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Research Article

Knowledge, awareness, and perception towards Human Papilloma Virus vaccination among the general population in Makkah, Saudi Arabia: A cross-sectional study

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Abstract

Background and aim: This cross-sectional study sought to assess knowledge, awareness, and perceptions about HPV vaccination among the general population in Makkah, Saudi Arabia, and identify factors influencing HPV vaccination decisions.

Materials and Methods: From May to April 2023 in Makkah, a descriptive cross-sectional study was carried out using random sampling techniques to select 501 participants for this research project. An online survey was distributed through social media platforms to collect the necessary data using structured questionnaires. Descriptive statistics and logistic regression models were then employed for data analysis.

Results: Most participants were female (78.1%), Saudi nationals (95.6%) and married (51.3%). Only 41.3% were familiar with HPV, and their awareness varied regarding its association with cervical cancer and genital warts. Among those informed about HPV, 72.0% were aware of the HPV vaccine, and about two-thirds believed it could prevent cervical cancer. Concerns regarding potential side effects were prevalent among participants. Factors associated with knowledge about HPV included employment in a health-related sector, pursuing a health specialty degree, and higher family income. Conversely, being married and older was associated with lower levels of awareness.

Conclusion: This study highlights a lack of knowledge and awareness regarding HPV infection and the HPV vaccine among the general population in Makkah, Saudi Arabia. Efforts should be made to improve education and awareness programs to increase knowledge about HPV and promote HPV vaccination. Targeted interventions addressing misconceptions and concerns about the vaccine could enhance vaccine acceptance and uptake among the population.

Keywords: human papilloma virus; hpv vaccine; general population; knowledge awareness; perception

1.Introduction

Human papillomavirus (HPV) is a non-enveloped DNA virus that predominately infects both the skin and mucous membranes. Head and neck squamous cell carcinoma and cervical cancer have been closely linked to specific HPV strains [1-3]. With over 100 different strains, approximately 30 to 40 types infect the genital tract. Most cases of cervical cancer are caused by two highly common viruses, HPV 16 and 18, while HPV 6 and 11 are associated with genital warts [1-3].

As the fourth most common type of cancer diagnosed globally and the fourth leading cause of cancer-related deaths among women, cervical cancer presents a serious threat to global health. [2]. Cervical cancer ranks ninth in Saudi Arabia among cancers that

affect women between the ages of 15 and 44 [2]. The incidence of cervical cancer has been on the rise, with late-stage diagnoses complicating treatment and contributing to elevated morbidity and mortality rates [2, 4].

Efforts to control cervical cancer have been primarily focused on early detection through cervical screening tests, such as the Pap smear, and the development of vaccines targeting HPV strains [5]. Cervarix (bivalent) and Gardasil-4 (quadrivalent), two preventive HPV vaccines available since 2010, have been extensively distributed among females aged 11-26 in Saudi Arabia [1, 2] for the prevention of genital warts and associated cervical lesions such as precancerous and cancerous changes. Although HPV vaccines are available and effective, their uptake remains low in Saudi Arabia, posing a significant barrier to cervical cancer prevention [1]. Several studies conducted across Arab societies, including Jordan, Qatar, Iraq, and UAE, have documented a notable lack of awareness and understanding regarding HPV infection, its association with cervical cancer, and the benefits of HPV vaccination [3]. To address these knowledge gaps and enhance awareness, it is essential to understand the factors influencing individuals' decisions to accept or decline vaccination. Previous studies have explored the impact of socio-demographic factors, knowledge levels, attitudes, and sources of information on HPV vaccine acceptance [1, 3]. However, there is a lack of specific research assessing knowledge, awareness, and perceptions surrounding HPV vaccination among the general population in Makkah City, Saudi Arabia in 2022.

Makkah City stands out for HPV vaccination knowledge, awareness, and perception studies due to several reasons. As an important religious and cultural hub, it attracts millions of pilgrims annually for Hajj and Umrah pilgrimages. [2]. Consequently, collecting data from Makkah City reflects a diverse population from various regions of Saudi Arabia and international visitors. Understanding the knowledge and perceptions of this population is essential for tailored interventions that address cultural and religious factors influencing HPV vaccination decisions. Studies conducted at Makkah City's Maternity and Children Hospital revealed surprisingly low awareness among participants regarding HPV vaccination and Pap smears despite high levels of awareness about cervical cancer [2]. The findings suggest a potential gap in communication and education provided by healthcare providers in Makkah City, emphasizing the significance of further investigating healthcare professionals' practices and recommendations related to HPV vaccination. Research conducted in Makkah City have uncovered an alarming lack of knowledge among female patients about HPV infection, cervical cancer, and the HPV vaccine [2]. Although awareness about cervical cancer is high, there remains a gap in understanding regarding how HPV infection influence contributes to cervical cancer development and the benefits of vaccination [2]. Therefore, it is essential to identify factors contributing to this lack of awareness and knowledge within the population of Makkah City and develop potential strategies for improvement [2]. By focusing on Makkah City, this research aims to gain an understanding of knowledge, awareness, and perceptions regarding HPV vaccination within its unique cultural and religious setting. Findings from this study can give rise to targeted interventions and health campaigns tailored specifically towards promoting HPV vaccine acceptance and reducing cervical cancer incidences. Addressing any existing gaps involves identifying prior studies conducted in Makkah City and developing effective strategies to ensure accurate information regarding vaccination reaching all individuals [2].

Therefore, this study aims to measure knowledge, awareness, and perceptions regarding HPV vaccination among the general population in Makkah City, Saudi Arabia, and explore factors influencing their decisions. By assessing current levels of awareness and recognizing specific reasons behind individuals' choices regarding vaccinations, targeted interventions, and health campaigns may be implemented to increase HPV vaccine uptake and acceptance.

2. Materials and Methods

A descriptive cross-sectional study was conducted in Makkah, Saudi Arabia, between May and April 2023. The minimum required sample size was calculated using the equation from a prior study [6]. Considering the general population in Makkah [7], a sample size of 385 participants was determined. To accommodate potential missing data, the sample size was increased by 10%. All adults aged 18 years and older residing in Makkah were eligible to participate, while exclusion criteria applied to individuals who did not speak Arabic. Participants were randomly selected using a simple random sampling technique. Data was collected through an online survey distributed *via* the Google Platform and shared across various social media channels. Initially, 515 participants initiated the online survey; however, 14 responses were excluded from the dataset. Consequently, the final sample consisted of 501 individuals who were included as study participants.

The questionnaire used in this study was structured and developed based on relevant literature [8,9]. Subsequently, its validity was assessed by three experts at Umm Al-Qura University, following which suggested modifications were incorporated. A pilot test of the survey was conducted among individuals (n=50) not involved in the study to evaluate item reliability. Initially prepared in English, the survey was translated independently into Arabic by two researchers. Expert linguists were then consulted to review the translated questionnaire and ensure its accuracy and consistency.

The questionnaire was structured into four primary sections, comprising a total of 24 questions. The first section included eight questions about the participants' socio-demographic characteristics, such as age, gender, nationality, education, marital status, income, occupation, and Pap smear history within the preceding three years. The second section comprised nine questions assessing participants' knowledge about HPV. The third section contained 13 questions evaluating participants' awareness of the HPV vaccine. Lastly, the fourth section included three questions gauging participants' acceptance of the HPV vaccine.

Ethics approval **(HAPO-02-K-012-2022-06-1143)**. for this study was obtained from the Biomedical Ethics Committee at Umm Al-Qura University, Makkah, Saudi Arabia. Participation in the study was voluntary, and informed consent was obtained from all participants after providing a clear explanation of the study objectives. Strict confidentiality measures were implemented, and no personally identifiable information was collected.

2.1 Statistical Analysis

The statistical analysis was conducted using RStudio (R Version 4.1.1). Descriptive statistics were used to summarize categorical variables, including frequencies and percentages. Univariate binary logistic regression models were employed to investigate factors associated with participants' knowledge of the HPV virus and its vaccine. The demographic characteristics of the participants served as independent

variables, while the knowledge variables (categorized as "No" or "Yes") were considered dependent variables. Subsequently, significantly associated factors were incorporated into multivariate logistic regression models to identify independent predictors of participants' knowledge. The results were presented as odds ratios (ORs) with corresponding 95% confidence intervals (95%CIs). Statistical significance was defined at a p-value of less than 0.05.

3. Results

Demographic characteristics: Five hundred and one participants were included in the analysis, achieving a robust response rate of 97.3%. Most participants were female (78.2%) and of Saudi nationality (95.6%). The sample consisted of individuals across various age groups, with the highest representation falling within the 18-25 years range (39.7%). Most participants were married (51.3%) and held a bachelor's degree (57.1%). Notably, unemployment was reported by 29.9% of the participants. Additionally, most females (82.4%) had not undergone a Pap smear test within the past three years (Table 1).

Parameter	Category	N (%)
Gender	**Male**	**109 (21.8%)**
	Female	**392 (78.2%)**
Age	**18-25 years**	**199 (39.7%)**
	26-30 years	**55 (11.0%)**
	31-40 years	**105 (21.0%)**
	More than 40 years	**142 (28.3%)**
Nationality	**Non-Saudi**	**22 (4.4%)**
	Saudi	**479 (95.6%)**
Marital status	**Single**	**224 (44.7%)**
	Married	**257 (51.3%)**
	Divorced/widow	**20 (4.0%)**
Educational level	**Illiterate**	**0 (0.0%)**
	Below high school	**40 (8.0%)**
	High school or diploma	**140 (27.9%)**
	Bachelor's degree	**286 (57.1%)**
	Postgraduate degree	**35 (7.0%)**
Occupation	**Student**	**9 (1.8%)**
	Unemployed	**150 (29.9%)**
	Work related to health sector	**28 (5.6%)**
	Work not related to health sector	**119 (23.8%)**
	Student in a health specialty	**70 (14.0%)**
	Student in a non-health specialty	**70 (14.0%)**
	Retired	**55 (11.0%)**
Perceived family income (SAR)	**Less than 5000**	**104 (20.8%)**
	5000 to 1000	**181 (36.1%)**
	More than 1000	**216 (43.1%)**
Pap smear within the last 3 years*	**Never**	**323 (82.4%)**
	Yes, within the past 3 years	**39 (9.9%)**
	Yes, more than 3 years ago	**30 (7.7%)**

Table 1: Demographic characteristics of the participants.

Knowledge about HPV: Among the participants, 41.3% (n=207) demonstrated familiarity with the HPV. Within this group, a substantial percentage acknowledged that unsafe sexual practices could increase the probability of HPV infection (71.0%) and that HPV can cause cervical cancer (69.6%) and genital warts (66.2%). Conversely, a notable proportion disagreed that HPV infection usually goes away without treatment (43.5%) and can affect both men and women (20.3%). A significant number of participants (55.6%) were unsure about the association of HPV with other genital cancers and the presence of symptoms (51.2%) (Table 2).

Parameter	Category	N (%)
HPV is a virus that is sexually transmitted.	**No**	**20 (9.7%)**
	Yes	**128 (61.8%)**
	Do not know	**59 (28.5%)**
HPV will usually go away on its own without treatment.	**No**	**90 (43.5%)**
	Yes	**26 (12.6%)**
	Do not know	**91 (44.0%)**

HPV can cause cervical cancer	**No**	**2 (1.0%)**
	Yes	**144 (69.6%)**
	Do not know	**61 (29.5%)**
HPV Infection can affect both men and women	**No**	**42 (20.2%)**
	Yes	**103 (49.8%)**
	Do not know	**62 (30.0%)**
Unsafe sexual relationships can increase the probability of HPV infection	**No**	**6 (2.9%)**
	Yes	**147 (71.0%)**
	Do not know	**54 (26.1%)**
Most people infected with HPV have no symptoms	**No**	**31 (15.0%)**
	Yes	**70 (33.8%)**
	Do not know	**106 (51.2%)**
HPV causes genital warts	**No**	**7 (3.4%)**
	Yes	**137 (66.2%)**
	Do not know	**63 (30.4%)**
HPV may cause other genital cancers (penis and anus)	**No**	**14 (6.8%)**
	Yes	**78 (37.7%)**
	Do not know	**115 (55.6%)**

Table 2: Responses of the participants who were knowledgeable about the HPV virus (n=207).

Knowledge about the HPV vaccine: Among the 207 participants who demonstrated knowledge about the HPV virus (n=207), 72.0% (n=149) were aware of the HPV vaccine. Among these participants, 58.4% expressed the belief that only women should receive the HPV vaccine. A majority of participants (63.2%) acknowledged that the vaccine could prevent cervical cancer. However, fewer participants (20.6%) believed it could provide protection against all types of cervical cancer or be administered to women already infected with the HPV (17.6%). A substantial proportion of participants expressed uncertainty regarding whether the vaccine could cause HPV infection (43.6%) or induce side effects (46.3%). The primary concern reported was the potential side effects of the vaccine (39.6%). The optimal times for HPV vaccination were perceived to be before marriage (30.9%) and during school age (28.9%). The decision-making process for vaccination was mainly self-driven (54.4%), although a joint decision table 3).

Parameter	Category	N (%)
Whom should be vaccinated with HPV vaccine	**Men**	**1 (0.7%)**
	Women	**87 (58.4%)**
	Both genders	**49 (32.9%)**
	Do not know	**12 (8.1%)**
Does HPV vaccine prevent cervical cancer? *	**No**	**16 (11.8%)**
	Yes	**86 (63.2%)**
	Do not know	**34 (25.0%)**
Does HPV vaccine protect against all types of cervical cancer? *	**No**	**55 (40.4%)**
	Yes	**28 (20.6%)**
	Do not know	**53 (39.0%)**
Does HPV vaccine decrease the chance of having changes in the Pap smear test? *	**No**	**13 (9.6%)**
	Yes	**54 (39.7%)**
	Do not know	**69 (50.7%)**
Do females need to be screened for HPV before vaccinated? *	**No**	**32 (23.5%)**

	Yes	**49 (36.0%)**
	Do not know	**55 (40.4%)**
Can the HPV be given to a woman having HPV infection? *	**No**	**28 (20.6%)**
	Yes	**24 (17.6%)**
	Do not know	**84 (61.8%)**
Can HPV vaccine cause HPV infection?	**No**	**65 (43.6%)**
	Yes	**19 (12.8%)**
	Do not know	**65 (43.6%)**
Can HPV vaccine cause side effects?	**No**	**30 (20.1%)**
	Yes	**50 (33.6%)**
	Do not know	**69 (46.3%)**
What is your greatest concern about the HPV vaccine?	**Side effects**	**59 (39.6%)**
	Efficacy	**8 (5.4%)**
	Cost	**15 (10.0%)**
	Nothing	**67 (45.0%)**
What is the appropriate time to be vaccinated against HPV virus?	**Preschool**	**4 (2.7%)**
	School age	**43 (28.9%)**
	Before marriage	**46 (30.9%)**
	Any age	**23 (15.4%)**
	I do not know	**33 (22.1%)**
Who should make the decision about HPV vaccination?	**Person himself**	**81 (54.4%)**
	Joint decision of parents and young person	**49 (32.9%)**
	Only the parents	**6 (4.0%)**
	I do not know	**13 (8.7%)**

Table 3: Responses of the participants who were knowledgeable about the HPV vaccine (n=149).

**The records have 13 missing values*

Factors associated with participants' knowledge about the HPV and the vaccine: Univariate analysis identified that working in a health-related sector (OR = 8.75, 95% CI = 1.70-68.0, p = 0.016) and being a student in a health specialty (OR = 12.8, 95% CI = 2.77-92.5, p = 0.003) were significantly associated with higher levels of knowledge about the HPV. Conversely, married participants (OR = 0.64, 95% CI = 0.44-0.92, p = 0.017) and those aged over 40 years (OR = 0.51, 95% CI = 0.32-0.79, p = 0.003) exhibited lower levels of knowledge. In the multivariate analysis, only participants' occupations remained independently associated with knowledge, with individuals working in health-related sectors (OR = 7.83, 95% CI = 1.45-62.7, p = 0.026) and students in health specialties (OR = 10.3, 95% CI = 2.15-75.6, p = 0.007) demonstrating higher levels of knowledge about the HPV (Table 4).

Parameter	Category	Univariate			Multivariate		
		OR	95% CI	p	OR	95% CI	p
Gender	Male	—	—				
	Female	0.95	0.62, 1.47	0.832	NA	NA	
Age	18-25 years	—	—		—	—	
	26-30 years	0.58	0.31, 1.07	0.084	0.62	0.28, 1.34	0.227
	31-40 years	0.92	0.57, 1.48	0.737	1.33	0.62, 2.90	0.468
	More than 40 years	0.51	0.32, 0.79	0.003	0.92	0.40, 2.12	0.837
Nationality	Non-Saudi	—	—				
	Saudi	2.48	0.96, 7.64	0.079	NA	NA	
Marital status	Single	—	—		—	—	
	Married	0.64	0.44, 0.92	0.017	0.86	0.45, 1.66	0.658
	Divorced/widow	0.36	0.12, 0.98	0.058	0.57	0.16, 1.80	0.356
Educational level	Below high school	—	—				
	High school or diploma	1	0.48, 2.13	>0.999	NA	NA	
	Bachelor's degree	1.50	0.76, 3.07	0.246			
	Postgraduate degree	1.56	0.62, 4.01	0.346			
Occupation	Student	—	—		—	—	
	Unemployed	2.33	0.54, 16.0	0.301			
	Work related to health sector	8.75	1.70, 68.0	0.016	7.83	1.45, 62.7	0.026
					2.16	0.47, 15.4	0.364
	Work not related to health sector	2.05					
	Student in a health specialty	12.8	2.77, 92.5	0.003	10.3	2.15, 75.6	0.007
			0.47, 14.2	0.383	1.70	0.35, 12.5	0.541
	Student in a non-health specialty	0.80	0.17, 5.77	0.793	0.67	0.14, 4.91	0.642
	Retired	1.08	0.23, 7.87	0.926	0.97	0.18, 7.77	0.976
Perceived family income	Less than 5000	—	—		—	—	
	5000 – 10,000	1.46	0.88, 2.43	0.145	1.41	0.80, 2.49	0.232
	More than 10,000	1.71	1.05, 2.81	0.032	1.76	1.00, 3.13	0.052
Pap smear within the last 3 years	Never	—	—				
	Yes, within the past 3 years	0.99	0.50, 1.94	0.986	NA	NA	
	Yes, more than 3 years ago	0.95	0.43, 2.02	0.9			

Table 4: Results of the regression analysis of factors associated with participants' knowledge about the HPV virus.

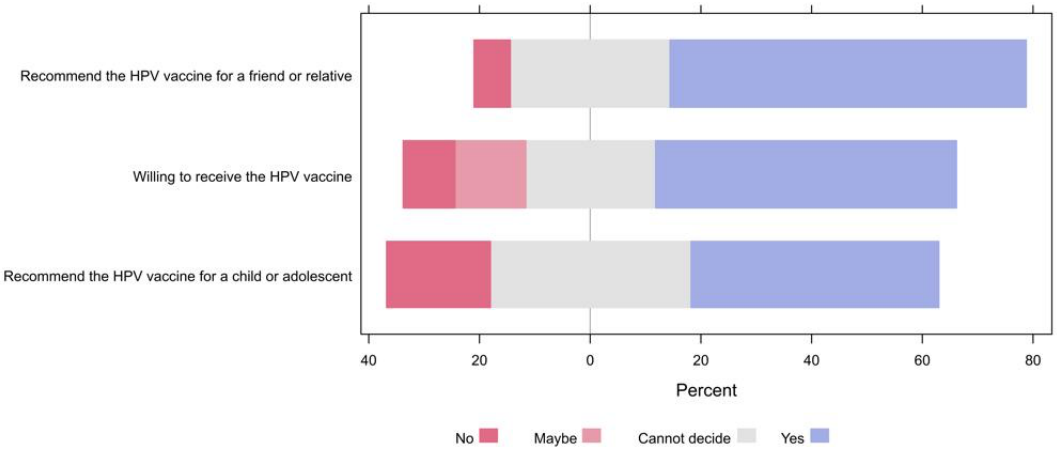
In terms of knowledge about the HPV vaccine, older participants (> 40 years) showed lower levels of awareness about the vaccine (OR = 0.38, 95% CI = 0.17-0.82, p = 0.014). Conversely, those employed in health-related sectors (OR = 4.05, 95% CI = 1.20-18.7, p = 0.039) and students pursuing health specialties (OR = 4.20, 95% CI = 1.75-11.0, p = 0.002) demonstrated higher levels of knowledge. In the multivariate model, independent predictors of high knowledge included students pursuing a health specialty program (OR = 3.66, 95% CI = 1.24-11.3, p = 0.020) and employment in a health-related sector (OR = 4.68, 95% CI = 1.31-22.7, p = 0.029, Table 5).

Parameter	Category	Univariate			Multivariate		
		OR	95% CI	p	OR	95% CI	p
Gender	Male	—	—		—	—	
	Female	1.33	0.64, 2.67	0.433	NA	NA	
Age	18-25 years	—	—		—	—	
	26-30 years	0.43	0.15, 1.28	0.117	0.41	0.12, 1.49	0.169
	31-40 years	0.61	0.27, 1.37	0.222	0.94	0.34, 2.57	0.897
	More than 40 years	0.38	0.17, 0.82	0.014	0.68	0.22, 2.10	0.498
Nationality	Non-Saudi	—	—		—	—	
	Saudi	4.01	0.65, 31.0	0.134	NA	NA	
Marital status	Single	—	—		—	—	
	Married	0.66	0.35, 1.23	0.192	NA	NA	
	Divorced/widow	0.2	0.03, 1.29	0.090			
Educational level	Below high school	—	—		—	—	
	High school or diploma	3.08	0.89, 10.9	0.074	NA	NA	

	Bachelor's degree	**2.76**	**0.89, 8.65**	**0.075**			
	Postgraduate degree	**2.2**	**0.50, 10.3**	**0.299**			
Occupation	**Unemployed**	—	—		—	—	
	Student	**NA**	**NA**	**0.988**	**NA**	**NA**	**0.988**
	Work related to health sector	**4.05**	**1.20, 18.70**	**0.039**	**4.68**	**1.31, 22.7**	**0.029**
	Work not related to health sector	**2.14**	**0.93, 5.18**	**0.080**	**2.54**	**0.57, 6.47**	**0.430**
	Student in a	**4.2**	**1.75,**	**0.00**	**3.66**	**1.24,**	**0.02**
	health specialty	**0**	**11.0**	**2**		**11.3**	**0**
	Student in a non-health specialty	**1.61**	**0.47, 6.47**	**0.469**	**1.36**	**0.35, 5.93**	**0.665**
	Retired	**0.61**	**0.18, 2.06**	**0.425**	**0.76**	**0.18, 3.04**	**0.693**
Perceived family income	**Less than 5000**	—	—		—	—	
	5000 – 1000	**2.39**	**1.00, 5.74**	**0.050**	**NA**	**NA**	
	More than 1000	**1.84**	**0.81, 4.15**	**0.142**			
Pap smear within the last 3 years	**Never**	—	—		—	—	
	Yes, within the past 3 years	**1.55**	**0.47, 7.04**	**0.515**	**NA**	**NA**	
	Yes, more than 3 years ago	**0.5**	**0.15, 1.78**	**0.262**			

Table 5: Results of the regression analysis of factors associated with participants' knowledge about the HPV vaccine.

HPV vaccine acceptance among participants knowledgeable about the HPV vaccine (n=149), approximately half expressed willingness to receive the



vaccine (54.4%). Additionally, 64.4% indicated they would recommend the vaccine to friends or relatives, 45.0% would recommend it to children or adolescents (Figure 1).

Figure 1: Percentage distribution of participants' responses regarding their acceptance of the HPV vaccine.

It is worth noting that 13 records had missing values in the analysis of responses related to the HPV vaccine (Table 3).

3 Discussion

The study investigated the knowledge, awareness, and acceptance of HPV vaccination among the general population. Our findings reveal significant gaps in knowledge among participants [10]. In comparison with previous studies conducted in Saudi Arabia, our findings highlight inadequate knowledge about HPV [11, 12]. A similar study conducted in Makkah revealed limited knowledge and awareness about the virus, and a relatively low percentage of participants (18%) were aware that the HPV vaccine does not cause serious side effects, despite an overall positive inclination toward receiving the vaccine if offered free of charge [13]. Another study conducted in Jazan reported similar deficiencies in knowledge, with participants scoring an average of 1.99 out of 10 in assessing their HPV-related knowledge. Notably, 63% of participants in that study acknowledged the preventive benefits of the HPV vaccine against warts and cervical cancer, which aligns with our finding of 63.2% awareness regarding the vaccine's preventive efficacy [12]. However, discrepancies exist, as our study indicates a higher percentage of participants (71%) acknowledging the link between unsafe sexual practices and HPV infection compared to the Jazan study. These discrepancies might be attributed to differences in study populations or sample demographics [12].

Similarly, a study from the Eastern Province of Saudi Arabia found that levels of knowledge were low (28%), with limited awareness of HPV (42.2%) [14]. Notably, 25.2% of participants disagreed with the idea that HPV would naturally go away without treatment, and 64.9% acknowledged the association between HPV and cervical cancer. In contrast, our study showed better understanding of treatment-related aspects, with 43.5% disagreeing that HPV resolves without treatment and 69.6% recognizing the link between HPV and cervical cancer. However, the percentage of participants with knowledge about HPV (41.3%) was lower in our study compared to the previous study [14].

The knowledge gap is not unique to Saudi Arabia. A study conducted in Bahrain revealed limited knowledge among the population regarding HPV infection, with only 41.3% reporting awareness [9]. Similarly, a study in Sharjah reported that 36.5% of participants had heard about HPV, conversely, a different study conducted in several Arab nations in the Middle East and North Africa area found low to moderate levels of HPV knowledge and vaccine awareness [15, 16]. These results underscore the necessity of extensive awareness initiatives aimed at filling in knowledge gaps and improving comprehension of HPV and its preventive measures across the region. Identifying the factors associated with varying levels of knowledge represents an important aspect of this study. Our findings highlight that occupation plays a significant role in determining HPV knowledge [10]. Participants in health-related sectors and students pursuing health-related specialties demonstrated significantly higher knowledge about HPV and its vaccine, aligning with previous literature [12, 14, 17, 18]. This finding indicates the pivotal role of exposure to healthcare settings for employment and education in augmenting knowledge levels. Targeted educational interventions should be implemented to address populations with lower awareness, particularly those in non-healthcare occupations.

Participants in our study generally expressed a positive attitude toward accepting the HPV vaccine. Over half of those knowledgeable about it expressed willingness to both receive and recommend it, and less than half were inclined to recommend it for children and adolescents. However, these findings highlight the need for further efforts to enhance acceptance rates by promoting awareness and addressing prevalent concerns.

By highlighting knowledge and awareness gaps about the HPV vaccine and its prevalence in the general population in Saudi Arabia and other Middle Eastern countries, our study adds to the body of current knowledge [10]. Additionally, the results emphasize that awareness levels might have been higher across previous studies in these nations, thereby advocating for intensified awareness-raising initiatives. Tailored interventions such as educational campaigns and targeted awareness programs are justified, aiming to elevate knowledge levels, increase acceptance of vaccine administration, and ultimately decrease incidence rates of HPV-related diseases.

Based on these findings, it is evident that enhancing knowledge and awareness concerning HPV, its associated risks, and the advantage of vaccination is vital to mitigating HPV-related diseases [9, 10, 15]. By directing educational efforts toward populations with lower awareness levels. particularly those outside of healthcare professions; healthcare providers, policymakers, and public health authorities can collaborate to advance vaccination campaigns against HPV.

Future research should focus on assessing the effectiveness of educational campaigns and interventions in improving knowledge acquisition and augmenting vaccine uptake rates among the general population [10]. Additionally, studies should investigate specific factors influencing vaccine acceptance and address any concerns associated with HPV vaccination, thereby identifying knowledge gaps that arise and spreading widespread awareness. Such proactive steps are crucial for reducing the incidence and impact of HPV-related diseases within society.

3.1 Strength, Limitations, And Future Research Implications

The strengths of this study include its comprehensive examination of knowledge, awareness, and perceptions regarding HPV vaccination among the general population of Makkah City, Saudi Arabia. The large sample size and randomized sampling technique ensure generalizability to all residents in Makkah. A meticulously designed structured questionnaire validated by experts and piloted among a separate group ensured reliable data collection. By incorporating Makkah's significance as an important religious and cultural center, the study added insights into the specific contextual factors influencing HPV vaccination decisions.

This study will likely have various ramifications for medical researchers, physicians, and healthcare providers in Makkah, Saudi Arabia, and the implications of this research are far-reaching. These results highlight the need for focused interventions and public health campaigns to increase understanding of HPV infection and vaccination-based prevention. Healthcare providers can utilize these findings to enhance their communication and educational strategies when discussing HPV vaccination with patients. Future research should assess the effectiveness of such interventions in expanding knowledge, fostering vaccine acceptance, and increasing HPV vaccination rates among the residents of Makkah. At the same time, it is essential to assess all relevant cultural and religious factors influencing HPV vaccination decisions in Makkah. Insights gained from research can guide the development of culturally sensitive interventions and educational materials tailored to the unique needs and perspectives of the population in Makkah, Saudi Arabia. Collaborative efforts among researchers, healthcare providers, and policymakers may contribute to decreasing the prevalence of HPV-related diseases while improving public health outcomes in Makkah, Saudi Arabia.

4 Conclusion

This study offers invaluable insights into the knowledge, awareness, and perceptions regarding HPV vaccination among the general population in Makkah, Saudi Arabia. The findings reveal significant knowledge gaps regarding HPV infection and vaccination and substantial gaps in understanding between different groups. There is a pressing need to enhance educational and awareness initiatives concerning HPV to promote knowledge and encourage participation in vaccination campaigns. Moreover, this study identifies occupation, education level, and age as influential factors affecting the level of knowledge, emphasizing the necessity for targeted interventions and educational campaigns tailored to specific populations. Collaboration among healthcare providers, policymakers, and public health authorities is essential to formulate comprehensive strategies aimed at enhancing knowledge, debunking misconceptions, and increasing acceptance of vaccination. By increasing awareness and understanding of HPV and its preventive measures, the prevalence of HPV-related diseases in Makkah, Saudi Arabia, can be diminished while fostering improved overall health outcomes. Future research should evaluate the effectiveness of interventions while exploring cultural and religious influences on vaccination decisions to strengthen public health endeavors in this region.

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