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Healthcare Workers Knowledge, Perception, Awareness, and Barriers about Human Papilloma Virus Vaccine: A Cross-Sectional Study in Saudi Arabia

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***Abstract*– Background:** Human papilloma virus (HPV) is a prevalent sexually transmitted infection associated with various cancers, including cervical, penile, and oropharyngeal cancers, as well as genital warts. Despite the availability of effective HPV vaccines, uptake remains low in many countries, including Saudi Arabia, especially among men. Healthcare workers (HCW) have a crucial role in influencing public vaccination rates and preventing HPV-related diseases. This study aims to assess the knowledge, perception, awareness, and barriers related to the HPV vaccine among HCW in KFMC, Saudi Arabia. **Methods:** A cross-sectional study was conducted from November 2023 to April 2024, involving physicians, nurses, respiratory therapists, pharmacists, and dentists. Data were collected using a structured questionnaire evaluating demographic information, knowledge of HPV and its vaccine, awareness, perceptions, and barriers to vaccine uptake. The questionnaire was distributed electronically, ensuring participant anonymity and voluntary participation. **Results**: 810 participants were involved. Most participants recognized the link of HPV to cervical and anal cancers, 52.47% ($p < 0.001$) and incorrectly believed HPV could not infect both genders. About 55.56% ($p < 0.001$) were unaware that HPV infections can be asymptomatic. Only 11.98% ($p < 0.001$) were vaccinated, though 63.70% ($p = 0.001$) were willing, and 83.04% ($p < 0.001$) supported its inclusion in immunization programs. Vaccine hesitancy was influenced by perceived low risk (17.97%, $p < 0.005$), lack of awareness (11.37%, $p < 0.001$), concerns about side effects (10.04%, $p = 0.021$), and cultural or religious beliefs (9.96%, $p = 0.001$). Targeted education and culturally sensitive outreach are essential to dispel misconceptions, address hesitancy, and improve vaccine uptake. **Conclusion:** The findings highlight the need for targeted educational interventions to address knowledge gaps and misconceptions among HCW to enhance their understanding about HPV-related risks and promote HPV vaccination.

Keywords: *HPV Vaccine, Healthcare Workers, Knowledge and Awareness, Barriers to Vaccination, Saudi Arabia, Public Health.*

1. INTRODUCTION

HPV is a common sexually transmitted infection that can cause various cancers and genital warts. Global HPV infection rates range from 3.5% to 45% in men and 2% to 44% in women. In Saudi Arabia, HPV prevalence is 31% in the general population. Over 92% in women with cervical cancer, and 80% in women with cytological abnormalities. HPV is responsible for a significant percentage of several cancers: 90% of anal, 70% of oropharyngeal, 75% of vaginal, 69% of vulvar, and 50.8% of penile cancers globally, as well as 90% of genital warts.

In Saudi Arabia, there are approximately 358 new cancer cases and 179 cervical cancer deaths annually. Cervical cancer screening in Saudi Arabia includes Pap smears and HPV testing, generally recommended for women aged 21-65. However, awareness of these screenings is low. Saudi Arabia initiated an HPV vaccination program in 2008 for girls aged 9-26 and males aged 9-21. While the FDA approved a quadrivalent HPV vaccine for males in 2009, male vaccination rates remain low globally. The HPV vaccination schedule in Saudi Arabia varies based on age and gender. The WHO predicts the HPV vaccine will save millions of lives in the coming decade. Studies have examined HPV awareness in Saudi populations, while research specifically targeting HCWs in Riyadh is limited. HCWs play a vital role in patient education about HPV vaccine that influences public acceptance. Existing research indicates a gap between

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knowledge and practice regarding HPV vaccination among some Saudi Arabian physicians. This study investigates HPV vaccine knowledge, perceptions, awareness, and gaps among HCW in KFMC in Riyadh, Saudi Arabia, to develop strategies for promoting vaccination.

2. MATERIALS AND METHODS

Study design and setting: A cross-sectional study was conducted from November 2023 to April 2024 at KFMC involving physicians, nurses, respiratory therapists, pharmacists, and dentists. Data were collected using a structured questionnaire evaluating demographics, HPV and HPV vaccine awareness, perceptions, and barriers to vaccine uptake. The questionnaires were distributed electronically via Google Forms. Participants received information about the study's purpose prior to consenting and beginning the questionnaire. Informed consent was obtained electronically before participation. A convenience sampling method was used. Inclusion criteria were age 20-70, English fluency. Incomplete questionnaires were excluded. The questionnaire was considered incomplete if the participants answered less than 70% of the questions. Recruitment was conducted via internal communications such as emails and notices, emphasizing voluntary participation.

Description of the questionnaire: The questionnaire consisted of 23 items, beginning with demographic data, followed by sections assessing knowledge of HPV infection and vaccination, awareness of HPV-related health risks, perceptions of the HPV vaccine, and identification of barriers to vaccination. The questionnaire was developed in English and was pilot tested to ensure clarity and appropriateness for the target population. Feedback from the pilot test was used to refine the questionnaire, ensuring that the questions were easy to understand and relevant to the study objectives. The questionnaire's reliability was assessed using Cronbach's alpha and underwent pilot testing with a small group of HCW to assess its clarity and validity.

Statistical analysis: All categorical variables such as gender, nationality, age group, marital status, and specialty etc. were presented as frequency and percentage. Pearson chi-square / Fisher's exact test was used to determine significant associations between categorical variables, depending on whether the cell was expected to have an expected frequency of less than 5. A two-tailed P – value less than 0.05 was considered as statistically significant results. All data was entered and analyzed using the SPSS 25 Statistics Package (SPSS Inc., Chicago, Illinois, USA) and MEDCALC version 23.0.2 software.

Ethical approval: Ethical approval for this study was obtained from the Institutional Review Board (IRB) at KFMC.

3. RESULTS

The Demographic and Clinical Characteristics of Participants (n = 810) in **(Table 1)** provide a comprehensive overview of the study sample. Gender distribution shows that most participants are female (61.0%). Regarding nationality, non-Saudi participants make up 54.1%, whereas Saudi participants represent 45.9%. Age distribution indicates that the largest age group is 31-40 years (34.4%), followed by 20-30 years (30.2%), 41-50 years (20.2%), 51-60 years (12.1%), and 61-70 years (3.0%). In terms of marital status, married individuals form the largest group (43.5%) followed by single (33.5%). Professionally, the majority are physicians (62.7%), followed by nurses (24.9%). Regarding years of practice, 36.4% have 5-10 years of experience. The knowledge score reveals that 71.7% (581 participants) have knowledge about HPV, while 28.3% (229 participants) lack knowledge. However, awareness about HPV is significantly lower, with only 19.9% (161 participants) being aware, while 80.1% (649 participants) lack awareness. Similarly, perception of HPV is reported in 46.0% (373 participants), whereas 54.0% (437 participants) lack perception.

The participants understanding HPV are presented in **(Table 2)**. Most participants (60.2%) incorrectly believe that HPV infection is not frequently encountered, while 33.8% correctly recognize it as common, and 5.9% were unsure. When asked if HPV is a sexually transmitted virus, 52.1% answered incorrectly, while 45.3% correctly identified it as an STI. Regarding its asymptomatic nature, 49.6% incorrectly believed it is always symptomatic, while 47.9% recognized it could be asymptomatic.

A proper understanding was observed in recognizing that HPV can infect both men and women, with 53.3% answering correctly. The majority identified that HPV causes genital warts (61.2%) and (61.5%) believed it is responsible for 90% of anal and cervical cancers. Additionally, 54.9% knew that HPV accounts for 60% of penile cancers, while 32.3% disagreed.

Regarding vaccination, 62.7% correctly identified the intramuscular route for administration, while 28.8% answered incorrectly. Only 58.6% correctly knew that one or two doses are given in Saudi Arabia, while 27.2% answered incorrectly, and 14.2% were uncertain. A similar trend was seen in vaccine protection awareness, with 58.8% believed that the vaccine protects against all HPV types, 35.1% answered incorrectly. About 61.7% knew that HPV vaccine efficacy exceeds 90%, but 29.8% (241 participants) disagreed.

Despite these knowledge gaps, only 12.0% reported receiving the vaccine, while 88.0% had not. However, 63.7% expressed willingness to be vaccinated, while 36.3% declined. Additionally, 67.2% supported vaccinating their children, while 32.8% opposed it. Around 65.6% agreed the HPV vaccine is necessary. In

addition, 64.0% supported including HPV vaccination in Saudi Arabia's immunization program.

(Table 3) presents the association between knowledge about HPV and participants characteristics, highlighting significant differences across demographics. Gender-wise. Female were more knowledgeable compared to male (69.5% vs 30.5%), p<0.001. Nationality does not show a significant difference (p = 0.167).

Age distribution indicates a significant association (p < 0.001), with the highest knowledge levels found among 20-30-year-olds, followed by 31-40-year-olds. Conversely, lack of knowledge is most prevalent in the 51-60 age group and 61-70 age group. Marital status also plays a role, with married individuals making up the largest proportion of knowledgeable participants, while widowed and divorced individuals show the highest lack of knowledge (p < 0.001).

In terms of specialty, physicians have the highest HPV knowledge compared to dentists, pharmacists, and nurses (p < 0.001). Years of practice significantly impact knowledge levels (p = 0.001). Those with less than 5 years of experience are more knowledgeable compared to those with over 20 years of experience.

(Table 4) presents the association between awareness about HPV and participants characteristics, highlighting key demographic trends. Gender-wise, females demonstrate higher awareness compared to males, p=0.021. Nationality does not significantly impact awareness levels (p = 0.992). Age distribution reveals that 31-40-year-olds have the highest awareness p = 0.061). Marital status does not significantly influence awareness (p = 0.932). Among specialties, physicians exhibit the highest awareness (p = 0.571). Years of practice also show no significant association (p = 0.192).

(Table 5) presents the association between perception about HPV and participants characteristics, highlighting significant trends. Gender-wise, females demonstrate better perception of HPV compared to males, p = 0.001. Nationality does not show a significant impact (p = 0.098). Age distribution reveals that perception is highest among 31-40-year-olds and 20-30-year-olds, p < 0.001). Marital status also plays a role (p < 0.001), with married individuals. In terms of specialty, physicians exhibit the highest perception levels compared to other specialities, (p = 0.372). Years of practice significantly impact perception levels (p = 0.001), with the highest perception found in participants with 5-10 years of experience.

Regarding reasons for vaccine refusal, the most cited reason is general opposition to vaccine refusal (28.5%), followed by perceived low risk of HPV infection (18.0%). Lack of awareness about the vaccine (11.4%) and concerns about side effects (10.0%) also contribute significantly. Additionally, cultural and religious beliefs (10.0%) play a notable role in vaccine hesitancy.

(Figure 1) Frequency distribution of various reasons for rejecting the HPV vaccine. As shown in 323 respondents, representing 28.46%, stated that they do not believe in refusing the vaccine. Another strong factor was the perception of not being at risk for an HPV infection, which 204 subjects (17.97%) reported. The third most common reason is lack of awareness about the vaccine, as indicated by 129 respondents for the reason for refusal (11.37%). Field results showed that 114 respondents, 10.04%, reported on concerns about side effects from the vaccine, while 113, 9.96%, showed cultural and religious beliefs that bring about discouragement of vaccination.

(Figure 1) conveys a very complex process of refusal, driven by mixing beliefs, perceived risks, and lack of information at the very core of vaccine refusal.

4. DISCUSSION

The current study provides important information regarding knowledge, awareness, perception, and barriers to HPV vaccination among healthcare workers (HCWs) at KFMC, Saudi Arabia. Burdened with continuous workloads, HCWs play a critical role in educating their patients to improve community health and enhance HPV vaccine acceptance, ultimately reducing the burden of HPV-related diseases in Saudi Arabia.

The study sample reflects diversity across multiple demographic factors, which significantly influence findings. Gender distribution shows that females exhibited higher knowledge (69.5%) compared to males (30.5%), a statistically significant difference (p < 0.001) [1,2]. This trend persists across awareness (p = 0.021) and perception (p = 0.001), where females demonstrate greater awareness and perception about HPV than males. These results indicate a gender disparity in HPV knowledge that may stem from women's greater exposure to reproductive health discussions and cervical cancer screening programs.

Nationality, however, does not significantly impact knowledge (p = 0.167), awareness (p = 0.992), or perception (p = 0.098) [3]. This suggests that Saudi and non-Saudi HCWs share similar levels of understanding, potentially due to uniform professional training and standardized healthcare guidelines within the Kingdom.

Age plays a significant role in knowledge (p < 0.001), awareness (p = 0.061), and perception (p < 0.001) [4]. Younger HCWs (20-30 years) demonstrate significantly higher knowledge (35.6%) compared to older age groups, especially those aged 51-60 (8.3%) and 61-70 (1.2%). This trend highlights a decline in HPV-related knowledge among older HCWs, which may reflect educational gaps in past medical training or limited exposure to HPV-related research. These findings align with previous research indicating that younger healthcare workers tend to have better awareness of newer medical advancements, including HPV vaccination [5].

Table 1. Demographic and Clinical Characteristics of Participants (n = 53)

Variables	Description	N (n%)
Gender	Male	316 (39.0%)
	Female	494 (61.0%)
Nationality	Saudi	372 (45.9%)
	Non-Saudi	438 (54.1%)
Age (years)	20-30	245 (30.2%)
	31-40	279 (34.4%)
	41-50	164 (20.2%)
	51-60	98 (12.1%)
	61-70	24 (3.0%)
Marital Status	Single	271 (33.5%)
	Married	352 (43.5%)
	Divorced	85 (10.5%)
	Widowed	102 (12.6%)
What is your specialty?	Dentist	8 (3.7%)
	Nurse	54 (24.9%)
	Pharmacist	10 (4.6%)
	Physician	136 (62.7%)
	Respiratory Therapist	4 (1.8%)
	Others	5 (2.3%)
How many years of practice?	< 5 years	217 (26.8%)
	5 - 10 years	295 (36.4%)
	11 - 20 years	197 (24.3%)
	> 20 years	101 (12.5%)
Knowledge Score	Knowledge about HPV	581 (71.7%)
	Lack of Knowledge about HPV	229 (28.3%)
Awareness Score	Awareness about HPV	161 (19.9%)
	Lack of awareness about HPV	649 (80.1%)
Perception Score	Perception about HPV	373 (46.0%)
	Lack of perception about HPV	437 (54.0%)

Marital status significantly impacts knowledge ($p < 0.001$) and perception ($p < 0.001$), but not awareness ($p = 0.932$) [6]. Married individuals (47.0%) exhibit the highest knowledge, while widowed individuals (25.3%) and divorced individuals (17.5%) show lower knowledge levels. Similarly, married HCWs (48.0%) demonstrate the highest perception about HPV, while widowed individuals (17.6%) have the lowest perception levels, suggesting that personal life circumstances may influence engagement with HPV-related information.

Specialty significantly affects knowledge ($p < 0.001$) but not awareness ($p = 0.571$) or perception ($p = 0.372$) [7]. Physicians (62.5%) display the highest knowledge about HPV, whereas dentists, nurses, pharmacists, respiratory therapists, and other healthcare professionals exhibit lower knowledge levels. This finding underscores the need for broader HPV-related education across non-physician healthcare fields, as supported by studies indicating that specialty training plays a crucial role in understanding vaccine efficacy [8].

Table – 2: Participant Responses and Their Impact on HPV

Variables	Description	n (n%)
Is HPV infection a frequently encountered infection?	TRUE	274 (33.8%)
	FASLE	488 (60.2%)
	I don't know	48 (5.9%)
Is HPV a sexually transmitted virus?	TRUE	367 (45.3%)
	FASLE	422 (52.1%)
	I don't know	21 (2.6%)
May HPV infection be asymptomatic?	TRUE	388 (47.9%)
	FASLE	402 (49.6%)
	I don't know	20 (2.5%)
Can HPV infect both women and men?	TRUE	432 (53.3%)
	FASLE	364 (44.9%)
	I don't know	14 (1.7%)
Can HPV infection cause genital warts?	TRUE	496 (61.2%)
	FASLE	293 (36.2%)
	I don't know	21 (2.6%)
May HPV infection be responsible for 90% or more anal and cervical cancer?	TRUE	498 (61.5%)
	FASLE	261 (32.2%)
	I don't know	51 (6.3%)
May HPV infection be responsible for 60% of penile cancer?	TRUE	445 (54.9%)
	FASLE	262 (32.3%)
	I don't know	103 (12.7%)
The route of choice for HPV vaccine is intramuscular	TRUE	508 (62.7%)
	FASLE	233 (28.8%)
	I don't know	69 (8.5%)
HPV vaccine in Saudi Arabia best given as one or two doses	TRUE	475 (58.6%)
	FASLE	220 (27.2%)
	I don't know	115 (14.2%)
HPV vaccine protects against all HPV types	TRUE	476 (58.8%)
	FASLE	284 (35.1%)
	I don't know	50 (6.2%)
HPV vaccine efficacy is more than 90%	TRUE	500 (61.7%)
	FASLE	241 (29.8%)
	I don't know	69 (8.5%)
Did you receive an HPV vaccine?	Yes	97 (12.0%)
	No	713 (88.0%)
Do you want to be vaccinated?	Yes	516 (63.7%)
	No	294 (36.3%)
Do you want your children/future children to be vaccinated?	Yes	544 (67.2%)
	No	266 (32.8%)
Do you think it is necessary to receive HPV vaccine?	Yes	531 (65.6%)
	No	222 (27.4%)
	I don't know	57 (7.0%)
Do you think including HPV vaccine in the Saudi immunization program is necessary?	Yes	518 (64.0%)
	No	218 (26.9%)
	I don't know	74 (9.1%)

Table – 3: Association between knowledge about HPV and Participants characteristics

Variables	Description	Knowledge about HPV	Lack of Knowledge about HPV	*P - value*
Gender	Male	177 (30.5%)	139 (60.7%)	*< 0.001
	Female	404 (69.5%)	90 (39.3%)	
Nationality	Saudi	258 (44.4%)	114 (49.8%)	0.167
	Non-Saudi	323 (55.6%)	115 (50.2%)	
Age (years)	20-30	207 (35.6%)	38 (16.6%)	*<0.001
	31-40	202 (34.8%)	77 (33.6%)	
	41-50	117 (20.1%)	47 (20.5%)	
	51-60	48 (8.3%)	50 (21.8%)	
	61-70	7 (1.2%)	17 (7.4%)	
Marital Status	Single	219 (37.7%)	52 (22.7%)	*<0.001
	Married	273 (47.0%)	79 (34.5%)	
	Divorced	45 (7.7%)	40 (17.5%)	
	Widowed	44 (7.6%)	58 (25.3%)	
What is your specialty?	Dentist	8 (3.7%)	0 (0.0%)	*<0.001
	Nurse	54 (25.0%)	0 (0.0%)	
	Pharmacist	10 (4.6%)	0 (0.0%)	
	Physician	135 (62.5%)	1 (100.0%)	
	Respiratory Therapist	4 (1.9%)	0 (0.0%)	
	Others	5 (2.3%)	0 (0.0%)	
How many years of practice?	< 5 years	185 (31.8%)	32 (14.0%)	*0.001
	5 - 10 years	200 (34.4%)	95 (41.5%)	
	11 - 20 years	144 (24.8%)	53 (23.1%)	
	> 20 years	52 (9.0%)	49 (21.4%)	

*Note: Categorical data presented as frequencies; * shows that P – value is significant at p < 0.005.*

Years of practice also significantly influence knowledge (p = 0.001) and perception (p = 0.001) but not awareness (p = 0.192) [9]. HCWs with less than 5 years of experience have the highest knowledge (31.8%), while those with more than 20 years of experience show the lowest knowledge (9.0%) and perception (6.4%). This suggests that recent graduates are better informed about HPV due to updated medical curricula, whereas longer-serving professionals may require refresher training to stay current with HPV vaccination guidelines. Similar patterns have been observed in previous studies, where knowledge gaps were more pronounced among HCWs with longer service duration due to outdated education on HPV vaccination [10].

Despite a general awareness of HPV's role in cervical and anal cancers, knowledge gaps exist regarding HPV's prevalence, transmission, asymptomatic nature, and vaccine administration. A significant percentage (52.1%) incorrectly believe HPV is not a sexually transmitted infection, while 49.6% do not recognize its asymptomatic nature, leading to misconceptions about infection risk and the necessity of vaccination [11].

Although support for HPV vaccination is high (64.0%), the actual vaccination rate remains low (12.0%), indicating a gap between knowledge and action. The belief that HPV vaccination is unnecessary (27.4%), along with concerns about vaccine safety (10.0%) and cultural/religious barriers (10.0%), further contributes to vaccine hesitancy. This pattern aligns with global findings that cultural beliefs and vaccine safety concerns are major obstacles to HPV vaccine acceptance [12].

A statistically significant gender disparity exists in perception (p = 0.001), with males (48.3%) showing lower perception than females (51.7%). This aligns with previous research suggesting that men often perceive themselves at lower risk for HPV-related diseases, despite the virus affecting both sexes [13].

Table – 4: Association between awareness about HPV and Participants characteristics

Variables	Description	Awareness about HPV	Lack of awareness about HPV	*P - value*
Gender	Male	50 (31.1%)	266 (41.0%)	*0.021
	Female	111 (68.9%)	383 (59.0%)	
Nationality	Saudi	74 (46.0%)	298 (45.9%)	0.992
	Non-Saudi	87 (54.0%)	351 (54.1%)	
Age (years)	20-30	49 (30.4%)	196 (30.2%)	0.061
	31-40	62 (38.5%)	217 (33.4%)	
	41-50	37 (23.0%)	127 (19.6%)	
	51-60	12 (7.5%)	86 (13.3%)	
	61-70	1 (0.6%)	23 (3.5%)	
Marital Status	Single	55 (34.2%)	216 (33.3%)	0.932
	Married	70 (43.5%)	282 (43.5%)	
	Divorced	18 (11.2%)	67 (10.3%)	
	Widowed	18 (11.2%)	84 (12.9%)	
What is your specialty?	Dentist	0 (0.0%)	8 (4.5%)	0.571
	Nurse	9 (23.7%)	45 (25.1%)	
	Pharmacist	1 (2.6%)	9 (5.0%)	
	Physician	27 (71.1%)	109 (60.9%)	
	Respiratory Therapist	1 (2.6%)	3 (1.7%)	
	Others	0 (0.0%)	5 (2.8%)	
How many years of practice?	< 5 years	44 (27.3%)	173 (26.7%)	0.192
	5 - 10 years	63 (39.1%)	232 (35.7%)	
	11 - 20 years	42 (26.1%)	155 (23.9%)	
	> 20 years	12 (7.5%)	89 (13.7%)	

These findings emphasize the urgent need for targeted educational campaigns, particularly among older HCWs, non-physician professionals, and male healthcare workers, to bridge knowledge gaps and encourage HPV vaccination. Given the significant influence of marital status and years of practice on knowledge and perception, educational interventions should target long-serving HCWs and those with personal misconceptions about vaccine necessity [14]. Moreover, integrating HPV vaccine education into continuous medical training and healthcare curricula could ensure all healthcare professionals—beyond physicians—are equipped with accurate HPV-related knowledge. Similar education-based interventions have successfully increased vaccine uptake in other countries [15,16]. Additionally, culturally sensitive public health campaigns should address religious concerns and vaccine safety misconceptions by engaging community leaders, religious scholars, and social influencers to normalize HPV vaccination. These efforts have proven effective in previous studies, demonstrating the importance of culturally tailored interventions in increasing vaccine acceptance [17].

Strengths: This study provides valuable insights into the knowledge, awareness, perceptions, and barriers related to HPV vaccination among a diverse group of HCWs in a major medical center in Riyadh, Saudi Arabia. The use of a structured questionnaire allowed for standardized data collection and facilitated comparisons across different subgroups of HCWs. The study highlights important knowledge gaps and misconceptions that can be addressed through targeted educational interventions. The findings can inform policy changes and public health campaigns aimed at improving HPV vaccine uptake in Saudi Arabia.

Limitations: The cross-sectional design limits the ability to establish causal relationships between variables. The study was conducted at a single medical center, which may limit the generalizability of the findings to other healthcare settings in Saudi Arabia. The convenience sampling method may have introduced selection bias. The study might have attracted

Table – 5: Association between Perception about HPV and Participants characteristics

Variables	Description	Perception about HPV	Lack of perception about HPV	*P - value*
Gender	Male	105 (28.2%)	211 (48.3%)	*0.001
	Female	268 (71.8%)	226 (51.7%)	
Nationality	Saudi	183 (49.1%)	189 (43.2%)	0.098
	Non-Saudi	190 (50.9%)	248 (56.8%)	
Age (years)	20-30	130 (34.9%)	115 (26.3%)	*<0.001
	31-40	145 (38.9%)	134 (30.7%)	
	41-50	71 (19.0%)	93 (21.3%)	
	51-60	23 (6.2%)	75 (17.2%)	
	61-70	4 (1.1%)	20 (4.6%)	
Marital Status	Single	150 (40.2%)	121 (27.7%)	*<0.001
	Married	179 (48.0%)	173 (39.6%)	
	Divorced	19 (5.1%)	66 (15.1%)	
	Widowed	25 (6.7%)	77 (17.6%)	
What is your specialty?	Dentist	4 (3.4%)	4 (4.1%)	0.372
	Nurse	23 (19.3%)	31 (31.6%)	
	Pharmacist	5 (4.2%)	5 (5.1%)	
	Physician	81 (68.1%)	55 (56.1%)	
	Respiratory Therapist	3 (2.5%)	1 (1.0%)	
	Others	3 (2.5%)	2 (2.0%)	
How many years of practice?	< 5 years	124 (33.2%)	93 (21.3%)	*0.001
	5 - 10 years	149 (39.9%)	146 (33.4%)	
	11 - 20 years	76 (20.4%)	121 (27.7%)	
	> 20 years	24 (6.4%)	77 (17.6%)	

*Note: Categorical data presented as frequencies; * shows that P – value is significant at p < 0.005.*

HCWs who were already more interested in or knowledgeable about HPV vaccination. Self-reported data through questionnaires are susceptible to recall bias and social desirability bias, which could influence the accuracy of the responses. Participants might have over-reported their knowledge or positive attitudes toward vaccination. The study did not explore the reasons behind the opposition to including the HPV vaccine in the Saudi immunization program, which would be valuable for developing targeted strategies to address these concerns. Further research is needed to understand the specific cultural and religious beliefs that influence vaccine hesitancy.

5. CONCLUSION

This study highlights significant gaps in knowledge, awareness, and perception of HPV vaccination among HCWs at King Fahad Medical City, Saudi Arabia. Despite their role in patient education, many HCWs lack comprehensive knowledge of HPV-associated risks, particularly regarding penile cancer, genital warts, and asymptomatic transmission. This knowledge gap may impact their ability to effectively recommend vaccination. One key finding is the low vaccination rate among HCWs, despite their acknowledgment of the vaccine's importance. This reflects broader issues such as perceived low personal risk, misinformation, and vaccine hesitancy. Barriers identified include concerns about vaccine safety, lack of awareness of HPV's full impact, and cultural or religious influences.

To address these challenges, targeted interventions should be implemented to enhance HCWs' understanding and advocacy for HPV vaccination. Integrating HPV vaccination education into continuing medical education (CME) programs can improve their knowledge of HPV transmission and vaccine efficacy. Workplace training programs should also be implemented to address misconceptions and emphasize vaccine safety. Additionally, culturally sensitive public health campaigns should be developed, engaging community and religious leaders to promote vaccine acceptance. Further

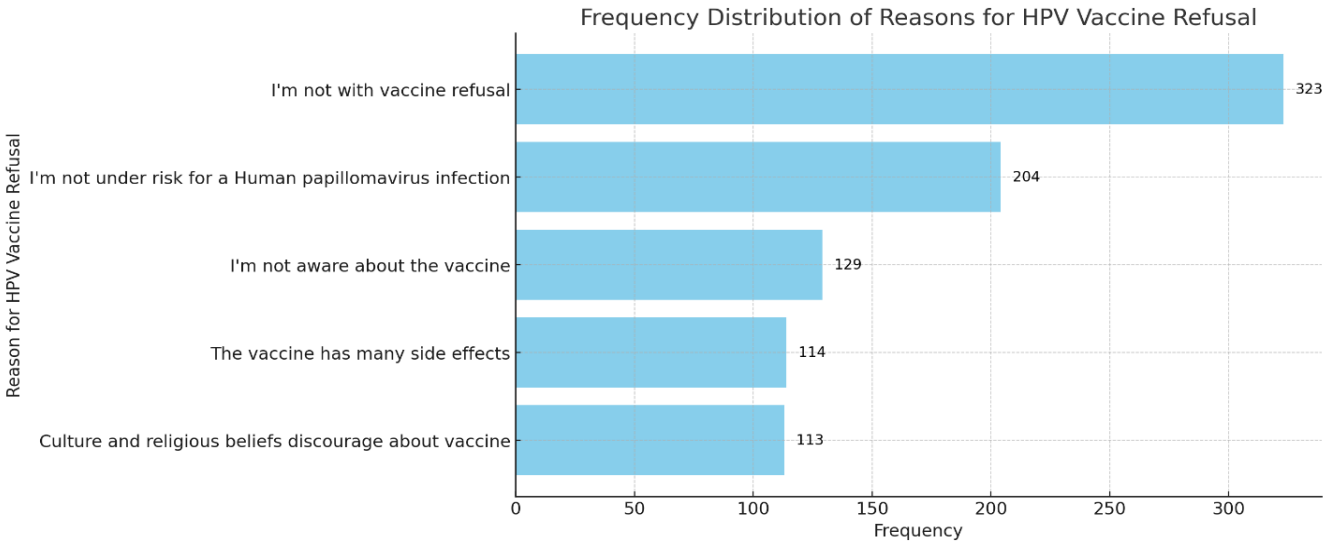

Figure.1: Frequency Distribution of Reasons for HPV Vaccine Refusal

research is necessary to explore factors affecting vaccine uptake and address specific barriers among HCWs. By implementing these strategies, HCWs can play a more active role in promoting HPV vaccination, ultimately improving public health outcomes in Saudi Arabia.

Conflict of Interest: The authors declare no conflict of interest.

Author contributions: Najd Alnojaidi: Conceptualization, methodology, formal analysis, and original draft preparation. Raghad Alammari: Data collection, project administration, and writing – review & editing. M. Hafidh: Statistical analysis and validation. Raed A. Khafajeh: Visualization, resources, and data curation. Sawsan Al Yousef: Supervision and final manuscript review. All authors have read and agreed to the published version of the manuscript.

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