	4	0.7%
	The probability of me having the infection is low	20	3.4%
	I believe the vaccine is not effective	2	0.3%
	Other	60	10.2%
Where	Governmental hospital	2	11.1%
	Private hospital	13	72.2%
	Abroad	3	16.7%
Doses	1 Dose	6	33.3%
	2 Doses	6	33.3%
	3 Doses	6	33.3%
Age at receiving the 1st dose	9-15	4	22.2%

	16-26	8	44.4%
	>26	6	33.3%
Reasons not completing doses	Unavailability of vaccine in governmental hospitals	1	7.1%
	Vaccine was not available after receiving the 1st dose	2	14.3%
	I was not aware of the required doses	5	35.7%
	Other	6	42.9%

Pleasingly, a major proportion of the respondents (86.5%) have the intention to vaccinate their daughters, and the most common justification stated by the respondents was they searched and read about HPV vaccine. On the other hand, 13.5% of the subjects did not have the intent at all to protect their daughters through immunization, and the main reason was lack of sufficient knowledge about HPV vaccine. Additionally, the study asked the participants about which motivation they believe is most effective in promoting HPV vaccine. Apparently, receiving messages from the MOH promoting HPV vaccine and finding more information about HPV vaccine through social media were the top ranked motivators by the study individuals (Table 4).

Table 4 Intention to Vaccinate Daughters

		Count	%
Will vaccinate daughters	Yes	527	86.5%
	No	82	13.5%
Why vaccinating daughters	I am aware of the viral infection	152	29.1%
	I searched and read about HPV vaccine	207	39.6%
	A doctor recommended the vaccine	47	9.0%
	I have personal experience	13	2.5%
	Other	104	19.9%
Why not vaccinating daughters	Fear of side effects	12	11.9%
	I don't have sufficient knowledge about the vaccine	63	62.4%
	Vaccine was not available in public hospitals	8	7.9%
	High price of vaccine	1	1.0%
	The probability of them having infection is low	8	7.9%
	I believe the vaccine is not effective	1	1.0%
	Others	8	7.9%
Best motivation to promote taking the vaccine or vaccinating daughters	More information about HPV through social media	128	21.0%
	More information about HPV through doctors	85	14.0%
	Messages from MOH promoting HPV vaccine	129	21.2%
	Vaccine promotion campaigns in the neighborhood	40	6.6%
	I won't vaccinate my children under any circumstances	13	2.1%
	Others	214	35.1%

The current study investigated possible associated factors with the individuals' rate of receiving the vaccine and intent to immunize descendants. All demographic factors in addition to the participants' level of knowledge regarding HPV infection and its vaccine were investigated for association with receiving the vaccine and intention to vaccinate a daughter. Studying or working in the medical field showed an association with the rate of receiving HPV vaccine among the study participants and this association achieved statistical significance (*p*-value =.049). Furthermore, these particular respondents would be more likely to vaccinate their daughters (*p*-value =.007). On the other hand, having a first degree relative who is a medical practitioner did not show significant association with receiving the vaccine nor intention to vaccinate daughters among the current sample. Nevertheless, the participants' level of knowledge regarding the HPV infection and vaccine seems to be associated with the rate of receiving the vaccine or the decision of vaccinating a child (table 5 and 6). Other factors such as age, marital status, nationality, residence, and educational level failed to achieve statistically significant association with the participants' decision.

Table 5 Association between Participants Factors and Vaccine Uptake

		Received HPV						
		Yes		No		I don't know		
		Count	%	Count	%	Count	%	*P*-value
Educational level	Elementary school	0	0.0%	5	100.0%	0	0.0%	.84
	Secondary school	1	7.1%	13	92.9%	0	0.0%	
	High school	2	2.9%	65	92.9%	3	4.3%	
	Diploma	0	0.0%	2	100.0%	0	0.0%	
	Bachelor or higher education	15	2.9%	471	90.9%	32	6.2%	
Participant education or career is medical	No	8	1.9%	396	92.5%	24	5.6%	.049
	Yes	10	5.5%	160	88.4%	11	6.1%	
Participant has a 1st degree relative who is a medical practitioner	No	4	1.5%	244	93.5%	13	5.0%	.147
	Yes	14	4.0%	312	89.7%	22	6.3%	
Evaluation of knowledge and misconceptions regarding Human Papilloma Virus	Insufficient	2	0.6%	307	91.9%	25	7.5%	<.001
	Moderate	7	4.2%	153	92.7%	5	3.0%	
	Good	9	8.2%	96	87.3%	5	4.5%	
Evaluation of knowledge about HPV vaccine	Insufficient	0	0.0%	212	91.8%	19	8.2%	<.001
	Moderate	7	3.3%	191	91.0%	12	5.7%	
	Good	11	6.5%	153	91.1%	4	2.4%	

Table 6 Association between Participants Factors and Intention to Vaccinate Their Daughters

		Will vaccinate daughters				
		Yes		No		
		Count	%	Count	%	*P*-value
Educational level	Elementary school	4	80.0%	1	20.0%	.092
	Secondary school	12	85.7%	2	14.3%	
	High school	67	95.7%	3	4.3%	
	Diploma	2	100.0%	0	0.0%	
	Bachelor or higher education	442	85.3%	76	14.7%	
Participant education or	No	360	84.1%	68	15.9%	.007

career is medical	Yes	167	92.3%	14	7.7%	
Participant has a 1st degree relative who is a medical practitioner	No	224	85.8%	37	14.2%	.656
	Yes	303	87.1%	45	12.9%	
Evaluation of knowledge and misconceptions regarding Human Papilloma Virus	Insufficient	273	81.7%	61	18.3%	.001
	Moderate	151	91.5%	14	8.5%	
	Good	103	93.6%	7	6.4%	
Evaluation of knowledge about HPV vaccine Categorize the domains	Insufficient	161	69.7%	70	30.3%	<.001
	Moderate	202	96.2%	8	3.8%	
	Good	164	97.6%	4	2.4%	

4. DISCUSSION

This study aims to estimate the prevalence of human papillomavirus (HPV) vaccine coverage and to investigate probable associated factors with the vaccine uptake among women in Saudi Arabia. The estimated coverage of HPV vaccine among individuals who participated in the study survey is 3% out of 609 female respondents. Another study conducted by Akkour et al., (2021) involving 564 Saudi women that estimated cervical cancer awareness, resulted in a similar vaccine coverage estimate that is 2%. In a recent study published in 2021, the estimate of HPV vaccine coverage in different courtiers was reported. The estimates range from 0.6% to more than 80% coverage of HPV vaccine (Gallagher *et al.*, 2017; Spayne and Hesketh, 2021). Countries were categorized based on the gross national income; however above 80% vaccine coverage was achieved by multiple high-income countries and low-income countries, too.

The reporting of HPV vaccine coverage was not ultimate in all countries, and this may affect the concluded findings. The very low coverage estimate in the present study is not unexpected. Although the HPV vaccine was approved by The Food and Drug Administration in 2010, the vaccine was not implemented in any prevention program till 4th quarter of 2021 (Health Days - Cervical Cancer Prevention Week, 2021). Undoubtedly, implementing a vaccine in a prevention program such as school age immunization is a key factor in promoting the vaccine. Scanning the gulf region, HPV vaccine was not implemented in a prevention program in almost all gulf countries, including Kuwait, Qatar, Bahrain and Oman, which results in a zero reported coverage (HPV Information Centre, 2021). However, one country did introduce the HPV vaccine in a prevention program and this implementation resulted in amusing findings.

The United Arab Emirates introduced the HPV vaccine in 2018 and the coverage estimate in 2020 reached 44% of the female population in the UAE (HPV Information Centre, 2021). The extensive literature review carried out by the current study investigators failed to find a formal nationwide estimate of human papillomavirus vaccine coverage in Saudi Arabia, therefore, the present estimate in addition to Akkour et al., (2021) study might be the first estimates and further thorough surveys are necessary to indicate a nationwide vaccine coverage estimate (HPV Information Centre, 2021).

The study acquired data related to the vaccine coverage to help better understand the current situation in Saudi Arabia and how to promote vaccine uptake among the general population. For example, whether a participant has a medical-related education or career is thought to be an influential factor on the vaccine uptake and that was profound in the study findings as it showed statistically significant association (p-value = .049). Meanwhile, participants with higher education did not seem to have higher vaccine uptake compared with participants who have other levels of education. This may indicate that higher educational status per say, does not influence person practices regarding the HPV vaccine. Indeed, knowledge regarding the human papillomavirus infection and vaccine, in particular, is what makes a difference.

As in these study findings, the respondents' knowledge regarding HPV infection and vaccine showed significant association with the vaccine uptake rate and intention to vaccinate daughters, too. These findings yield the fact that increasing knowledge and promoting awareness related to a specific issue, HPV vaccine in this case are one of the most important modifiable factors to focus on to change the general population perception and practice. Yet, in the current study, most participants' knowledge regarding the infection and vaccine of HPV was, unfortunately, insufficient. These, unfavorable, findings are in line with other results in the literature as multiple studies conducted in Saudi Arabia showed a remarkable lack of knowledge and awareness among the general population including male and female individuals (Hussain *et al.*, 2016; Almehmadi *et al.*, 2019; Alrajeh and Alshammari, 2020;

Akkour *et al.*, 2021). Interestingly, several studies reported a high acceptance of receiving HPV vaccine among Saudi female individuals ranging from 54.1% to 64.3% (Hussain *et al.*, 2016; Akkour *et al.*, 2021).

In the present findings, most respondents (53.6%) indicated internet and social media as the source of their knowledge regarding human papillomavirus vaccine, followed by healthcare practitioners in second place (15.3%). Furthermore, 74.9% of the study participants believe that healthcare practitioners are a good source to know about HPV vaccine, and the second most sources rated is internet and social media. Similarly, two different recent studies conducted in Saudi Arabia concluded similar results as participants in both studies agreed that physicians, internet and social media are the main source of their knowledge (Alrajeh and Alshammari, 2020; Akkour *et al.*, 2021). These results affirm how essential and reliable is the internet and social media as a source of health-related knowledge in Saudi society. A systematic review of 44 articles, concluded that an association exists between social media content and individuals knowledge but not necessarily with vaccine uptake (Ortiz *et al.*, 2019).

On the other hand, a study conducted in the USA analyzed over 270 million interactions with almost 260 thousands tweets, showed a strong correlation between vaccine coverage and exposure to certain topics (Dunn *et al.*, 2017). Nevertheless, participants, in the present study and other Saudi studies, showed the valuable trust they have in healthcare practitioners as a source of knowledge in addition to the internet and social media. Upon these findings, it can be concluded that the internet and social media is an essential channel of health promotion, and it may be of profound impact to engage healthcare practitioners and utilize their presence in the social media in order to increase the general population knowledge and consequently improve their practice regarding human papillomavirus vaccine.

Recommendations

The results of this survey revealed that there is poor knowledge among participants about HPV infection and available vaccines. Only 3% of participants were vaccinated against HPV while 86% were willing to vaccinate their daughters, reporting that their lack of knowledge about the infection and the vaccine was the most significant barrier. Prevention is a cornerstone in the Saudi vision 2030 health system plan; these data can be used as a benchmark for launching a health promotion program to enhance awareness of HPV vaccine among women in Saudi Arabia, which may help to increase vaccine uptake and acceptability among females in Saudi Arabia. This would be best achieved by effectively utilizing social media as a valuable and trusted source for the dissemination of health information to the public. Moreover, healthcare providers should cease every opportunity to educate their patients about the HPV vaccine, with a special focus on the involvement of primary health care and obstetrics and gynecology physicians.

5. CONCLUSION

Human papillomavirus is a devastating infection with serious complications. The study findings revealed a vaccine uptake of 3% only; however the participants have a promising willingness to protect their offspring with HPV immunization. Lack of knowledge and awareness about the infection and vaccine were the main obstacles to taking the vaccine. Thus, efforts to increase awareness and promote the vaccine through healthcare practitioners and social media are crucial.

Author's contributions

Author AB established the literature search, managed the data collection and analysis, and prepared the first draft of the manuscript. Author OA participated intellectually in the research, and reviewed the final draft of the manuscript.

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Conflicts of interest

The authors declare that there are no conflicts of interests.

Data and materials availability

All data associated with this study are present in the paper.

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