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# Barriers to HPV Vaccination and Cervical Cancer Prevention at Health Personnel Level During the COVID-19 Pandemic in Eldoret, Kenya

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## Abstract

**Background:** Cervical cancer remains the chief cause of cancer mortality among women in low-resource settings. The advent of the HPV vaccine constitutes a milestone in cervical cancer prevention. Reproductive healthcare providers perform cervical screening and vaccination in Kenya, and little information is currently available about their knowledge, attitudes, and acceptability of the HPV vaccine.

**Objectives:** The objectives of the study are to determine health personnel knowledge, attitudes and acceptance surrounding cervical cancer and the HPV vaccine in Kenya, to identify structural problems hindering cervical cancer prevention, and to utilize this information to make policy recommendations.

**Methods:** A cross-sectional survey was conducted to evaluate acceptability, knowledge, and attitude regarding HPV, cervical cancer, and HPV vaccine among healthcare personnel working at the Moi Teaching and Referral Hospital (MTRH), Kenya and reproductive health specialists attending an annual scientific conference. We utilized convenience sampling by a self-administered, anonymous questionnaire.

**Results:** Our findings revealed a high level of divergence between knowledge of HPV infection and vaccines. A mean score of 2.27, indicating a negative attitude among healthcare workers, was calculated, with 36.8% expressing concern that the HPV vaccine may result in promiscuity. A total of 81.4 % of healthcare workers either strongly agreed or agreed that communication between children and parents to have the HPV vaccination might be a problem in Kenyan culture. Subgroup analyses revealed statistically significant differences in knowledge concerning the target group of the HPV vaccine.

**Conclusion:** Significant divergent knowledge among workers on HPV and vaccines may limit HPV vaccine uptake or target the wrong age group. There is an urgent need to bridge this information gap through a well-designed HPV education program for medical personnel. Our findings illustrate the need for continued medical education for healthcare workers according to gender, site location, medical profession, and years of work

## Key Words

Healthcare Personnel; Kenya; HPV Vaccine; Knowledge; Attitude; Structural Problems

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## Background:

Human papillomavirus (HPV) infection of the genital mucosa is a common sexually transmitted infection (STI), and its central role in the etiology of cervical cancer has been established.<sup>1</sup> Among asymptomatic women in the general population, the prevalence of HPV infection ranges from 2-40%.<sup>2</sup> The prevalence of HPV varies with age, and HPV is most prevalent in younger populations, especially within the age range of 20-30 years.<sup>3,4</sup> Approximately 50% of HPV infections occur in sexually active adolescent girls and young women.<sup>5</sup>

Cancer is the third leading cause of death in Kenya, with a rate of 18,000 deaths per year.<sup>6</sup> Cervical cancer is the second most prevalent cancer among women in the country after breast cancer, and its

incidence is rising.<sup>7</sup> In many industrialized countries, however, the incidence of cervical cancer is lower, which can be attributed to the widespread implementation of cervical screening programs.

According to the World Health Organization (WHO), 39 percent of Kenyan women have harboured an HPV infection at some point in their lives. Factors impacting on high risks of cervical cancer in Kenyan women include multiple pregnancies, early age of first intercourse, hormonal contraceptives, smoking, and HIV infection.<sup>10,11</sup> For a woman living with HIV, a HPV infection can develop into cervical cancer more quickly than for a woman who is HIV negative. The high incidence of HIV in Kenya is an important consideration when establishing a strategy against cervical cancer. A

Kenyan study conducted from 2007 to 2010 reported that, in order to target vulnerable populations, it is beneficial to combine cervical cancer screening with HIV testing.<sup>12</sup>

Currently, there are highly efficacious vaccines approved for females aged 9-26 years.<sup>13</sup> The first is Quadrivalent HPV vaccine, or Gardasil®, the first vaccine for the prevention of cervical cancer, abnormal and precancerous cervical lesions, abnormal and precancerous vaginal and vulva lesions, and genital warts. The other is Cervarix™, or bivalent HPV, the second vaccine for the prevention of cervical cancer and precancerous lesions associated with the most common cancer-causing HPV types, 16 and 18.

Although the Kenya Pharmacy and Poisons Board approved the use of the HPV vaccination in 2007, its purchase is not affordable for most Kenyans. Two vaccinations, Cervarix, and Gardasil, currently cost around \$300 (all figures USD) and \$150 respectively.<sup>14</sup> Until the cost of these HPV vaccinations decreases or less expensive options become available, inoculation is not viable in Kenya without substantial subsidies.

However, the acceptance of the vaccine might be related to other factors for decision making in vaccination of the population other than the price alone, such as the acceptance by healthcare providers.<sup>15</sup> Healthcare providers have been found to play a pivotal role in influencing parents' decision making to allow their children to receive the HPV vaccination.<sup>16</sup> The acceptance of the HPV vaccine from healthcare workers (HCWs), therefore, might result in HPV vaccine implementation in the future. Despite low to moderate levels of knowledge about HPV vaccine among school teachers, vaccine acceptability is high. Teachers with little knowledge of the HPV vaccine are less likely to accept the vaccine than those who know more; this may affect uptake if not addressed. Empowering teachers to be vaccine champions in their community may be a feasible way of disseminating information about the HPV vaccine and cervical cancer.

Although the HPV vaccine has been used in Kenya for five years, there is little or no information about HPV vaccine acceptability among HCWs working in Kenya, unlike in industrialized settings. Healthcare providers are expected to have good acceptance and a positive attitude toward the HPV vaccine. Moreover, they are also expected to have good knowledge of the HPV vaccine, as well as the HPV infection and its relation to cervical cancer. In addition, they are considered the primary and most trusted source of health and vaccine information for the public.

The objectives of this research are threefold. The first is to assess HPV vaccine acceptability, knowledge and attitudes regarding HPV, cervical cancer, and HPV vaccine among HCWs and to identify structural problems. The second is to determine differences in knowledge according to different medical professions, gender, years of work, and outpatient location. The third is to make policy recommendations for HPV education interventions.

## **Materials and Methods**

### **Study Design and Setting**

This study is a cross-sectional survey of healthcare providers and involved healthcare workers (HCWs) working in the Department of Reproductive Health at the Moi Teaching and Referral Hospital, Eldoret, Kenya. It also involved data retrieval from a questionnaire administered to Obstetricians and Gynaecologists attending an annual scientific conference in Eldoret based in Uasin Gishu County in Kenya. Eldoret is a principal city in Western Kenya and lies south of Cherangany hills, the location elevation varies from about 2100 metres above the sea level to more than 2700 metres (7000 – 9000 feet). Data collection was undertaken in February 2015 using a self-administered questionnaire.

The questionnaire contained multiple-choice questions. Questions included demographics and socio-professional questions, questions on the knowledge of the epidemiology of cervical cancer, the HPV infection and its link to cervical cancer, questions on the knowledge and attitudes regarding HPV, cervical cancer, and the HPV vaccine, and questions on the acceptability of the HPV vaccine. Other professionals included anaesthetists and pharmacists working in reproductive health, as well as residents and students.

Knowledge of cervical cancer included the cause, risk, and screening. Knowledge of the HPV vaccine focused mainly on the efficacy and its benefit. The Health Belief Model (Glanz) was applied to develop the questions about attitudes. These questions focused on the perceived severity of cervical cancer, the perceived benefit of the vaccination, and perceived barriers to vaccination. These three factors could be expected to influence decisions about HPV vaccine acceptance among healthcare providers. Questions about acceptability were based on characteristics of the vaccine (i.e., vaccination procedure, cost, benefit, and target group of vaccination).

We tested the reliability of the questionnaire among 15 healthcare providers that included ten residents and five nurses in the Division of Reproductive

Health of the Moi Teaching and Referral Hospital. The questionnaire was delivered by hand during working hours and collected by a research assistant. The Obstetricians/Gynaecologists attending an annual conference were given the questionnaire by the researcher who was assisted by research assistants, and the survey was collected back on the same day.

Each participant received written explanations about the objectives of the study.

### Recruitment Strategy and Sample Size

Due to the unavailability of previous information about the topic for the three categories of professionals, obstetricians/gynaecologists, nurses, general practitioners and others, we did not formally calculate the sample size. Instead, a convenient sample was employed.

### Data Analysis

Data were analyzed using a statistical software program (STATA, version 12.1). Descriptive statistics were generated, and data were presented as a mean (standard deviation) or median (range) for continuous variables and years of providing care, and as a percentage for categorical variables, including gender and main outpatient practice.

Knowledge was presented by frequency and percentage in each item. Attitude assessment was categorized on a five-level Likert scale that ranges from 1 for "Strongly Disagree," to 5 for "Strongly Agree". These were presented in percentage. The level of attitude was calculated from the mean scores and grouped into three classes: 1-2.33 =

"Negative"; 2.34-3.67 = "Neutral"; 3.68-5 = "Positive". Overall attitude was presented by mean/median scores.

The number of years of providing clinical care was dichotomized into <8 years and ≥8 years; this categorization was used to reflect the median years of HCWs. The chi-square test was used to compare the differences in the proportions of knowledge and attitude across medical professions, gender and >8 years of professional experience. An independent t-test/Mann Whitney test for nonparametric values was used to compare the mean/median differences of knowledge and attitudes between nurses and medical doctors, residents, and gynaecologists. The data collected were analyzed, and P-values <0.05 were considered significant.

### Socio-Demographic Characteristics

A total of 196 questionnaires were completed and returned, of which (63.27%) were male HCWs and (36.7%) were female HCWs. The response rate was 98.5%. Most staff respondents were obstetrician-gynaecologists (65/193; 33.7%), followed by general practitioners (61/193; 31.6%), followed by others (40/193; 20.7%), followed by nurses (27/193; 14.0%). The median number of years of experience in healthcare provision for the participating healthcare providers is eight years (IQR 4-13). The remaining proportion of healthcare providers categorized as others is accounted for in Table I below. A majority of the healthcare providers mainly carry out their practice in the three locations tabulated, with the greatest proportion (58.3 %) under the public healthcare facilities. The socio-demographic characteristics of the respondents are outlined in

**Table I: Socio-Demographic Characteristics**

Variable	n	%
<b>Gender</b>		
Male	124	63.3
Female	72	36.7
<b>Years of Clinical Care</b>	8	(IQR: 4-13)
<b>Location of Practice</b>		
Private practice office	42	22.7
Public health center	108	58.4
Hospital department	29	15.7
Other	6	3.2
<b>Medical Speciality</b>		
Obstetrician/ Gynaecologist	65	33.7
Nurse	27	14
General Practitioner	61	31.6
Other	40	20.7

## Health Professionals' Survey: Attitudes, Knowledge, and HPV Vaccines Practices

### Knowledge of HPV Genotypes:

The majority (81.2%) of participants disclosed that, in their opinion, there are over 100. HPV type 16 and 18 were the most (85.2%) cited for causing cervical types of HPV cancer.

### Knowledge of HPV Vaccines:

Knowledge of to whom and when the HPV vaccine should be administered diverged among those surveyed (see Table 2).

**Table 2:** Assessing HPV Vaccine Knowledge

Variable	n	%
How many types of HPV are there?	Over 100	81.2%
What types of HPV cause cervical cancer most?	HPV 16 and HPV 18	85.20%
How many types of HPV vaccine are available for cervical cancer prevention?	2 vaccines	56.4%
To which age group should the HPV vaccine be given?	10-30 y	70.10%
Both boys and girls should get the HPV vaccine before he/she becomes sexually active	Yes	69.80%
Can the HPV vaccine be given to a sexually active girl?	No	17.20%
Do girls/women need to be screened for HPV before getting vaccinated?	Yes	59.90%
Can it be given to a woman who already has an HPV infection?	No	68.8%
How many doses of the HPV vaccine are required for protection?	3	80.20%
Is it safe to give HPV vaccine to HIV-infected persons?	Yes	73.10%

### Attitude:

A total of 70.3% of respondents either agreed or strongly agreed that vaccine safety was a concern, whilst 36.8% of respondents were either ambivalent or agreed that the HPV vaccine may lead to an increase in risky sexual behaviour.

### Overall Attitude Score:

Safety concerns: mean 2.3 (95% CI: 2.1 - 2.4); Promiscuity concern: mean 2.27 (95% CI: 2.1-2.4)

### Structural Problems

Eighty one percent either strongly agree or agree that communication between children and parents to have the HPV vaccination might be a problem in Kenyan culture. A total of 55.7% either strongly agree or do not agree that a well-informed child should be able to request the vaccination without parental consent. A total of 55.7% believe that the high cost may constitute an important obstacle, and 35.9% maintain that inadequate information may be an obstacle (see Table 3).

**Table 3:** Attitude and Structural Problems

Variable	Agree (N=193) %
Are people worried about vaccine safety?	70.30%
The HPV vaccine can lead to an increase in risky sexual behaviour	36.80%
<b>Structural Problems</b>	
Communication between children and parents to get HPV vaccination might be a problem in Kenyan culture	81.40%
A well-informed child should be able to request vaccination without parental consent	55.70%
What do you think will be the most important obstacle preventing yourself to receive/advice HPV vaccination?	Cost: 55.7 %
	35.9% inadequate information
What is the cost of 1 dose of the HPV vaccine?	Kshs 2000: 35.23%

**Table 4:** Bivariate Analysis between HPV Vaccine Knowledge, Structural Problems and Attitude Against Gender

Variable	n	%	P Value
How many types of HPV are there?	Over 100	81.2%	p= 0.7
What types of HPV causes cervical cancer most?	HPV 16 and HPV 18	85.20%	p= 0.1
How many types of the HPV vaccine are available for cervical cancer prevention?	2 vaccines	56.4%	p=0.4
To which age group should the HPV vaccine be given?	10-30 y	70.10%	p=0.04
Both boys and girls should get the HPV vaccine before he/she becomes sexually active.	Yes	69.80%	p=0.8
Can HPV vaccine be given to a sexually active girl?	No	17.20%	p=0.8
Do girls/women need to be screened for HPV before getting vaccinated?	Yes	59.90%	p=0.5
Can it be given to a woman already having HPV infection?	No	68.8%	p=0.5
How many doses of HPV vaccine are required for protection?	3	80.20%	p=0.9
Is it safe to give HPV vaccine to HIV-infected persons?	Yes	73.10%	p=0.7
<b>Attitude</b>			
People are worried about vaccine safety?	Agree	70.30%	p=0.03
The HPV vaccine can lead to an increase in risky sexual behaviour	Agree	36.80%	p=0.06
<b>Structural problems</b>			
Communication between children and parents to get HPV vaccination might be a problem in Kenyan culture.	Agree	81.40%	p=0.9
A well-informed child should be able to request vaccination without parental consent	Agree	55.7%	p=0.4
What do you think will be the most important obstacle preventing you from receiving/advising the HPV vaccination?	Inadequate information	55.7%	p=0.6
	Cost	35.2%	p=0.7

*P-value for a chi-square test*

An association was found between gender and vaccine safety ( $p = 0.03$ ), with 66.7% of men and 76.4% of women agreeing that people are worried about vaccine safety. Female and male HCWs also differed in their answers concerning the age group to which the HPV vaccine should be administered ( $p=0.04$ ), with 63.4% of male HCWs and 81.7% of women answering that 10-30 years is the age group that should be receiving the vaccine.

**Table 5:** Bivariate Analysis between HPV Vaccine Knowledge, Structural Problems and Attitude Against Years of Practice (Below 8 Years of Age vs. Above 8 Years of Age)

Variable	n	%	P Value
How many types of HPV are there?	Over 100	81.2%	p=0.7
What types of HPV cause cervical cancer most?	HPV 16 and HPV 18	85.20%	p=0.3
<b>How many types of the HPV vaccines are available for cervical cancer prevention?</b>	<b>2 vaccines</b>	<b>56.4%</b>	<b>p=0.002</b>
To which age group should the HPV vaccine be given?	10-30 y	70.10%	p=0.2
<b>Both boys and girls should get HPV vaccine before he/she becomes sexually active</b>	<b>Yes</b>	<b>69.80%</b>	<b>p&lt; 0.001</b>
Can HPV vaccine be given to a sexually active girl?	No	17.20%	p=0.3
<b>Do girls/women need to be screened for HPV before getting vaccinated?</b>	<b>Yes</b>	<b>59.90%</b>	<b>p=0.003</b>
<b>Can it be given to a woman already having an HPV infection?</b>	<b>No</b>	<b>68.8%</b>	<b>p=0.002</b>
How many doses of the HPV vaccine are required for protection?	3	80.20%	p=0.9
Is it safe to give HPV vaccine to HIV-infected persons?	Yes	73.10%	p=0.9
<b>Attitude</b>			
People are worried about vaccine safety?	Agree	70.30%	p=0.4
The HPV vaccine can lead to an increase in risky sexual behaviour	Agree	36.80%	p=0.04
<b>Structural problems</b>			
Communication between children and parents to get HPV vaccination might be a problem in Kenyan culture.	Agree	81.40%	p=0.4
A well-informed child should be able to request vaccination without parental consent	Agree	55.7%	p=0.8
What do you think will be the most important obstacle preventing you to receive/advice HPV vaccination?	Inadequate information	55.7%	p=0.2
	Cost	35.2%	p=0.8

*P-value for a chi-square test.*

A chi-square test done to test for association between HPV vaccine knowledge against years of medical practice showed a significant association between the types of cervical cancer, whether boys and girls should get the HPV vaccine, whether women need to be screened before the vaccination, and whether the vaccine should be given to a woman if she already has HPV infection with a p-value of 0.002, 0.001, 0.003 and 0.002, respectively.



**Table 6:** Bivariate Analysis between HPV Vaccine Knowledge, Structural Problems and Attitude Against Medical Profession

Variable	n	%	P Value
How many types of HPV are there?	Over 100	81.2%	p<0.001
What types of HPV cause cervical cancer most?	HPV 16 and HPV 18	85.20%	p=0.06
How many types of the HPV vaccines are available for cervical cancer prevention?	2 vaccines	56.4%	p<0.001
To which age group should the HPV vaccine be given?	10-30 y	70.10%	p = 0.1
Both boys and girls should get HPV vaccine before he/she becomes sexually active	Yes	69.80%	p< 0.001
Can HPV vaccine be given to a sexually active girl?	No	17.20%	p= 0.6
Do girls/women need to be screened for HPV before getting vaccinated?	Yes	59.90%	p<0.001
Can it be given to a woman already having the HPV infection?	No	68.8%	p<0.001
How many doses of HPV vaccine are required for protection?	3	80.20%	p = 0.09
Is it safe to give HPV vaccine to HIV-infected persons?	Yes	73.10%	p= 0.1
<b>Attitude</b>			
People are worried about vaccine safety?	Agree	70.30%	p= 0.006
The HPV vaccine can lead to an increase in risky sexual behaviour	Agree	36.80%	p= 0.02
<b>Structural problems</b>			
Communication between children and parents to get HPV vaccination might be a problem in Kenyan culture.	Agree	81.40%	p=0.1
A well-informed child should be able to request vaccination without parental consent	Agree	55.7%	p=0.03
What do you think will be the most important obstacle preventing you to receive/advice HPV vaccination?	Inadequate information	55.7%	P<0.001
	Cost	35.2%	p=0.2

*P-value for a chi-square test*

A chi-square test revealed a statistically significant difference between knowledge among medical staff in the following areas: the number of HPV vaccines available for cervical cancer prevention (p<0.001), with obstetricians/gynaecologists (49.1%), general practitioners (20.9%), nurses (20.9%), and others (9.1%) answering two HPV vaccines; whether the HPV vaccine should be administered before he/she becomes sexually active was statistically different

(p<0.001), with 78.9% of obstetricians/gynaecologists, 36.2% of nurses, 52.2% of general practitioners, and 32.7% of others agreeing it should; screening of girls before HPV vaccination (p<0.001), with 15.2% of obstetricians/gynaecologists, 10.7% of nurses, 47.3% of general practitioners, and 26.8% of others saying yes; whether it can be administered to a woman already infected with HPV (p<0.001), with 22.55% of

obstetricians/gynaecologists, 13.2% of nurses, 38.8% of general practitioners, and 25.6% of others stating that it cannot.

Statistical differences between HCWs perception were also observed in attitude and people's safety concerns ( $p=0.006$ ), with 44.4% of obstetricians/gynaecologist, 33.3% of nurses, 51.5% of general practitioners, and 82.5% of others either strongly agreeing or agreeing that people have concerns about the vaccine's safety; whether the HPV vaccine may lead to an increase in risky sexual behaviour ( $p=0.03$ ), with 22.6% of obstetricians/gynaecologists, 18.5% of nurses, 47.5% of general practitioners, and 52.5% of others expressing being either ambivalent or agreeing.

High cost and inadequate information were considered a handicap for advising on HPV vaccination, which differed per profession ( $p>0.001$ ), with 75% of obstetricians believing that high cost would be an impediment. The majority of the healthcare workers (51.3%) reported that inadequate information on the HPV vaccine was a major barrier towards women receiving the vaccine.

Another area of discord ( $p=0.03$ ) was whether a well-informed child should be able to request the vaccination without parental consent or not, with 79.8% of obstetricians/gynaecologists, 40.1% of nurses, 55% of general practitioners, and 25.1% of others agreeing.

**Table 7:** Bivariate Analysis between HPV Vaccine Knowledge, Structural Problems and Attitude Against Out-patient Practice Location

Variable	n	%	P Value
How many types of HPV are there?	Over 100	81.2%	$p=0.2$
What types of HPV cause cervical cancer most?	HPV 16 and HPV 18	85.20%	$p=0.2$
How many types of the HPV vaccine are available for cervical cancer prevention?	2 vaccines	56.4%	$p=0.06$
To which age group should the HPV vaccine should be given?	10-30 y	70.10%	$p=0.6$
Both boys and girls should get HPV vaccine before he/she becomes sexually active	Yes	69.80%	$p=0.04$
Can HPV vaccine be given to a sexually active girl?	No	17.20%	$p=0.4$
Do girls/women need to be screened for HPV before getting vaccinated?	Yes	59.90%	$p=0.06$
Can it be given to a woman already having an HPV infection?	No	68.8%	$p=0.1$
How many doses of the HPV vaccine are required for protection?	3	80.20%	$p=0.9$
Is it safe to give HPV vaccine to HIV-infected persons?	Yes	73.10%	$p=0.04$
<b>Attitude</b>			
People are worried about vaccine safety?	Agree	70.30%	$p=0.4$
The HPV vaccine can lead to an increase in risky sexual behaviour	Agree	36.80%	$p=0.08$
<b>Structural problems</b>			
Communication between children and parents to get HPV vaccination might be a problem in Kenyan culture.	Agree	81.40%	$p=0.4$
A well-informed child should be able to request vaccination without parental consent	Agree	55.7%	$p=0.8$
What do you think will be the most important obstacle preventing you to receive/advice HPV vaccination?	Inadequate information	55.7%	$p=0.2$
	Cost	35.2%	$p=0.8$

*P-value for a chi-square test*

There was a significant association with outpatient practice location and whether it is safe to give the HPV vaccine to HIV-infected people ( $p = 0.04$ ), with 60% of private practice offices, 77.6% of public health centres, 82.8% of hospital departments, and 33.3% of “others” saying yes; whether both boys and girls should get HPV vaccine before he/she becomes sexually active ( $p = 0.04$ ), with 66.7% of HCWs in private practice offices, 72.0% of HCWs in public health centres, 72.4% of HCWs in hospital departments, and 50.0% in other locations agreeing that both boys and girls should have the HPV vaccine before he/she becomes sexually active.

### **Discussion:**

To our knowledge, this is the first study examining knowledge across different medical professions in various settings. Our study showed that the divergence of knowledge of the HPV infection and vaccines among HCWs was high.

Our survey highlighted some gaps in knowledge concerning the availability of the two HPV vaccines and the eligibility of the administration of the three-dose HPV vaccine. General practitioners, nurses, and professionals who come under “other” categories were poorly informed about the availability of the two HPV vaccines. There was also some discrepancy in knowledge concerning whether the HPV vaccine should be administered before a person becomes sexually active, with a smaller percentage of nurses, general practitioners and HCWs than the “other” category answering that it should.

Discrepant responses were observed in different outpatient settings, with HCWs from “other” locations disagreeing the most that the HPV vaccine should be administered before boys and girls become sexually active. Furthermore, a discrepancy was also found between gender, with a smaller percentage of male HCWs answering correctly that 10-30 years is the age group that girls should be receiving the vaccine. The lack of adequate information reported by general practitioners has also been reported as a setback to promoting HPV uptake.

Several studies have shown that existing national HPV education programs have led to improved awareness and knowledge of HPV infections among HCWs and the general public.<sup>17,18</sup> This study has highlighted that Continued Medical Education (CME) and Continuing Nurse Education (CNE) programs are pivotal to strengthening cervical cancer screening programs by ensuring adequate knowledge concerning prior HPV screening and the age group to which the HPV vaccine should be administered.

Our survey highlighted that the attitude was poor among HCWs, which can be interpreted as an indication of a poor incentivizing attitude to promote HPV vaccination uptake among HCW personnel. The concern that the HPV vaccine may lead to an increase in risky sexual behaviour is echoed across the spectrum of medical professions, with nurses, general practitioners, other medical professionals, and HCWs with less than eight years of experience expressing the greatest fear. This link established between HPV vaccination and promiscuity may constitute a considerable setback, as has been shown by other studies.<sup>19,20</sup>

Significant statistical differences between HCWs' perception of people's safety concerns were also shared across the spectrum of medical professions, with a higher percentage of female HCWs being especially concerned. These findings also underscore the need to allay safety concerns in the general population which, along with one-third of HCWs expressing lack of information, may hamper initiatives to promote HPV vaccine uptake. A sub-analysis study has also enabled us to identify the need for HCWs working in private practices to be updated on recent studies showing the immunogenicity and safety of the bivalent vaccines in HIV-positive women.<sup>21</sup>

Studies have also shown that for the HPV vaccination to be generally accepted among women, healthcare workers need to have knowledge of the vaccine in order for them to advise women on the advantages of the vaccine.<sup>22</sup>

This survey has also brought to the fore the need for enhanced communication between children and parents to obtain HPV vaccination in Kenyan culture. In light of this structural bottleneck qualitative, in-depth interviews are required to identify weaknesses and develop a more efficient HPV prevention communication strategy.

### **Strengths and Limitations:**

This survey has the strengths of not only exploring knowledge and attitude across medical professions from different settings, but also exploring how knowledge differs by gender and work years. However, a limitation is that self-reported data to measure attitude may have been influenced by social desirability. In addition, given that attending the annual conference is not mandatory, the non-randomly selected HCWs attending the conference may be better informed and more inclined to update their knowledge of HPV vaccination and cervical cancer prevention than HCWs who did not attend.

### Conclusion:

Overall, there was a divergence of knowledge of the eligibility of the three-dose HPV vaccine across the medical professions. This difference of knowledge was also significant when a sub-analysis was undertaken by gender, <8 years and ≥8 years of work experience, and workplace. A poor mean attitude score was yielded, with nurses and general practitioners expressing a higher level of concern about subsequent promiscuity following HPV vaccine uptake. HCWs were unanimous about their perception of safety as a major public concern. HCWs from private practices were the most concerned about the safety of the HPV vaccine in HIV-infected girls.

There is an urgent need to bridge knowledge and divergence and to foster an attitude favourable to promoting HPV uptake. Given nurses' strategic position in public health, it is imperative that cervical cancer prevention becomes a significant component of continuing nurse education. The findings highlight the need to develop effective and possibly separate interventions for different medical professions, and possibly by gender, work practice and < 8 years and ≥8 years of work. An emphasis should be placed on how the HPV vaccine should be a crucial component of cervical cancer management in HPV naïve girls, HIV negative or HIV -infected girls.

### Abbreviations

HPV: Human Papilloma Virus

NGO: Non-Governmental Organization

IREC: Institutional Research Ethics Committee

### Declarations

#### Ethics Approval and Consent to Participate:

Ethics approval and consent to participate was sought and obtained from Moi University School of Medicine/Moi Teaching and Referral Hospital Ethical Committee (IREC). A self-administered questionnaire was given to the participants after a signed consent. Information collected was kept confidential by using numbers and codes, especially the data on knowledge, attitude, and acceptability of the HPV vaccine. Furthermore, informed consent was obtained from all individuals. Ethical approval was obtained from the Ethics Committee of the Moi Teaching and Referral Hospital/Moi University School of Medicine (IREC). FAN: IREC 1428

#### Consent for Publication

Not Applicable

#### Availability of Data and Materials:

The datasets used and/or analyzed during the current study are available from the corresponding

author on reasonable request.

### Competing Interests:

The authors declares that they have no competing interests

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### Authors' Contributions:

HM designed, collected data, analyzed and interpreted the data and wrote the manuscript. SM analyzed and interpreted the data. OO Analyzed data and contributed to writing the manuscript. JO analyzed and interpreted the data DV analyzed and interpreted data. All authors read and approved the final manuscript.

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**Author's Information:** This paper explores Kenya's healthcare provider knowledge, attitudes and acceptability surrounding the HPV vaccine which was approved in 2007. There is little or no information about HPV vaccine acceptability among HCW working in Kenya, unlike in industrialized settings. The research is innovative as it sets out to assess differences in knowledge according to different medical professions, gender, years of work, and an outpatient location in order to make policy recommendations for HPV education interventions.

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