DETERMINANTS OF HPV-VACCINES ACCEPTABILITY AMONG GUARDIANS OF GIRLS AGED 9-17 YEARS IN LAIKIPIA COUNTY, KENYA

WANYEKI PURITY WANGECI

A THESIS SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENT FOR THE AWARD OF A MASTER DEGREE IN PUBLIC HEALTH EPIDEMIOLOGY AND DISEASE CONTROL OF

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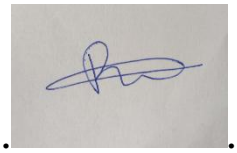
DECLARATION AND APPROVAL

I declare that this thesis is my original work and has not been presented for a degree in any other University or for any other award.

Signature…  **. Date…06/07/2025**

Purity Wangeci Wanyeki

MPH/2019/48348

Approval:

This thesis is presented with my knowledge and approval as the university supervisor for examination purposes.

Signature ……..... Date……

Dr. Joseph Muchiri, PhD.
Department of Community Health, Epidemiology and Biostatistics.
Mount Kenya University

Signature……. Date…….

Dr. Willy Kiboi, PhD.
School of Nursing and Public Health
Chuka University

DEDICATION

To my husband, daughter, parents, siblings, and friends, who have been my unwavering support throughout this journey

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ABSTRACT

Human papillomavirus (HPV) is a sexually transmitted infection (STI) and a leading contributor to cervical cancer in women. To address this public health concern, many countries have implemented prophylactic three-dose HPV vaccination programs targeting girls aged 9 years and above, administered through schools and health facilities. Kenya introduced HPV vaccination into its routine immunization schedule on October 18, 2019, becoming the 16th African country to do so. Guardians knowledge, beliefs, and perceptions about the HPV vaccine may influence its acceptance and uptake for their daughters. However, in Kenya, there is limited data on the factors that determine HPV vaccine acceptability among guardians of girls aged 9–17 years. The study aimed to assess HPV vaccine acceptability among guardians of girls aged 9–17 years in Laikipia County and to examine how guardians' knowledge, perceptions, and socio-demographic characteristics influence their willingness to accept the vaccine. A cross-sectional analytical study design was employed, with data collected using researcher-administered structured questionnaires. A sample of 473 households with girls aged 9-17 years were interviewed (N=473). Pretesting was done among 30 guardians in Laikipia West sub county to ensure validity and reliability. Participants in this study gave consent before participating in the study, and all necessary approvals were sought. All ethical standards and regulations were adhered to throughout the study. Data analysis was done through SPSS version 29. Descriptive statistics, including frequencies and percentages, were used to summarize participants' knowledge, perceptions, and vaccine acceptability. Logistic regression analysis, with a 95% confidence interval and a p-value < 0.05, was employed to identify associations between dependent and independent variables. The findings of the study revealed that majority of the respondents had a good knowledge level (84.1%), held positive perception (74.2%) as well as high HPV vaccine acceptability (66.4%). Factors significantly associated with HPV vaccine acceptability included duration lived in current residence [AOR = 0.35, 95%CI: 0.12, 1.00, p = 0.050)], occupation [AOR = 8.19, 95% CI: 3.05, 21.96, p < 0.001], and medical insurance [AOR = 0.46, 95% CI:0.24,0.88, p = 0.019]. Additionally, overall knowledge ([AOR = 2.02, 95% CI: 0.94, 4.32, p = 0.042]) and perception ([AOR = 11.08, 95% CI: 5.70, 21.57, p < 0.001]) were statistically associated with vaccine acceptability. The study concluded that demographic, socioeconomic, and attitudinal factors play a critical role in influencing guardians' decisions regarding HPV vaccination for their daughters. Despite some barriers to vaccination, the majority of respondents expressed willingness to have their daughters vaccinated. It is recommended that the Ministry of Health strengthen community-based campaigns and incorporate the HPV vaccine into the National Immunization Program. Moreover, guardians involvement in school-based vaccination programs should be prioritized to enhance uptake.

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ABBREVIATIONS AND ACRONYMS

ANOVA:	Analysis of Variance
AOR:	Adjusted odds ratio
CDC:	Center for Disease Control and Prevention
CHVs:	Community Health Volunteers
CI:	Confidence interval
COR:	Crude odds ratio
FDA:	Food and Drug administration
HBM:	Health Belief Model
HIC:	High Income Countries
HPV:	Human Papillomavirus
KEMRI:	Kenya Medical Research Institute
KNBS:	Kenya National Bureau of Statistics
LMIC:	Low- and Medium-Income Countries
MKU:	Mount Kenya University
MOU:	Memorandum of Understanding
MOH:	Ministry of Health
NACOSTI:	National Commission for Science, Technology and Innovation
STI:	Sexually Transmitted Infection
SPSS:	Statistical packages for Social Sciences
UK:	United Kingdom
US:	United States
WHO:	World Health Organization

CHAPTER ONE: INTRODUCTION

1.1 Background to the study

Human Papillomavirus (HPV) is a sexually transmitted infection (STI) and a leading cause of cervical cancer, the second most prevalent neoplastic malignancy among women globally (Scarinci et al., 2020). Women's most prevalent HPV-associated cancer is cervical cancer, with about 270,000 deaths annually. These deaths can be significantly reduced through primary prevention and prophylactic vaccination (Kristina et al., 2020). About 20 oncogenic strains of Human papillomavirus cause cervical cancer (Ford et al., 2020). Additionally, about 44000 new cancer cases annually, out of which 34,800 are caused by Human papillomavirus (Kristina et al., 2020). According to Barnabas et al., (2021), HPV 35 and 16 account for 8% of infections in Africa, HPV 31,45,56 and 58 account for 6%.

Cervical cancer primarily affects women in developing countries, particularly those in lower socioeconomic regions, due to limited access to preventive services such as vaccination and early screening (Mburu et al., 2019). Vaccinating pre-adolescent girls at a low cost is an effective strategy for combating cervical cancer (Warner et al., 2017). In Kenya, approximately 5,250 new cases and 3,286 deaths from cervical cancer occur annually (Mburu et al., 2019). Of these new cases, women between the ages of 15 and 44 are most affected, with about 1002 new cases annually. Vaccinating teenage girls before the onset of sexual activities is important to effectively prevent or reduce cervical cancer cases (Ngetich et al., 2021). In Kenya, 5,000 new cases of cervical cancer and 3,000 deaths due to cervical cancer complications were reported in 2020 (Kagina et al., 2022).

According to Mabeya et al. (2018), the incidence of cervical cancer in Kenya is projected to nearly double by 2025.

Lately, many developed countries are adopting vaccination and early detection of HPV carcinogenic types to deal with HPV infection among girls of adolescent age (Ramanadhan et al., 2020). The U.S. Food and Drug Administration (FDA) has approved three vaccines for Human Papillomavirus (HPV) (Barnabas et al., 2021): the quadrivalent vaccine, approved in 2006; the bivalent vaccine, approved in 2009; and the nonavalent vaccine, approved in 2014, all aimed at reducing HPV infection incidence and cervical cancer (Deignan et al., 2021). HPV prophylactic vaccines are designed to protect against specific HPV strains. The bivalent vaccine (Cervarix®) targets high-risk HPV types 16 and 18, which are oncogenic and responsible for approximately 70% of cervical cancer cases. The quadrivalent vaccine (Gardasil®) covers the same high-risk types, 16 and 18, along with low-risk types 6 and 11, which are associated with genital warts (Barnabas et al., 2021); and the nonavalent vaccine (Gardasil 9®) covers additional high-risk strains (HPV 31, 33, 45, 52, and 58), accounting for about 20% of cervical cancer cases (Gallagher et al., 2017). Njuguna et al. (2021) note that the Centers for Disease Control and Prevention (CDC) recommends routine HPV vaccination for girls at ages 11 or 12 with a three-dose schedule, while those aged 13–26 are advised to receive catch-up immunization. Many countries have implemented HPV vaccination programs through schools and healthcare facilities to increase coverage and accessibility (Mburu et al., 2019).

Kenya introduced HPV vaccination into its routine immunization schedule on October 18, 2019, becoming the 16th African country to do so with a target of 800,000 girls aged ten years (Ministry of Health, Kenya, 2019). This was after a 2year pilot program in Kitui

County targeting girls aged 9-12 years which indicated a 96% successful uptake, revealing readiness to roll out the program (Kagina et al., 2022). Kenya administers two doses of either the bivalent or quadrivalent HPV vaccine free of charge to girls above 10 years, with a six-month interval between the doses (Mabeya et al., 2018; Ombuor, 2019).

Despite the numerous efforts by the Kenyan government to promote HPV vaccination, influential opponents, such as religious leaders, have discouraged guardians from allowing their daughters to receive the vaccine, arguing that it may encourage premarital sex (Nzwili, 2019). Other studies in Northeastern and coastal regions of Kenya showed that lack of knowledge of HPV vaccine largely contributed towards low HPV acceptability. The uptake of the HPV vaccine in Kenya has remained low, with only 33% of the targeted population receiving the first dose in 2020, and just 16% returning for the second dose (Kagina et al., 2022). Additionally, limited research has been conducted in Kenya on HPV vaccine acceptability, with no studies specifically focusing on Laikipia County (Mabeya et al., 2018).

This study sought to assess the determinants influencing HPV vaccine acceptability among guardians of girls aged 9-17 years. The results of this study contribute towards increasing HPV vaccination coverage that leads to prevention and control of cervical cancer in Laikipia County and Kenya at large.

1.2 Statement of the problem

Despite the known effectiveness of HPV vaccination in preventing cervical cancer, uptake in Kenya remains low, with only 33% of the target population receiving the first dose and 16% the second (Kagina et al., 2022). In Laikipia County, where nomadic lifestyles, rural and semi-urban set up, limited access to healthcare, and cultural barriers prevail, guardians'

decisions critically impact vaccine acceptability. However, little is known about the key determinants influencing their willingness to accept the HPV vaccine for their daughters. This gap in evidence hinders tailored interventions that could improve coverage. There is limited data on HPV vaccine acceptability among guardians in Laikipia County and other regions in Kenya. Since guardians play a crucial role in consenting to HPV vaccination for their daughters, understanding the factors influencing their decision is essential. Therefore, this study seeks to identify the underlying factors—knowledge, perception, and sociodemographic characteristics—that influence HPV vaccine acceptability among guardians of girls aged 9–17 years in Laikipia County.

1.3 Study objectives

1.3.1 Broad objective of the study;

To identify the determinants of HPV-vaccines acceptability by guardians of girls aged 9-17 years in Laikipia County, Kenya.

1.3.2 Specific objectives of the study;

i. To assess the acceptability of HPV vaccine among guardians of girls aged 9-17 years in Laikipia County, Kenya.
ii. To determine the influence of HPV level of knowledge on HPV vaccine acceptability among guardians of girls aged 9–17 years in Laikipia County, Kenya.
iii. To determine the influence of HPV perception on HPV vaccine acceptability among guardians of girls aged 9–17 years in Laikipia County, Kenya.
iv. To determine the influence of socio-demographic factors on HPV vaccine acceptability among guardians of girls aged 9–17 years in Laikipia County, Kenya.

1.4 Research questions

The research questions were;

i. What is the level of HPV vaccine acceptability among guardians of girls aged 9–17 years in Laikipia County, Kenya?
ii. How does guardians' level of knowledge of HPV influence HPV vaccine acceptability among guardians of girls aged 9–17 years in Laikipia County, Kenya?
iii. How does guardians' perception of HPV influence HPV vaccine acceptability among guardians of girls aged 9–17 years in Laikipia County, Kenya?
iv. What is the influence of socio-demographic factors on HPV vaccine acceptability among guardians of girls aged 9–17 years in Laikipia County, Kenya?

1.5 Significance of the study

This study immensely contributes to the existing literature hence relevant in guiding future studies of HPV vaccine acceptability. Additionally, Information acquired will contribute towards guardians' acceptability towards HPV vaccination of their daughters, which will in turn play a major role in prevention of cervical cancer. Vaccine acceptability is key in ensuring successful immunization programs in Kenya and this study will support the government in realizing its health outcomes. Moreso, the information is vital for Laikipia County as well as other counties in identifying ways of up scaling vaccination, notifying the health sector on the aspect of HPV vaccine that need to be emphasized in the health promotion programs to increase acceptance and additionally, consecutive prevention and control of cervical cancer. On the other hand, information from this study will guide health programs geared towards HPV infection and increased uptake of HPV infection.

1.6 Justification of the study

Cervical cancer remains a major public health burden in Kenya, particularly in regions with limited access to health education and services. Guardians play a central role in decision-making for HPV vaccination, yet their knowledge and attitudes remain understudied in Laikipia County. This study is justified as it provides context-specific evidence on barriers and facilitators to vaccine acceptability, informing more effective health promotion and policy strategies. The findings will support efforts by the Ministry of Health and other stakeholders to improve vaccine uptake and reduce cervical cancer incidence.

1.7 Scope of the study

The study exclusively took place within Laikipia County. Additionally, the research was limited to given time frame where the activities were scheduled during the research period. The study covered guardians whom girls were aged nine to seventeen years in Laikipia County. Furthermore, the study examined guardians' acceptability and the association between guardians' knowledge, perceptions, socio-demographic factors and their association to HPV vaccine acceptability.

1.8 Study limitations

The study relied on self-reported data, which may be subject to recall or social desirability bias. Additionally, cross-sectional design limits causal inferences between variables.

Language barriers or misunderstandings during interviews may have influenced some responses despite translation efforts.

1.9 Delimitations

This study was delimited to guardians of girls aged 9–17 years residing in Nyahururu Sub-County, Laikipia County, Kenya. It focused specifically on assessing the acceptability of the HPV vaccine and its association with guardians' knowledge, perceptions, socio-demographic, and health facility-related factors. The study excluded girls themselves, healthcare providers, and other community members not directly involved in vaccination decision-making. It also concentrated only on HPV vaccine acceptability and not on actual vaccine uptake, completion rates, or long-term health outcomes. Data collection was limited to a specific period and relied on structured questionnaires administered to selected households.

1.10 Assumptions of the study

It was assumed that all respondents provided honest and accurate information during the interviews. The study also assumed that the sample size selected was representative of the guardian population in Laikipia County. Additionally, it was presumed that the data collection tools used in the study effectively measured the variables of interest, including knowledge, perception, and vaccine acceptability. Finally, it was assumed that guardians fully understood the importance of their role in making decisions regarding HPV vaccination for their daughters.

1.11 Operational definition of terms

Acceptability: The willingness of guardians to allow their teenage girls to receive the HPV vaccines.

Adolescents: This is a development stage marked by biopsychosocial changes and it is the transitioning phase from childhood to adulthood. In this study, adolescent girls were girls aged 9-17 years.

Knowledge: These are facts and information gained through education, experience or understanding of a subject. In this study, guardians' knowledge entails the known facts and information about HPV, HPV vaccine and other HPV related information and the ability to apply the knowledge towards HPV vaccine acceptance to their daughters.

Perception: Health perception refers to a person's belief and attitude towards their mental, physical and social well-being and which influences their decision towards their health responsibility and behavior (Yiğitalp et al., 2021). A measure of how guardians' perception of HPV vaccines influences their consent towards vaccination of their daughters who are 9-17 years was carried out in this study. The study participants were gauged on their opinion regarding the seriousness of cervical cancer, their level of risk and impact of cervical cancer.

CHAPTER TWO: LITERATURE REVIEW

2.1 Introduction

This section provides a critical analysis of the literature, examining previous studies on the factors influencing HPV vaccine acceptability among guardians of girls aged 9 to 17 years in Kenya and other regions. Additionally, the chapter incorporates both theoretical and conceptual frameworks.

2.2 Empirical literature

2.2.1 Acceptability of HPV vaccine

HPV vaccine acceptability refers to guardians' willingness to approve and consent to the HPV vaccine for themselves or their children (Kristina et al., 2020). Successful teenage immunization programs come from increased parental willingness of the HPV vaccine (Kagina et al., 2022). Globally, HPV vaccine acceptability among guardians varies significantly by region due to factors such as awareness, health literacy, cultural beliefs, and access to health services. In high-income countries, such as the U.S. and the UK, vaccine acceptability has been relatively high, especially when supported by school-based vaccination programs and consistent health messaging (Kristina et al., 2020; Lei et al., 2021). However, vaccine hesitancy persists due to misinformation, perceived vaccine safety concerns, and beliefs about early sexual activity (Bednarczyk, 2019).

In sub-Saharan Africa, acceptability has remained moderate to low due to knowledge gaps, poor health infrastructure, and sociocultural barriers (Santhanes et al., 2018). Studies from Uganda and Rwanda show that vaccine acceptability increases when parents are well-informed and when services are integrated into routine school or facility-based immunization programs (Nabirye et al., 2020).

In Kenya, HPV vaccine acceptability is hindered by parental concerns about vaccine safety, lack of information, and cultural misconceptions (Njuguna et al., 2021; Kagina et al., 2022). In some counties like Kitui, acceptability was high during the pilot phase due to intensive community engagement, but in others like Tana River, low knowledge levels and religious opposition reduced uptake. Most studies in Kenya focus on uptake, not acceptability, especially from the perspective of guardians—creating a gap this study seeks to fill. Whereas research and piloting has been conducted in African and East African countries, there is limited research conducted in Kenya and none in Laikipia County regarding HPV vaccine acceptability among guardians of adolescent girls (Mabeya et al., 2018).

In Kenya, the rollout of the HPV vaccine has encountered logistical, social, and cultural challenges. While the Ministry of Health integrated the vaccine into the national immunization schedule in 2019, uptake has remained below target due to low awareness, misinformation, and vaccine hesitancy among guardians (Njuguna et al., 2021). Some counties reported successful pilot programs, such as in Kitui, where coordinated school-based campaigns yielded higher coverage. However, sustained success has been hindered by inconsistent messaging and limited follow-up on second-dose completion. Comparing these efforts to regional neighbors like Rwanda, where structured and government-led communication has led to higher uptake, highlights the potential of culturally tailored outreach in improving vaccine acceptability (Binagwaho et al., 2012). Understanding how Kenyan guardians interpret and act on vaccine information is therefore essential for program effectiveness.

2.2.2 Knowledge of HPV vaccine

An individual with knowledge about vaccination should be aware of the target groups, timelines and where the vaccination is conducted and should be satisfied by the vaccination information (López et al., 2020). McBride and Singh (2018) found that while a significant proportion of participants (70%) recognized HPV as a cause of cervical cancer, fewer individuals (14.9% to 31.5%) were aware of its association with other cancers. Furthermore, factors such as knowledge levels, clarity, and bias significantly influenced HPV vaccine uptake. Similarly, research by Karafillakis et al., (2019) found that 44% of individuals hesitant about the HPV vaccine cited inadequate knowledge about the vaccine as a contributing factor. Likewise, 92% of hesitant guardians reported lack of clarity of the HPV information and that the information was biased while 32% believed in the unreliability of the information. On the other hand, such studies did not look assess determinants of HPV vaccines acceptability among teenage girls.

HPV vaccine knowledge is greatly affected by factors like gender, family income, education level (McBride & Singh, 2018). According to Shapiro (2022), people are more likely to recognize behavioral risk factors, such as smoking, as contributors to cancer than they are to understand the role of infectious agents like HPV. Other studies assessing HPV knowledge across four categories—general knowledge, knowledge of cervical cancer, knowledge of other cancers, and knowledge of the HPV vaccine—showed that 70% of adults were aware of the link between HPV and cervical cancer, while only 14.9% to 31.5% understood the connection between HPV and other cancers (McBride & Singh, 2018). However, these studies did not specifically assess the level of knowledge about the HPV vaccine among guardians.

Vaccine resistance among guardians was explained in a model of individual factors which amongst them were knowledge and information (López et al., 2020). According to López et al., (2020), a study conducted in Europe identified key barriers to HPV vaccine acceptance, including concerns about vaccine safety, its perceived effects on teenage sexual behavior, and doubts about its effectiveness. Similarly, Monteiro et al., (2018) highlighted that fears regarding vaccine side effects, its composition, and its potential link to chronic diseases reflect a lack of adequate knowledge about the HPV vaccine. Furthermore, studies by Santhanes et al. (2018) demonstrated that low awareness of HPV and its vaccine among women in Asia and Western countries negatively affected vaccine uptake. For example, research in Hong Kong found that only 27.5% of mothers were willing to vaccinate their daughters, while a study in Japan highlighted that mothers' knowledge levels significantly influenced their decisions, with only 16% intending to vaccinate their daughters. Additionally, studies indicate that educational interventions for guardians could increase vaccine acceptability for their daughters by 70% (McBride & Singh, 2018). On the other hand, these studies did not explore the determinants of HPV vaccine acceptability among teenage girls, nor did they examine the factors influencing HPV vaccine acceptability.

A study conducted in Western Kenya revealed low levels of awareness among mothers of adolescent girls, leading to low acceptability of the HPV vaccine (Mabeya et al., 2021). Consequently, insufficient knowledge about HPV vaccination has been related to Hispanics' low vaccine acceptability levels (Dochez et al., 2017). Access of public information related to HPV vaccine has been a challenge due to language barriers. Most information was found to be available in English hence limiting people with low

proficiency in obtaining clear and in-depth information (Dochez et al., 2017). Social media related content on HPV has been found to increase the knowledge and awareness levels (Ortiz et al., 2019). According to Febriani et al., (2018) there is a need to incorporate sexual health education programs within programs focusing on HPV vaccination promotion. On the other hand, increased knowledge levels of adolescents and women have been reported in some studies resulting from education campaigns with other studies showing low knowledge levels among the facilitators (López et al., 2020). Guardians in Latin America have perceived the vaccine as new technology; hence, lack of information about it was noted (Leite e Sousa et al., 2018). On the other hand, such studies did not look assess determinants of HPV vaccines acceptability among teenage girls, hence the current study.

Mburu et al., (2019) found that most Kenyan women had limited knowledge about HPV vaccination, and accepting to consent towards vaccination of their daughters largely depended on the perceived effectiveness of the vaccine in protecting against cancer. According to Leite e Sousa et al., (2018), there exists a gap in knowledge for HPV vaccine safety and its ability to prevent against genital warts and precursor lesions. There is missing research on the knowledge levels of guardians of Laikipia County, Kenya regarding to HPV vaccine and related knowledge and how their knowledge levels influence HPV vaccine acceptability among their daughters.

2.2.3 Perception of HPV vaccine

Despite the numerous efforts made to promote the HPV vaccine, several challenges have been encountered, including low acceptance rates and guardians misconceptions. The HPV vaccine faces low acceptance rates among some guardians due to the perception that

vaccinating their daughters may imply approval for early sexual activity (Febriani et al., 2018). A study found that 43% of participants expressed concerns about the safety and potential negative effects associated with the HPV vaccine. Guardians perceived the virus to cause infertility and possibility of causing multiple sclerosis as perceived from Hepatitis B vaccine (Karafillakis et al., 2019). Guardians have been shown to perceive HPV vaccination to their daughters as a leeway to unsafe sex by believing it may protect them from other sexually transmitted illnesses (Mburu et al., 2019). However, there is a knowledge gap on how this perception has influenced acceptability of the HPV vaccine to their daughters. Overall vaccine perception hasn't been outlined in these studies.

Additionally, a study conducted among non-Hispanic white women found that HPV vaccine uptake was significantly associated with perceived susceptibility to HPV rather than perceived benefits or disease severity (CalderónCalder et al., 2020). There were gaps regarding to perceived benefits and severity and how they would relate to acceptability. Some countries suspended HPV immunization programs due to lack of public trust as a result of rumors on the possibilities of adverse effects caused by the HPV vaccine (Harrington et al., 2021). Lack of trust towards the vaccine by guardians has also resulted in low vaccine acceptability (Febriani et al., 2018). Existence of myths and misconceptions about the HPV infection can result in an over-evaluation of the vaccine. This can affect the importance of surveillance against cervical cancer (Leite e Sousa et al., 2018). Misinformation about the HPV vaccine within the community has a significant impact, fostering negative attitudes that reduce HPV vaccine uptake (Njuguna et al., 2021). Majority of communities in Kenya perceive HPV vaccination with mistrust, poor knowledge and misinformation (Njuguna et al., 2021). Consequently, guardians' belief in

the effectiveness of the HPV vaccine in preventing cervical cancer plays a crucial role in influencing its acceptability (Febriani et al., 2018). Some perceive HPV vaccination as an introduction to negative religious groups like illuminati (Njuguna et al., 2021).

Many countries including Rwanda and Uganda introduced great subsidies towards HPV vaccine. Kenya also incorporated HPV vaccination into its routine vaccination program to increase the acceptability and uptake. However, this has faced several perceptions that have hindered acceptance, including limited awareness, concerns about safety and future fertility (Santhanes et al., 2018). There are information gaps on the perception of cost and affordability of HPV vaccine among guardians and how this has affected HPV vaccine acceptability.

Vaccination against HPV has been proven to have high effectiveness in preventing HPV infections, and several countries have demonstrated greater adoption of HPV vaccination programs. Studies reveal a 68% decrease of HPV 16/18 infections in countries where 50% of females have received vaccination. (Shapiro, 2022). A study conducted among Swedish women who received the quadrivalent HPV vaccine and were followed from ages 10 to 30 revealed a cumulative incidence of invasive cervical cancer of 94 cases per 100,000 in the unvaccinated group, compared to 47 cases per 100,000 in the vaccinated group. This finding highlights the effectiveness of the HPV vaccine in reducing the risk of invasive cervical cancer (Lei et al., 2021). However, the study did not sufficiently explore the role of guardians in the acceptability of the HPV vaccine for girls under 17 years old. There are information gaps of how wide HPV vaccination programs were and whether affordability of HPV vaccines consequently resulted in high HPV vaccine acceptability.

Additionally, because it makes other malignancies, including cervical cancer, more likely, cervical cancer is seen as being serious (Song et al., 2015). A study suggests that a family's history of cervical cancer influences parental willingness to accept the HPV vaccine. Consequently, one of the key factors driving HPV vaccine acceptance is the perceived impact of cervical cancer on the family and an individual's ability to care for loved ones. They believed that HPV infections interfered with their overall quality of life and wellbeing (CalderónCalder et al., 2020). Although extensive research has explored women's perceptions of HPV severity, few studies have examined how guardians perceive the severity of HPV concerning their daughters.

Earlier studies conducted in the U.S. identified various myths held by African American guardians, which act as barriers to the vaccination of their children. They cited unsafety of the vaccine which was challenged by a study that states that out of 2milllion deaths of youths in the year which they received the vaccine, the death patterns weren't consistent and only one youth's death was in the vaccination month.(Lama et al., 2022) Other myths highlighted in the study includes children at 11 or 12 years are too young to be vaccinated, there is limited test for the vaccine and that there isn't need for vaccination after Pap smear tests(Bednarczyk, 2019). The community's perception of HPV vaccination programs has not been thoroughly assessed in most low and middle-income countries, and Kenya is no exception. In order to ensure scale up and sustainability of the vaccination programs, it would be essential to assess and address vaccination barriers (Dereje et al., 2021).

2.2.4 Socio-Demographic Factors Influencing HPV Vaccine Acceptability

Socio-demographic and health facility-related factors play a crucial role in influencing HPV vaccine acceptability among guardians. Cultural beliefs, religious norms, and household decision-making dynamics often shape guardians' attitudes toward adolescent vaccination. For example, studies show that in many African settings, including Kenya, cultural sensitivity and religious interpretations significantly affect vaccine decisions. Some guardians perceive the HPV vaccine as implicitly endorsing early or extramarital sexual activity, which leads to hesitancy or outright refusal (Santhanes et al., 2018). In conservative communities, particularly those with strong religious or patriarchal structures, men may discourage their spouses from immunizing their daughters, and misinformation about vaccine safety is common (Lahijani et al., 2021). Additionally, socio-cultural challenges such as early marriages, school dropouts, and limited exposure to reproductive health information further reduce the likelihood of HPV vaccine acceptance in pastoralist and informal settlement areas of Kenya (Mabeya et al., 2018).

Religious institutions can also influence community attitudes towards the HPV vaccine, either by reinforcing misinformation or promoting abstinence-only ideologies. While some churches advocate for vaccination, others express distrust toward the healthcare system or emphasize sexual purity, which undermines public health efforts (Lahijani et al., 2021). Despite the central role of religion in shaping public attitudes, few studies have systematically evaluated how religious leaders and structures influence HPV vaccine acceptability.

In addition to socio-demographic considerations, health facility-related factors are key determinants of vaccine acceptance. Healthcare workers' attitudes, knowledge, and ability to communicate vaccine benefits influence guardians' decisions. Studies show that when healthcare professionals hold personal biases or lack adequate training about adolescent health, they may fail to recommend the vaccine or provide incomplete information (Warner et al., 2017). Furthermore, limited staffing, vaccine shortages, poor cold-chain systems, and inadequate outreach programs all reduce access and trust in the health system (Cooper et al., 2019; Nabirye et al., 2020). In Uganda, for instance, facility-based barriers such as insufficient provider training, funding, and information materials were directly linked to low vaccine uptake (Nabirye et al., 2020).

A missed opportunity exists during adolescent girls' health visits, where vaccination could be offered but often is not. One study revealed that 79% of unvaccinated girls had visited a health facility within the previous year, yet they were not offered the HPV vaccine (Warner et al., 2017). This highlights system-level inefficiencies in capturing eligible adolescents. Concerns about vaccine safety and inadequate knowledge among health professionals, coupled with guardians' mistrust of the health system—as reported in European studies—further complicate vaccine promotion (Karafillakis et al., 2019).

Government policy, vaccine cost, and public awareness campaigns also significantly influence vaccine acceptability. Publicly funded HPV programs with clear guidelines and strong health worker involvement have demonstrated higher uptake in multiple settings (Shapiro et al., 2022). However, in Kenya and many other low- and middle-income countries, information on how such programs influence guardians' attitudes remains limited. Furthermore, few studies have concurrently examined the interaction between

socio-demographic characteristics and health system factors in determining HPV vaccine acceptability—an area that this study seeks to address.

2.3 Theoretical framework

The Health Belief Model (HBM) was created by social scientists from Public Health Service in the U.S. in the early 1950s. It aimed at determining why people fail to take up programs for early disease detection and prevention (Mercadante & Law, 2020). The theory was developed at a time when there was free screening of tuberculosis in the U.S. The Public Health service delivered mobile X-ray units to people free of charge and conveniently, but it yielded limited success. They hence decided to determine factors that were influencing or hindering their uptake for the program and came up with the Health Belief model (Green et al., 2020).

The theory states that a person's acceptance of behavior will be influenced by their perception of the disease's potential dangers and the effectiveness of the suggested treatment or preventive strategy (Vermandere, 2016). The Health Belief Model (HBM) explains individuals' health behaviors based on factors such as their perceived risk, benefits, barriers, severity and readiness to take action (Aldohaian et al., 2019). The constructs are useful in this investigation because they clarify attitudes around HPV and HPV vaccination and, thus, help determine acceptance (Ammar et al., 2020). The notion states that an individual's perceived benefits and likelihood to accept and act on a health issue should outweigh any perceived hurdles. A component of the Health Belief Model, known as self-efficacy, refers to the expectations about one's ability to successfully perform the behavior (Aldohaian et al., 2019). Vermandere (2016) asserts that there is a great connection between the structures of HBM and the acceptability of the HPV vaccine.

In order to consent to their daughters receiving the HPV vaccine, a guardian must consider cervical cancer to be serious, believe that their daughters are at risk of the disease, and be confident that receiving the vaccine will prevent cervical cancer and have no negative side effects (Vermandere et al., 2016).

The HBM was particularly relevant in analyzing the relationship between perceived severity and perceived benefits with actual vaccine decision-making. By structuring perception-related questions around the HBM constructs, the study was able to explore not just awareness levels, but the motivational and psychological barriers to vaccine uptake.

In this study, the Health Belief Model guided the design of the questionnaire and interpretation of findings. Specifically, the constructs of perceived susceptibility, perceived severity, perceived benefits, and perceived barriers were used to frame questions assessing guardians' perceptions about HPV and the vaccine. For example, the perception scale evaluated how guardians viewed their daughters' risk of HPV and the benefits of vaccinating early. Self-efficacy was also explored by assessing guardians' confidence in making vaccine decisions. These constructs were later analyzed to determine their influence on vaccine acceptability.

2.4 Gaps in literature review

Despite numerous global studies on HPV vaccine uptake and effectiveness, there is limited research focused specifically on guardians' acceptability of the vaccine, particularly in rural Kenyan settings. Most Kenyan studies emphasize vaccine coverage statistics or focus on adolescent girls and health workers, overlooking the critical role of guardians as decision-makers. Additionally, there is a scarcity of data on how socio-

demographic and facility-based factors interact with guardians' perceptions and knowledge to influence acceptability. Limited studies were identified focusing on Laikipia County, Kenya, further justifying the need for this research.

2.5 Conceptual framework

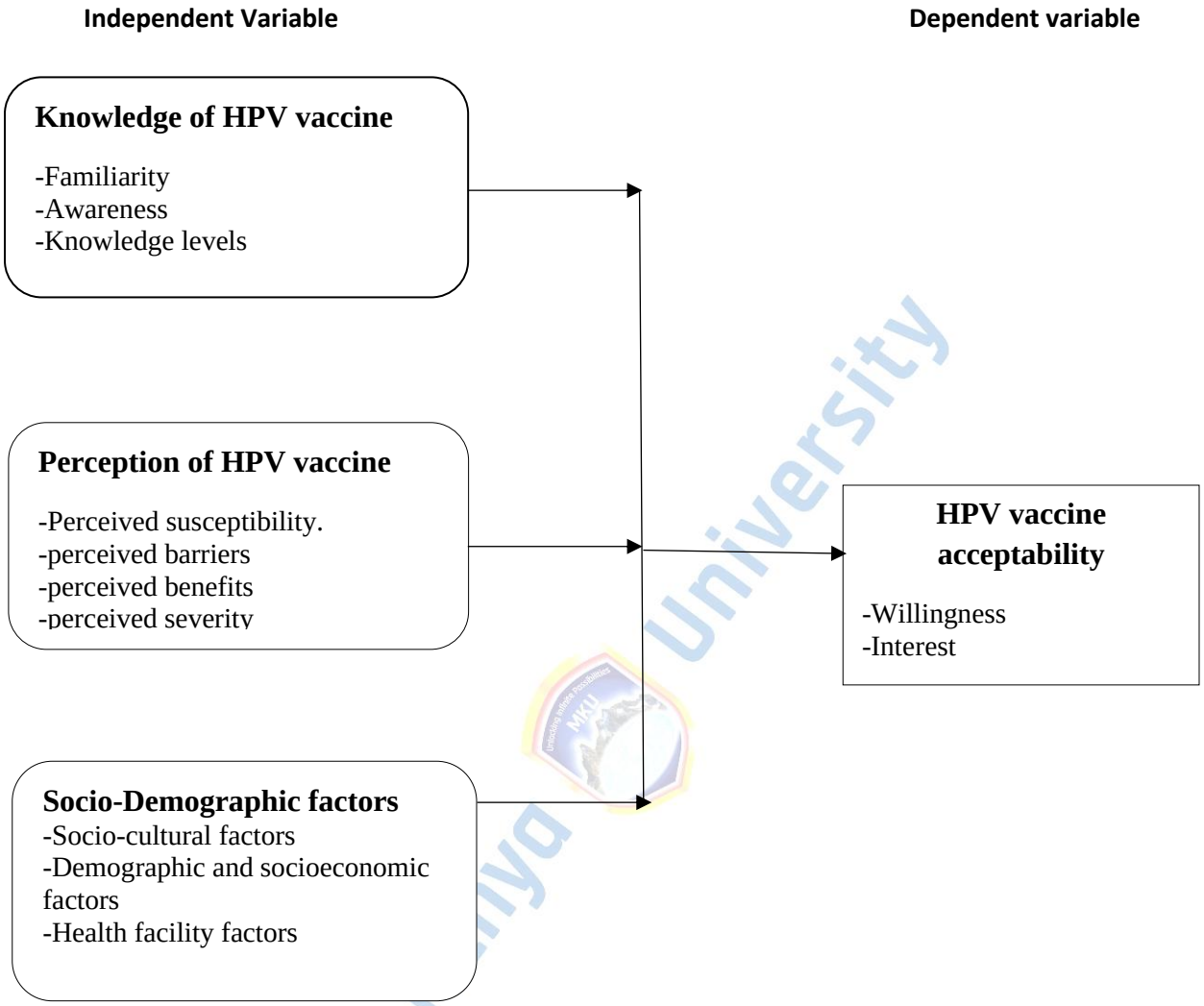

Figure 1: Conceptual framework on factors influencing HPV vaccine acceptability among guardians of girls aged 9-17years.

Source: Adopted and modified from Morteza et al., (2017)

CHAPTER THREE: RESEARCH METHODOLOGY

3.1 Introduction

This chapter presents the research methodology, including a detailed description of the research design, the study's setting, the study's target audience, the sampling procedure and techniques, the sample population, the validity, and reliability testing to be done, the data collection techniques to be used, the proposed data analysis techniques, and the ethical considerations made.

3.2 Research design

The study adopted an analytical cross-sectional design, which is suitable for examining the relationships between variables at a specific point in time (Wang & Cheng, 2020). This design was appropriate for assessing the acceptability of the HPV vaccine and its associated factors, as it allowed for data collection from a representative sample within a defined time frame and resource limits. It also enabled identification of statistical associations between dependent and independent variables, without the need for follow-up.

3.3 Study variables

The dependent variable of the study was HPV vaccine acceptability, measured as a binary outcome (Accept vs. Do not accept), based on guardians' willingness to vaccinate their daughters (López et al., 2020). The independent variables in this study included sociodemographic characteristics, knowledge level, and perception. Sociodemographic characteristics comprised age, gender, education level, income, marital status, religion,

type of health facility visited, and method of payment for healthcare, and were measured using structured multiple-choice items.

Knowledge level was assessed through 22 structured questions related to HPV and HPV vaccination, with each correct response scoring one point. The total scores were converted into percentages and categorized as either “Good” (greater than 50%) or “Poor” (50% or below) (Shapiro, 2022). Perception was measured using 14 items rated on a 5-point Likert scale ranging from 1 (Strongly Disagree) to 5 (Strongly Agree) (Shapiro et al., 2018). The individual scores were aggregated into a percentage, with values above 50% indicating a positive perception and those 50% or below indicating a negative perception (Abi Jaoude et al., 2018).

3.4 Location of the study

The study was carried out in Nyahururu Sub-County, Laikipia County. Laikipia is a diverse, cosmopolitan county predominantly characterized by rural settlements. Additionally, the County has diverse cultures and is dominated by crop and livestock farming activities (County Government of Laikipia, 2018). Limited data on HPV vaccination status and cervical cancer in Laikipia County necessitated further research in the region.

3.5 Study population

The study population included all guardians of girls aged 9–17 years residing in Nyahururu Sub-County, Laikipia County. Guardians were defined as adults (18 years and above) who were primary decision-makers in the household concerning health matters of the adolescent girl(s). This included biological parents, grandparents, or other adult caregivers. The

sampling frame used was 22,053 which was the total number of households in Nyahururu division.

3.5.1 Target population

The study focused on guardians of girls aged 9 to 17 in Nyahururu Sub-County, Laikipia County. These individuals were considered key decision-makers regarding HPV vaccination and were thus eligible to participate.

3.5.2 Inclusion criteria

The inclusion criteria comprised guardians aged 18years and above who has at least one girl aged 9 and 17 years in the household. Additionally, the study included guardians residing in Nyahururu Sub- County for at least 6 months who provided informed consent to participate in the study.

3.5.3 Exclusion criteria

Mentally incapacitated guardians unable to provide reliable responses were excluded from the study. Additionally, guardians of girls outside the 9–17-year age range were excluded from the study. Equally, guardians who were unwilling to participate and those who took part in the pretesting phase of the study were also excluded.

3.6 Sample size determination

Nyahururu Division has 22,053 households, according to KNBS (2019). Using the Fisher et al. (1998) calculation, a sample size of 422 guardians of girls between the age of 9 and 17 years was derived.

This was calculated with the following parameters: a 5% margin of error and a 95% confidence level.

The formula used to calculate is: $n = Z^2\ ([p\ (1-p)])\ /d^2$

Where: n= sample size, z=normal deviant at 95% confidence interval=1.96, p=population proportion estimated to be 50% according to Rajiah et al. (2017) and $d = margin\ of\ acceptable\ error = 0.05$.

Using the formula, the minimum sample size (N) = 384.

$$Sample\ size\ (n) = 1.96^2\ ([0.5\ (1 - 0.5)])\ /0.05^2$$

$$n = (3.8416 * 0.25)\ /0.0025$$

…… $n = 384$

A provision for 10% sample size was included to cater for a possible non-response. Therefore, the sample size was 422 households. The study collected and reported data on 473 participants.

3.7 Sampling techniques

This study employed a multi-stage sampling technique. This method enabled the researcher to draw samples from the population by progressively selecting smaller and smaller groups at each stage. To create the sample, the population was separated into clusters at various levels (Bhandari, 2021). The sampling frame was 22,053 which is the total number of households in Nyahururu division. The first step involved selecting the main sampling units. Laikipia County consists of five sub-counties: Laikipia West, Laikipia East, Laikipia North, Laikipia Central, and Nyahururu Sub-County. The five sub-counties were listed, and Nyahururu Sub-County was randomly chosen as the main sampling unit. Nyahururu Sub-County comprises four divisions: Nyahururu, Marmanet, Gituamba, and Ngarua. These divisions were listed, creating the four primary sampling units, and Nyahururu division was randomly chosen.

In the second stage, the primary sampling unit (Nyahururu division) was divided to form the secondary sampling units. The five localities in Nyahururu division were listed, and the locations were grouped into urban, suburban, and rural strata. One location was selected from each stratum using simple random sampling, resulting in three selected locations. This method ensured that no bias was introduced.

The final stage involved creating the ultimate sampling units. The three selected locations were listed with their corresponding sub-locations. Using simple random sampling, two sub-locations were chosen from each location, giving a total of six ultimate sampling units. After selecting the six sub-locations using multistage sampling, systematic random sampling was used to select households from each sub-location's list. The sampling interval was calculated by dividing the total number of households by the required sample for that sub-location (Table 1). Within each household, the guardian most responsible for health-related decisions of girls aged 9–17 was identified and recruited after providing informed consent. If more than one eligible guardian was present, one was selected using simple random sampling.

Table 1:Distribution of study sample

Sub-County	Division	Location	Sub-location name	Households per sub-location	Proportionate sample
Nyahururu	Nyahururu-22053	Nyahururu-8071	Ndunyu	4944	121
			Manguo	3127	76
		Maina-3519	Maina	2293	56
			Ndururumo	1226	30
		Igwamiti-5691	Losogwa	3244	79
			Shemanei	2447	60
		TOTAL SAMPLING FRAME 22053; TOTAL 17281			**422**

3.8 Data collection tools

Data was collected over a four-week period in April 2023**.** A questionnaire comprising 40 questions was administered in this study. The questionnaire was developed through a process of modification from earlier related studies (de Oliveira et al., 2020; Leite e Sousa et al., 2018) and tailored to the specific objectives of our research. Four sections made up the questionnaire: 1) Socio-demographic characteristics of guardians;(Age, gender, marital status, education level, income level, and place of residence); 2) their knowledge of HPV; 3) their perception of the HPV vaccine informed by the health belief model (Aldohaian et al., 2019); (Perceived likelihood and severity of sickness; Attitude Toward Vaccination; Perceived Vaccine Safety and Effectiveness). and their 4) Acceptability of the HPV vaccine.

3.9 Pre-Testing of the Data Collection Tools

A pre-test was conducted with 30 guardians of girls aged 9-17years who had similar population characteristics as those sampled in the main study. (Kristina et al., 2020). The pre-test was done in Laikipia West sub-county which targeted a different population from the one in the main study (Nyahururu sub-county).

3.9.1 Validity of the tools

By enlisting specialists to carefully review the questionnaire and evaluate its content, validity was established. The final questionnaire included the input that was provided. Before the main data collection, a pre-test study was conducted with 5% of the sample size from the population, excluding those who participated in the main study. This was done to test the validity of the questionnaire and ensure the accuracy of the study's results. Pre-testing the questionnaire was done to ensure its clarity, accuracy, and consistency. The consistency and accuracy of the questions were then determined.

3.9.2 Reliability of the tools

Reliability of the research instruments designated the ability of the research instruments to generate the desired results after repeated testing. Additionally, it explained the extent to which the instruments used could be relied on by the researcher. In the study, reliability was accomplished using the test-retest method to measure the internal consistency. A correlation coefficient of 0.9 was achieved which was deemed acceptable.

3.10 Data collection

3.10.1 Data collection personnel

The principal investigator recruited data collectors who were community health workers from relative locations of study. They underwent one day training on data collection, the objectives, how to use Open Data Kit (ODK) tools, ethical considerations as well as how to administer the questionnaire. During the training, all the four sections of the questionnaire were elaborated, and terminologies and items were explained. This ensured that the data collectors understood the content of the questionnaire and could administer efficiently.

3.10.2 Data collection procedures

Initial visits were made to the study locale to enable the researcher to get acquainted with the study location and to establish a rapport with the respondents. In terms of questionnaire administration, the trained community health workers served as interviewers to guide the participants in filling in the questionnaire. The survey questionnaire was explained by trained personnel to the guardians before filling in the consent form. Participants gave their consent before taking part in the study after learning about the survey and its objectives. The participants gave information about their demographic information before answering questions about their knowledge, perceptions, and acceptance of HPV vaccines. Guardians' willingness to have their daughters vaccinated with the HPV vaccine served as an indicator of the vaccine's acceptability. Each study participant was assigned a unique identification number. To prevent losing data and guarantee confidentiality, data was then loaded collected using ODK tool was uploaded to an external server which was only

accessible by the principal investigator and all necessary security measures were implemented to ensure the safety of the data, including an external backup.

3.11 Data analysis and presentation

Data analysis was conducted using the Statistical Package for Social Sciences (SPSS) version 29. Data quality was assured through checking for completeness and consistency after which it was coded and analyzed. The characteristics of the population were also described using descriptive statistics.

Perception was measured using a Likert scale. The sum score of the 14 items was converted into a percentage score. Scores >50% indicated positive perception, and ≤50% indicated negative perception. Knowledge level was assessed through 22 structured questions. Each correct response scored one point and the total scores were converted into percentages and categorized as either "Good" (greater than 50%) or "Poor" (50% or below) For inferential analysis, binary logistic regression was used to assess associations between HPV vaccine acceptability (dependent variable) and independent variables. All variables significant at $p < 0.05$ in bivariate analysis were included in the multivariable model. Adjusted odds ratios (AORs) with 95% confidence intervals were reported. The findings were presented using graphs, charts, and tables.

Table 2:Table showing data analysis matrix

Variable	Type of variable	Data analysis method
Acceptability	Quantitative	Frequencies, percentages
Knowledge	Quantitative	Frequencies, percentages
Perception		
Socio-demographic factors	Quantitative	Frequencies, percentages
Determinants of HPV vaccine acceptability	Quantitative	Regression analysis

3.12 Ethical considerations

The study obtained ethical and administrative approvals from relevant authorities prior to data collection. Approval was granted by the Mount Kenya University Ethical Review Committee (Reference: MKU/ERC/1413), the National Commission for Science, Technology and Innovation (NACOSTI) through a research permit (Reference: NACOSTI/P/23/24131), and the Laikipia County Government (Authorization Letter Ref: LC/PHO/018/2023).

Before any data was collected, all participants were required to give their consent and were informed of the security precautions that would be taken. To protect the confidentiality of private health information, data collection was conducted in a secure and private setting rather than in an open forum. After explaining the significance of the study and their part in it, giving the sample participants time to ask questions, and receiving their voluntary consent, the questionnaire was provided to them. The study made every effort to keep participant information completely confidential. To guarantee confidentiality, participants were given identity numbers to use when entering data and hence prevented stigmatization as a result of study participation.

CHAPTER 4: RESULTS AND DISCUSSION

4.1 Introduction

This chapter outlines the findings of the determinants of HPV vaccine acceptability for guardians of girls between the age of 9 and 17 years in Laikipia County, Kenya. It includes an analysis of the socio-demographic characteristics of the respondents, assessed knowledge levels, participant perceptions, and factors influencing HPV vaccine acceptability among guardians.

4.2 Response rate

Out of the targeted 422 participants, 473 guardians were successfully recruited, representing an 112% response rate. This high response rate may be attributed to the community-based approach and the willingness of guardians to discuss their daughters' health. It demonstrates strong participation and enhances the reliability and generalizability of the findings.

4.3 Association Between Independent Variables and HPV Vaccine Acceptability

4.3.1 Socio-demographic characteristics and its association with HPV Vaccine Acceptability

Only 213 (45%) of the participants were of age group 36-45 years and the majority (366, 77.4%) of the participants were female. Additionally, 215 (45.5%) of primary guardians had attained secondary education. Most of the households, 314(66.4%) had their religious affiliation as protestant. Only 199(42.1%) of households preferred visiting dispensaries as their health facility. Participants reported that the primary method of covering healthcare and medical expenses was through the National Health Insurance Fund (NHIF), with 252 (53.3%) indicating reliance on this option. (Table 3)

Table 3: Socio-demographic characteristics of the respondents

Variable		N	%
Age	Below 25 Years	18	3.8
	25-35 Years	135	28.5
	36-45 Years	213	45.0
	46-55 Years	85	18.0
	Above 55 Years	22	4.7
Sex	Male	107	22.6
	Female	366	77.4
Primary Guardians of the girls	Father	249	52.6
	Mother	212	44.8
	Grandmother	12	2.5
Occupation	Business	69	14.6
	Employed-Salaried	80	16.9
	Casual-labor	84	17.8
	Farmer	45	9.5
	Unemployed	56	11.8
	Self employed	139	29.4
Average household income per month	Below Ksh 10,000	256	54.1
	Ksh 10,000- Ksh 20,000	158	33.4
	Ksh 20,001-Ksh 30,000	31	6.6
	Ksh 30,001-Ksh 40,000	11	2.3
	Ksh 40,001-Ksh 50,000	10	2.1
	Above Ksh 50,000	7	1.5
Education level	No Basic education	26	5.5
	Primary School	113	23.9
	Secondary School	215	45.5
	Tertiary Education	119	25.2
Religious affiliation	Protestant	314	66.4
	Catholic	153	32.3
	Muslim	6	1.3
Health facility attended	County Referral	167	35.3
	Sub County Hospital	59	12.5
	Dispensary	199	42.1
	Private Hospital	48	10.1
Method of payment for medical expenses	National Health Insurance Fund	252	53.3
	Self-Pay	221	46.7
	Total	473	100.0

The Pearson Chi-Square Tests revealed several statistically significant associations between various variables and the likelihood of guardians getting their daughters vaccinated against HPV. Specifically, age ($\chi^2 = 27.900$, df = 4, $p < .001$), education level ($\chi^2 = 38.271$, df = 3, $p < .001$), which health facility guardians visit ($\chi^2 = 36.364$, df = 3, $p < .001$), health facility choice ($\chi^2 = 98.557$, df = 4, $p < .001$), family income per month ($\chi^2 = 22.560$, df = 5, $p < .001$), occupation ($\chi^2 = 43.934$, df = 5, $p < .001$), how guardians pay for health care and medical expenses ($\chi^2 = 40.723$, df = 1, $p < .001$) and guardians ($\chi^2 = 13.647$, df = 2, $p = .001$) were all significantly associated with the likelihood of guardians getting their daughters vaccinated against HPV (Table 8).

Table 4:Association between demographic factors and HPV vaccine acceptability among guardians

	I would get my daughter vaccinated		
	Chi-square	df	P value
Age	27.900	4	.000*
Sex	.880	1	.348
Education level	38.271	3	.000*
Which health facility do you visit?	36.364	3	.000*
Health facility choice	98.557	4	.000*
Religious affiliation	7.970	2	.019*
Family income per month	22.560	5	.000*
Occupation	43.934	5	.000*
Payment method health care and medical expenses	40.723	1	.000*
Guardians	13.647	2	.001*,

Results are based on nonempty rows and columns in each innermost sub table.

*. The Chi-square statistic is significant at the .05 level.

b. More than 20% of cells in this sub table have expected cell counts of less than 5.

The bivariate chi-square analysis revealed that certain socio-demographic factors were associated with HPV vaccine acceptability among guardians in Laikipia County. Notably, education level, age, and religion showed statistically significant relationships ($p < 0.05$). Education level posed a significant association to HPV vaccine acceptability. This finding supports previous literature indicating that education enhances awareness and understanding of health interventions, including vaccination (Mabeya et al., 2018; Santhanes et al., 2018). Religion also influenced vaccine acceptability reflecting trends noted by Lahijani et al. (2021) who emphasized the role of religious narratives in shaping community health behaviors. From the researcher's perspective, these findings reinforce the need for public health messaging that is both age-sensitive and culturally aware. Educational campaigns should be targeted toward less-educated guardians, and religious leaders should be engaged as allies to improve trust and uptake of the HPV vaccine.

4.3.2 Knowledge about HPV and its association with HPV Vaccine Acceptability

Most of the respondents were aware that HPV is a virus 388 (82%), that it is a causative factor of cervical cancer 333 (70.4%) and that cervical cancer is the primary cause of cancer-related deaths among women 441 (93.2%). Additionally, findings indicated that most respondents 291 (61.5%) acknowledged that the HPV vaccine helps reduce the risk of developing cervical cancer. However, 174 respondents (63.2%) mistakenly believed that the vaccine could not be administered to individuals who had already engaged in sexual activity.

Less than half of the respondents 101 (21.4%) were aware that the HPV vaccine should be administered before the first sexual intercourse. However, the majority 381 (80.5%) knew

that the vaccine is recommended for girls aged 9 years and above. Additionally, more than three quarter of the respondents 420 (88.8%) were aware that vaccine works in people who aren't infected by HPV.

Additionally, Majority of the respondents 386 (81.6%) were aware that the HPV vaccine is offered by the government, 257 (54.3%) were aware that HPV vaccine could not harm, 332 (70.2%) knew that it is included in a girl's immunization record while 301(63.6%) had heard about pap smear test. The overall knowledge about HPV was computed. (Table 4).

Table 5:Guardians knowledge of HPV

	Prevalence of correct response	
	n	**%**
HPV is a virus	388	82.0
Cervical cancer is a type of disease inherited from guardians' genetics	143	30.2
The majority of cervical cancer cases are caused by human papillomavirus (HPV) infection	333	70.4
Nearly everyone infected with HPV will have symptoms	174	36.8
Cervical cancer is one of the leading causes of cancer-related deaths among women in Kenya	441	93.2
HPV vaccine decreases the chance of having cervical cancer	291	61.5
HPV vaccine should be given before a girl's first sexual intercourse	101	21.4
HPV vaccine can be administered to people who have already had sex	174	36.8
HPV vaccine is effective for girls aged 9 years old and above	381	80.5
HPV vaccine works in individuals who have not yet been infected with HPV	420	88.8
HPV vaccine can be harmful to health	257	54.3
HPV vaccine can cause HPV infection	237	50.1
HPV vaccine is provided by the government	386	81.6
HPV vaccine is included in a girl's immunization record	332	70.2
Do you know the role of a Pap smear test	301	63.6

According to the study, the most prevalent HPV transmission mode cited was sexual 343 (81.5%), the persons who can be infected with HPV less than half were Girls 362 (46.8%)

and the commonly recognized measure for preventing HPV transmission was the use of condoms, reported by 192 respondents (45.9%). Out of all the responses, 454 (96%) were aware that HPV vaccine prevents cervical cancer, 343 (72.5%) reported that two doses are required for complete vaccination and 322 (68.1%) reported to know the youngest age for a girl to be vaccinated as 9 years. (Table 5).

Table 6:Guardians knowledge on HPV-multiple responses

		N	%
Diseases HPV vaccine protect against	Cervical Cancer	454	96.0
	HIV_AIDS	5	1.1
	Breast Cancer	8	1.7
	Warts	6	1.3
Number of doses	1 dose	54	11.4
	2 doses	343	72.5
	3 doses	19	4.0
	4 doses	57	12.1
The youngest age that a girl should receive HPV vaccination	Below 9 Years	43	9.1
	9 Years	322	68.1
	Above 9 Years	108	22.8
Pap smear test use	Cervical cancer screening	390	82.5
	Testing STDS	16	3.4
	Treating Cervical Cancer	67	14.2
Transmission Modes	Sexual	343	81.5
	Blood	41	9.7
	Public Toilets	5	1.2
	Physical	18	4.3
	Aerosol	14	3.3
Persons infected with HPV	Women	302	39.0
	Girls	362	46.8
	Boys	54	7.0
	Men	56	7.2
HPV infection prevention	Condoms	192	45.9
	HPV Vaccine	25	6.0
	Monogamy	44	10.5

It Cannot be Prevented	28	6.7
Late Onset of Sexual Intercourse	58	13.9
Antibiotics	36	8.6
Adequate personal hygiene	35	8.4

Knowledge was further classified into two terciles as shown in figure 2. Findings indicated that majority 398 (84.1%) of guardians had good knowledge about HPV (Figure 2). The Pearson Chi-Square Tests revealed statistically significant association between knowledge about HPV ($\chi^2 = 20.014$, df = 1, $p < .001$), and the likelihood of guardians getting their daughters vaccinated against HPV (Table 8).

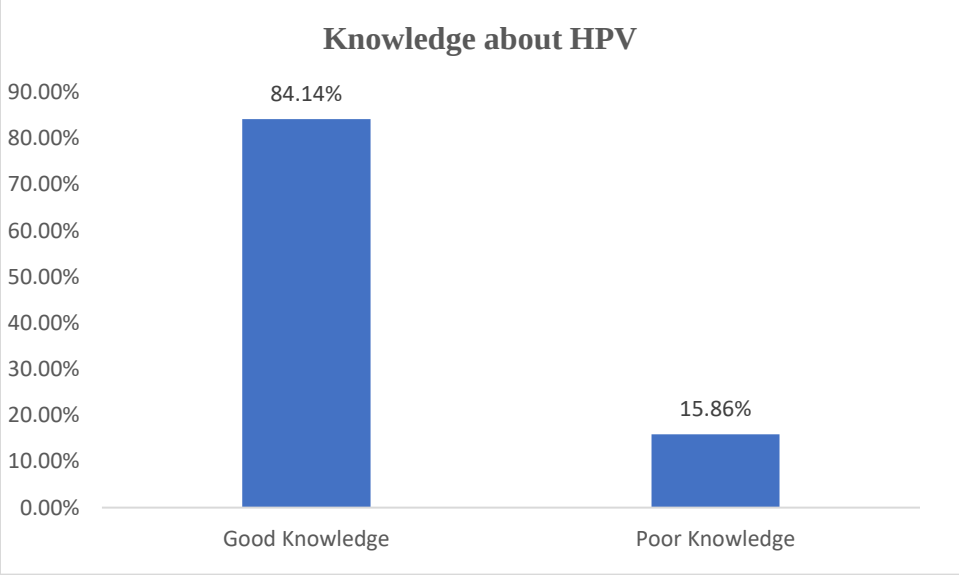

Figure 2: Overall Knowledge levels of HPV among respondents.

Table 7:Association between overall knowledge level and HPV vaccine acceptability among guardians

	I would get my daughter vaccinated		
	Chi-square	df	P value
Knowledge about HPV	20.014	1	.000*

Results are based on nonempty rows and columns in each innermost sub table.

*. The Chi-square statistic is significant at the .05 level.

b. More than 20% of cells in this sub table have expected cell counts of less than 5.

This study indicated an overall good knowledge level among most participants 398 (84.1%). The present study was consistent to a study conducted in Finland (79%), UK (72.4%) and Germany (74%) (López et al., 2020) and consistent to a study conducted in New Jersey where most guardians (84%) had a high knowledge levels of HPV vaccine. The knowledge levels in New Jersey however differed among immigrants hence non-U.S. born guardians had relatively lower knowledge (54.8%) as compared to U.S. born guardians (76.1%). (Anuforo et al., 2022). The difference would be due to the language and culture barriers for the non-U.S. born guardians that would result into a lower knowledge level. This indicates the need for HPV vaccination outreach programs that are sensitive to language and culture even in high socioeconomic regions. Our study however indicated a higher knowledge level than a study in Southwestern Poland where 20.2% of respondents had a good knowledge level (Ganczak et al., 2018) and higher than a study in Addis Ababa (58.3%) (Dereje et al., 2021). Both studies in Poland and Addis Ababa with lower HPV vaccine knowledge levels were conducted after HPV vaccine was introduced worldwide. Poland is within the EU countries where HPV vaccine hadn't been incorporated as a free and mandatory in the immunization program (Ganczak et al., 2018). This hence could explain why Poland residents a lower knowledge level at the time of the study since majority had weren't aware and couldn't afford the vaccine.

Our study respondents had a higher knowledge level than those in a study conducted in Eldoret Kenya where only 27.2% had knowledge of HPV (Mabeya et al., 2018). The study

in Eldoret was done some few years after Kenya rolled out HPV vaccine school program in 2013-2015 (Kagina et al., 2022) and hence by the time of study, there was limited spread of information about HPV vaccine unlike in our current study time whereby most counties had embraced HPV school program vaccination. Kenya commenced vaccination officially late 2019 and included different vaccination strategies including schools, community and health facilities program with different stakeholders being brought in place including community Health Promoters, teachers, health professionals among others (Snow Inc, 2021). This emphasizes the need to use inclusive measures towards vaccination thus ensuring reach to as many and diverse people as possible.

Findings indicated that the majority (82%) were aware that HPV is a virus. Our study aligned with findings from a study in Western Amazon, where 78.9% of respondents recognized HPV as a virus (de Oliveira et al., 2020). This suggests a high level of knowledge among respondents in both studies. Human Papillomavirus (HPV) is a viral sexually transmitted infection (STI) that primarily affects sexually active individuals worldwide. Enhancing awareness about HPV could contribute to the prevention of STIs and a reduction in cervical cancer cases (Leite e Sousa et al., 2018).

Our findings indicated that majority of respondents (70.4%) possessed a good knowledge level of HPV as a causative factor of cervical cancer. This study was slightly higher than a study in Western Amazon which had 63.7% of respondents aware of HPV as a causative of cervical cancer (de Oliveira et al., 2020). The variation in findings could be attributed to differences in sociodemographic characteristics, as the previous study focused on adolescents, whereas our study targeted guardians. Our study revealed that a small proportion of respondents (29.6%) were unaware of HPV infection as a risk factor for

cervical cancer. This percentage was lower than findings from Ethiopia, where 41.6% of participants had limited knowledge about cervical cancer and its risk factors (Alene et al., 2020). This disparity may be attributed to the shorter time gap between the introduction of the HPV vaccine into Ethiopia's national immunization program and the research period (2018–2020) compared to our study (2019–2023). The extended timeframe in our study may have contributed to greater awareness among respondents.

Our study indicated that all respondents were unaware whether nearly everyone infected with HPV would have symptoms. This was consistent with a study in Tanzania where 84% weren't aware of HPV symptoms (Mabelele et al., 2018). This indicates a poor knowledge level among respondents from both studies about HPV infection symptoms. Almost all respondents (93.2%) demonstrated good knowledge of cervical cancer as the leading cause of cancer-related deaths among women. Cervical cancer remains a significant public health concern, ranking as the fourth leading cause of cancer deaths among women globally. Notably, 90% of these deaths occur in low- and middle-income countries due to limited access to prevention measures of cervical cancer (Sung et al., 2021). This insists on the importance of increased knowledge on cervical cancer as it is a determinant of utilization of cervical cancer prevention measures.

Most respondents (61.5%) were aware that the HPV vaccine reduces the risk of developing cervical cancer. This finding aligns with a study conducted in Kenya, where the majority (74%) of respondents recognized the HPV vaccine as a preventive measure against cervical cancer (Njuguna et al., 2021). However, a study in Tanzania reported significantly lower awareness, with only 7.8% of respondents acknowledging the vaccine's role in cervical cancer prevention (Mabelele et al., 2018). This discrepancy may be attributed to the time

gap between the studies, during which awareness campaigns may have contributed to increased knowledge. Additionally, findings from the current study reveal that the majority (78.6%) of guardians were unaware that the HPV vaccine should be administered before the onset of sexual intercourse. Emphasis however should be made towards the effectiveness of vaccine to those who haven't been exposed to the virus through sexual intercourse (Pingali et al., 2021).

More than three quarter (80.5%) of the respondents were aware that HPV vaccination onset age is aged 9 years old. Respondents in our study had a good knowledge level than those in a study in Hanoi, Vietnam where 67.9% were correct about HPV vaccination age (Tran et al., 2018). According to a surveillance on youth risk behavior, approximately 2% of ladies had their first sexual encounter before they are 13 years old (Eaton K. et al., 2018). WHO however recommends girls of between the ages 9 and 20 years to get the HPV vaccination (WHO, 2022b). This hence justifies why it is necessary to vaccinate a girl at 9 years before their first sexual encounter which is influenced by adolescent stage.

Findings indicated good knowledge levels among most respondents (81.6%) towards HPV vaccine being provided by the government. Majority (70.2%) of the respondents knew that the HPV vaccine is included in a girl's immunization record. Our results were consistent with a study of adolescents' knowledge levels on HPV which indicated that 77.9% were aware of the presence of HPV national immunization program for girls (de Oliveira et al., 2020). Kenya launched its HPV vaccination national immunization program in late 2019 (Barnabas et al., 2021).In other countries like Vietnam, HPV vaccine was expensive and hence not included in the national Immunization program (Tran et al., 2018). There is,

therefore, a need for governments to integrate the HPV vaccine into the National Immunization Program, which would help increase its accessibility and affordability.

A few respondents (36.4%) had not heard about Pap smear test which was consistent with a study in Meru County(38.1%) (Kandie et al., 2019) and relatively higher as compared to a study in Eldoret Kenya where 27% of guardians did not know about the Pap smear test (Mabeya et al., 2018). The variation in results between Laikipia County (our current study) and Eldoret may be attributed to differences in study methodologies and the time gap between the studies. The increased awareness of cervical cancer prevention measures in Kenya over time could have contributed to the observed differences in knowledge levels.

The researcher also sought to determine respondents' understanding of the purpose of a Pap smear test. The majority (82.5%) correctly identified it as a screening tool for cervical cancer. Similarly, a study conducted in Mombasa and Tana River counties in Kenya found that guardians (66%), school heads (63%), and community leaders (30%) demonstrated a relatively good knowledge level regarding the purpose of a Pap smear test (Njuguna et al., 2021). A study in Tanzania however indicated lower (63.2%) awareness of cervical cancer screening. The lower rate in Tanzania as compared to our study would be because of low coverage rates of screening services. (Mabelele et al., 2018). This would hence indicate the need to increase coverage of cervical cancer screening services which would result in increased awareness of the positive effect of screening towards early detection, treatment, and prevention of cervical cancer.

A few participants were against vaccination of boys (7%) and believed vaccination was for girls (46.8%) and women (39%). These findings align with other studies where most participants opposed vaccinating boys, believing that since boys do not have a cervix, they

are not at risk for cervical cancer, which primarily affects women (Grandahl et al., 2019). This underscores a lack of awareness regarding other diseases caused by the HPV virus, including those that affect men. HPV vaccine programs majorly target girls and young women however vaccination against boys have attracted several discussions due to their low prevalence rates of cervical cancer (St. Laurent et al., 2018). Some high-income level countries however provide gender neutral vaccines hence targeting boys (Bergman et al., 2019).

Responses revealed low knowledge levels towards HPV vaccine prevention measures with few responses (6%) indicating HPV vaccine as a prevention measure and less than half (45.9%) indicated use of condoms and late onset of sexual intercourse (13.9%).HPV vaccine preventive measures range from primary prevention strategies like the HPV vaccine which is highly effective and secondary preventive measures like screening (Sung et al., 2021). Administering HPV Vaccine among adolescents is geared towards implementing the Immunization Agenda 20230 and leads to expanded coverage of vaccine assuring that everyone is reached (IA2030, 2022). Disparities have been observed between low- and middle-income countries (LMICs) and high-income countries (HICs). By May 2020, less than 30% of low- and middle-income countries (LMICs) had implemented national HPV vaccination programs, whereas over 80% of high-income countries (HICs) had done so (PATH, 2022). Among LMICs, Sub-Saharan Africa reported the lowest prevalence of cervical cancer screening (40%), compared to more than 60% in HICs (Lemp et al., 2020). Therefore, there is a critical need for subsidized screening and vaccination programs to improve the situation, particularly in low- and middle-income countries (Lei

et al., 2021; Palmer et al., 2019).Out of all the responses, 454 (96%) indicated cervical cancer as a disease is prevented by HPV vaccine.

Our respondents were majorly aware of cervical cancer as a disease prevented by HPV vaccine and less aware of other diseases. In addition to cervical cancer HPV vaccine protects against other diseases like oral and Ano genetical cancers as well as oropharyngeal and Ano-genetical warts (Karanja-Chege, 2022). A study in Vietnam indicated that 94.6% of respondents were aware on HPV vaccine benefits (Tran et al., 2018). The study in Vietnam indicated more respondents (68.8%) had a high education level post high school unlike our study where less than half were secondary level (45.5%). The high education level would result to an increased ability to get more information in regard to vaccine and could easily reference information on the internet or other credible sources hence resulting to high knowledge levels (Lama et al., 2022).

Additionally, a study conducted in Meru County found that the majority of participants (78.4%) had never heard of the HPV vaccine, indicating a lower level of knowledge compared to our study, where most respondents (61.5%) knew that the HPV vaccine helps prevent cervical cancer (Kandie et al., 2019). This difference could be attributed to increased HPV vaccine awareness campaigns in schools and communities by the time of our study compared to when the study in Meru was conducted. As a result, the HPV vaccine was incorporated into Kenya's routine vaccination program in late 2019 (Barnabas et al., 2021). By the time of our study, HPV vaccination programs had expanded to many counties, leading to increased awareness.

Most respondents (72.5%) in our study reported that two doses are required for complete vaccination. According to a research in Lira district, Uganda, 61.30% weren’t informed of

the number of HPV vaccine doses while 81.09% weren't aware of the recommended vaccine intervals between the doses (Kisaakye et al., 2018). Our study participants had a good knowledge regarding to the recommended HPV vaccine doses as opposed to those in Lira district. The difference would have occurred as a result on difference in sociodemographic characteristics since our respondents were guardians while those in Uganda were female adolescent girls. According to WHO at least 2 doses of the HPV vaccine are recommended and girls with an immunocompromised immune system can receive three doses for more effectivity (WHO, 2022b).

4.3.3 Perception on HPV by the respondents and its association with HPV vaccine acceptability

All 473 (100%) participants recognized the importance of Pap smear screening, even after receiving the HPV vaccination. However, 77(16.3%) respondents held a negative perception, believing that cervical cancer is not a serious disease. Majority of the respondents, 81.2% (384) had a positive perception and stated that HPV vaccination is important. More than half, 56.7% (268) had a negative perception towards HPV vaccine being a requirement for school entry.

Regarding the effectiveness of the HPV vaccine against HPV infection, 353(74.6%) respondents had a positive perception, affirming that the vaccine is effective in preventing HPV. Majority of the respondents 395 (83.5%) stated that guardians needed to be well informed to decide towards vaccinating daughters. Most of the respondents 365 (76.5%) positively perceived HPV to be a serious disease to their daughter. More than half 315 (66.6%) of the respondents regarded their daughter's risk of HPV infection as low compared with other girls of the same age.

The researcher aimed to identify the perceived barriers to HPV vaccination programs. The main barriers mentioned by the respondents which showed their negative perceptions included high cost of HPV vaccine 247 (52.2%), the likelihood of HPV vaccine interfering with fertility 251 (53.1%), potential of side effects from the vaccine 278 (58.8%), pain during injection 364 (77%) and the limited knowledge towards HPV vaccine source 342 (72.3%). On the other hand, respondents had a slightly higher 246 (52%) positive perception towards the inability of HPV vaccine to encourage unsafe sex among young girls. The majority of guardians, 351 (74.2%), held a positive overall perception of the HPV vaccine. (Table 6). The Pearson Chi-Square Tests revealed statistically significant association between HPV Related Perception ($\chi^2 = 138.985$, df = 1, $p < .001$) and the likelihood of guardians getting their daughters vaccinated against HPV (Table 6)

Table 8:HPV related perception by the respondents

	Positive perception n(%)	**Negative perception n(%)**
Need for Pap smear screening after HPV vaccination	473(100.0)	77(16.3)
Seriousness of Cervical cancer	396(83.7)	89(18.8)
Importance of HPV vaccination	384(81.2)	268(56.7)
HPV vaccine requirement for school entry	205(43.3)	120(25.4)
Effectiveness of HPV vaccine against HPV	353(74.6)	78(16.5)
Guardians need for more information before deciding on daughters' vaccination	395(83.5)	111(23.5)
Seriousness of HPV disease.	362(76.5)	315(66.6)
Perceived daughter's risk of HPV infection as compared with other girls of the same age	158(33.4)	247(52.2)

High cost of HPV	226(47.8)	342(72.3)
Limited knowledge of HPV vaccine source.	131(27.7)	251(53.1)
Interference of HPV vaccines with fertility.	222(46.9)	278(58.8)
HPV vaccines side effects.	195(41.2)	364(77.0)
Pain during injection.	109(23.0)	227(48.0)
HPV vaccination encourages unsafe sex among young girls.	246(52.0)	236(237)

Table 9:Association between overall perception and HPV vaccine acceptability among guardians

	I would get my daughter vaccinated		
	Chi-square	df	P value
Knowledge about HPV	20.014	1	.000*

Results are based on nonempty rows and columns in each innermost sub table.
*. The Chi-square statistic is significant at the .05 level.
b. More than 20% of cells in this sub table have expected cell counts of less than 5.

The majority of guardians (74.2%) had an overall positive perception of HPV. This percentage was higher than findings from a study in Gondar, Ethiopia, where slightly more than half of the respondents (59.9%) held a positive perception of HPV vaccination (Alene et al., 2020). The variation could be attributed to differences in study tools and the time gap between the studies. Additionally, a study conducted in Poland revealed an even lower perception of the HPV vaccine, with only 21% of respondents believing it should be

administered to children aged 11 years and below (Ganczak et al., 2018). This disparity could be due to differences in socioeconomic characteristics, as Poland is a high-income country, whereas Kenya falls within the low- and middle-income category.

Regarding perceived severity, the majority of respondents (83.7%) believed that cervical cancer is a highly severe disease that poses a significant risk to women's lives. Findings from our study was higher than a study among Saudi Arabian women where 36% perceived cervical cancer as a serious disease. Saudi Arabia had not incorporated HPV vaccine into its national vaccination program and hence resulting into low awareness level of the severity of infection as well as need to uptake cervical cancer screening as observed in the study (Aldohaian et al., 2019) .

A significant proportion of respondents (76.5%) perceived HPV as a serious disease affecting their daughters, while more than half (66.6%) considered their daughters' risk of HPV infection to be lower compared to other girls of the same age. This perception may be attributed to factors such as early onset of sexual activity, multiple sexual partners, and unsafe sex practices among young women, aligning with findings from a study conducted among Japanese women (Yamaguchi et al., 2021). Similarly, another study reported a high perception of susceptibility to HPV infection, with higher perception rates observed among women in urban areas (71%) compared to those in rural areas (62%) (Runge et al., 2019). This difference may be due to increased exposure to high-risk behaviors in urban settings compared to rural areas.

The perceived benefits of HPV vaccine were relatively high with 81.2% believing that vaccination is important. Regarding effectiveness of HPV vaccine against HPV infection, 74.6% (353) had a positive perception of HPV vaccine effectiveness against HPV. This

study was consistent with a study in Uganda where 72.1% of respondents believed that HPV vaccine is an effective protection against cervical cancer (Kisaakye et al., 2018). This consistency would be because of increased HPV vaccine awareness efforts in Uganda and Kenya whereby both studies were conducted more than 3years after introduction of HPV into national routine immunization schedule for Uganda (2015) and Kenya (2019).

Majority of the respondents 83.5% (395) stated that guardians needed to be well informed to make a decision towards vaccinating daughters. A similar study among African American guardians revealed that they required more information about HPV before accepting the vaccination for their daughters. This lack of awareness could lead to delays in vaccinating girls, ultimately resulting in missed opportunities for cervical cancer prevention (Lama et al., 2022).

The perceived barriers mentioned by the respondents included high cost of HPV vaccine (52.2%), the likelihood of HPV vaccine interfering with fertility (53.1%), potential of side effects from the vaccine (58.8%), pain during injection (77%)) and the limited knowledge towards HPV vaccine source (72.3%). This showed their negative perceptions towards HPV vaccine. A study conducted in Mombasa and Tana River County, Kenya, identified several barriers to HPV vaccination, including limited information about the vaccine, low literacy levels, concerns about its safety, fears of interference with fertility, anxiety about injections, and potential side effects (Njuguna et al., 2021).

A study of African Americans perception in the U.S. revealed that HPV vaccine safety was a major hindrance towards acceptability of HPV vaccine with online platforms being the main source of information towards the unsafety of the vaccine (Restivo et al., 2018). Clinical trials have been sufficiently conducted and indicates absence of adverse effects

because of the vaccination (Bednarczyk, 2019). Misinformation within communities has greatly shaped perceptions and attitudes toward HPV vaccination, acting as a significant barrier to its acceptance. Therefore, healthcare workers play a crucial role in ensuring the dissemination of accurate information to the public (Grandahl et al., 2019).

The perception that HPV vaccine would encourage unsafe sex among young girls had a slightly more than half (52%) positive perception. According to a study in the U.S., state laws regarding to HPV vaccination have faced negative perceptions due to the fear of encouraging risky sexual behaviors among the adolescents (Policy, 2021; Rodriguez et al., 2020). However, other studies conducted in the U.S. to assess the association between the passage of legislation on HPV vaccine uptake, HPV vaccine information, and adolescent sexual behavior—compared to states without such legislation—have indicated that there is no link between HPV vaccine policies and engagement in risky sexual behaviors among adolescents (Cook et al., 2018). It is of great essence to ensure that HPV vaccine among adolescents is administered before their first sexual experience hence reducing HPV infections and their effects (Bednarczyk, 2019). Studies show that HPV infection sexual mode of transmission have been perceived to cause fear of stigma and can result in reduction of sexual intimacy with their partners in the fear of transmission (You et al., 2019). Other perceptions from similar research that were observed as barriers towards vaccination and weren't included in our studies included cultural and religious factors and negative masculinity from husbands preventing wives from vaccinating girls (Otieno et al., 2020).

4.3.4 HPV vaccine acceptability by the respondents

The study assessed whether the respondent would get their daughters vaccinated. More than half had a high acceptability of HPV vaccination to their daughters (66.38%) (Figure 3). The study further assessed whether the respondent's daughter had taken the HPV vaccine yet. More than half (63.2%) had received the vaccine (Figure 5).

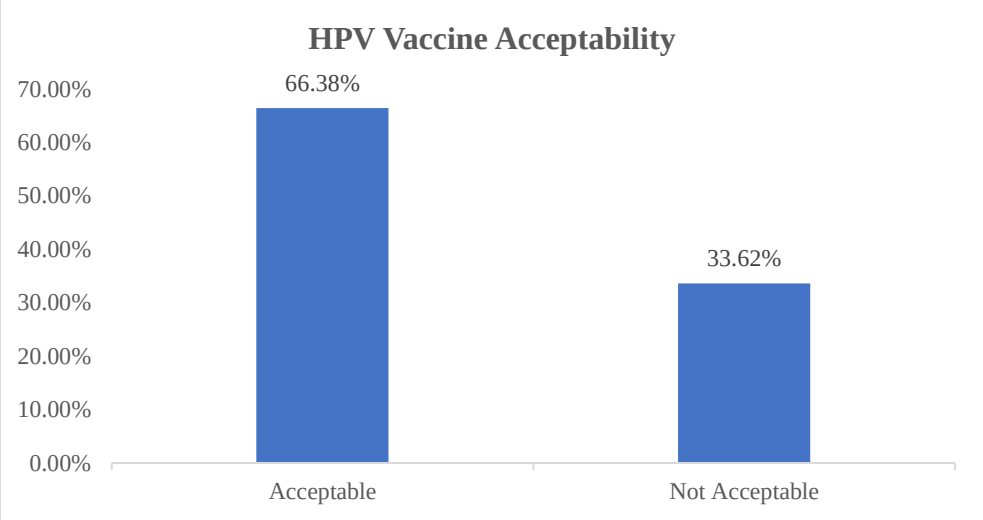

Figure 3: HPV vaccine acceptability among guardians.

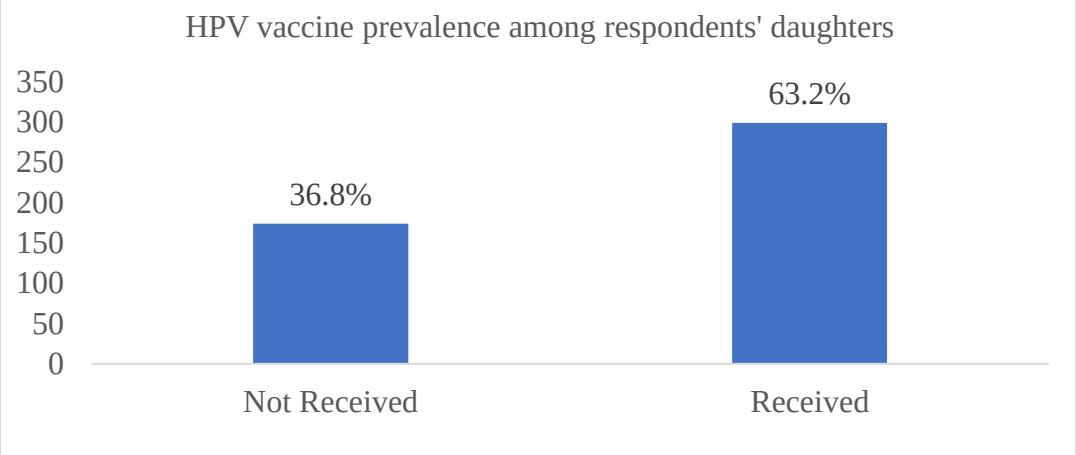

Figure 4: HPV vaccination prevalence.

According to the study, the acceptance level was high among most respondents (66.4 %) which was lower than other studies in Bench-Sheko Zone, Southwest Ethiopia (79.5%) (Destaw et al., 2021) and Gondar, Northwest Ethiopia (83.1%) (Alene et al., 2020) and Zgorzelec, Poland (85.1%) (Ganczak et al., 2018). The variations in acceptance levels observed in studies conducted in Ethiopia could be partially attributed to differences in socio-demographic characteristics among the study populations. Moreover, in some areas there was prior sensitization and vaccination efforts before the study resulting in higher acceptability as compared to participants with limited information.

In addition, the current finding (66.4%) is lower than studies that reported an acceptability level of 89% among teachers in Kitui County during Kenya's HPV vaccine pilot study period (Kagina et al., 2022). The difference might have arisen due to the difference in population whereby the latter study had school teachers as the study population while our study had guardians. The high level of acceptability among teachers could be attributed to their high awareness of HPV vaccination, which was reported at 90% in that study. Consequently, pilot studies were conducted in schools and hence increasing the chances of teachers having a high awareness level as opposed to guardians. Presence of school programs resulted to high acceptance levels according to studies (65-86%) while absence of school programs resulted into low acceptance rates (19-71%) (Restivo et al., 2018)

The World Health Organization (WHO) developed a global plan to eradicate cervical cancer by aiming to vaccinate 90% of adolescent girls against HPV, ensuring 70% of women undergo cervical cancer screening, and providing appropriate treatment for 90% of those diagnosed with cervical disease (Barnabas et al., 2021; WHO, 2022). The completion rates have however varied across WHO regions ranging from 29% to 60% (Director-

General WHO, 2022). High-income countries like Australia, have implemented successful school-based vaccination programs. achieving HPV vaccination coverage rates of 70%–80% among adolescent girls (Brotherton & Bloem, 2018).

More than half (63.2 %) of the respondent's daughters had taken the HPV vaccine. The results of this study align with a study conducted in Eldoret, Kenya, where 64% of adolescents had received two doses of the HPV vaccine (Mabeya et al., 2018). However, our study reported a lower vaccination rate compared to the 2019 National Immunization Survey-Teen data from the United States, which indicated that 71.5% of girls had received more than one dose of the HPV vaccine. This difference could be attributed to variations in healthcare infrastructure, public awareness campaigns, and vaccine accessibility between the two regions (Pingali et al., 2021). This study however had a relatively lower response rate (19.7%) which was likely to be impacted by COVID-19 pandemic (Santoli et al., 2020) hence generalization of the data would be a challenge. The rates which were relatively higher in the later study would be because of efforts made by the U.S government and stakeholders towards intensifying vaccination programs and reducing the number of doses from three to 2 (Pingali et al., 2021). However other studies have showed a higher coverage of HPV vaccine among population living below poverty line indicating lower vaccine confidence. (Swiecki-Sikora et al., 2019)

According to a literature review study targeting European guardians, the pooled percentage of HPV vaccine acceptability was 59.2% with Nordic countries like Iceland indicating high vaccine acceptance rate (López et al., 2020). The relatively high acceptance level in the current study could be because of the ongoing HPV vaccination programs in Kenya that are being conducted in schools and community levels. This is hence a call of action for

countries that hasn't incorporated HPV vaccine into their routine vaccination schedule as well as intensified vaccination and education programs among those who have already incorporated like Kenya.

4.4. Multivariable Logistic Regression Analysis of factors associated with HPV Vaccine acceptability.

All variables with significant associations at the bivariate level ($p < .05$) were included in the final multivariable logistic regression analysis to identify the determinants of HPV vaccine acceptability among guardians. This approach ensured that all relevant predictors were simultaneously assessed for their independent contributions to vaccine acceptability. The logistic regression analysis in Table 9 examines the factors associated with HPV vaccine acceptability among guardians of daughters in Laikipia County, Kenya.

According to multiple logistic regression, the variables duration lived in current residence, occupation, payment for health care and medical expenses, guardians' knowledge and perception revealed a significant association with the outcome variable ($P<0.05$). Respondents who had lived in their current residence for 10–20 years were 0.35 times less likely not to accept the HPV vaccine for their daughters compared to those who had lived there for over 30 years (AOR = 0.35, 95% CI [0.12, 1.00], $p = 0.050$).

Guardians engaged in business were 2.85 times more likely not to accept the HPV vaccine for their daughters than those who were self-employed (AOR = 2.85, 95% CI [1.16, 6.99], $p = 0.022$). Additionally, unemployed guardians were 8.16 times more likely not to accept HPV vaccination for their daughters compared to self-employed guardians (AOR = 8.16, 95% CI [3.05, 21.96], $p < 0.001$).

Guardians using NHIF for healthcare payments were 0.46 times less likely not to accept the HPV vaccine for their daughters compared to those who preferred self-pay (AOR = 0.46, 95% CI [0.24, 0.88], p = 0.019).

The study also found that guardians with poor knowledge were 2.02 times more likely not to accept the HPV vaccine for their daughters compared to those with good knowledge (AOR = 2.02, 95% CI [0.94, 4.32], p = 0.042). Furthermore, respondents with a positive perception of the HPV vaccine were 11.08 times more likely not to accept it for their daughters compared to those with a negative perception (AOR = 11.08, 95% CI [5.70, 21.57], p < 0.001).

According to the multiple logistic regression analysis, the variables age, number of girls in the household, caregiver type, household income, education level, religious affiliation, type of health facility visited, and reasons for choosing a health facility were not statistically significant predictors of HPV vaccine acceptability among guardians of daughters in Laikipia County, Kenya, at the 0.05 level of significance (p > 0.05).

Table 10: Determinants of HPV acceptability

		Acceptable, n (%)	Not Acceptable,n (%)	COR (95% CI)	AOR (95% CI)	P Value
Age	Below 25 Years	3(0.6)	15(3.2)	5.00(1.12-22.30)	6.19(0.81-47.14)	.079
	25-35 Years	88(18.6)	47(9.9)	0.53(0.22-1.32)	1.45(0.34-6.13)	.611
	36-45 Years	157(33.2)	56(11.8)	0.36(0.15-0.87)	0.89(0.23-3.44)	.864
	46-55 Years	55(11.6)	30(6.3)	0.55(0.21-1.41)	1.26(0.30-5.27)	.756
	Above 55 Years	11(2.3)	11(2.3)	Reference	Reference	.
Duration lived in the	Below 10 Years	184(38.9)	87(18.4)	0.42(0.23-0.78)	0.53(0.20-1.41)	.203
current area	10-20 Years	77(16.3)	26(5.5)	0.30(0.15-0.61)	0.35(0.12-1.00)	**.050***
	21-30 Years	30(6.3)	20(4.2)	0.59(0.27-1.31)	0.68(0.21-2.17)	.512
	Above 30 Years	23(4.9)	26(5.5)	Reference	Reference	.
Number of girls	None	3(0.6)	15(3.2)	14.77(3.91-55.89)	4.04(0.54-30.31)	.175
	One	129(27.3)	60(12.7)	1.38(0.78-2.44)	1.25(0.42-3.68)	.689
	Two	117(24.7)	62(13.1)	1.57(0.88-2.78)	1.74(0.65-4.63)	.268
	Three and above	65(13.7)	22(4.7)	Reference	Reference	.
Caregiver	Father	169(35.7)	80(16.9)	0.10(0.20-0.44)	1.19(0.15-9.29)	.870
	Mother	143(30.2)	69(14.6)	0.10(0.02-0.45)	1.28(0.17-9.89)	.815
	Other relatives	2(0.4)	10(2.1)	Reference	Reference	.
Occupation	Business	45(9.5)	24(5.1)	1.55(0.83-2.91)	2.85(1.16-6.99)	**.022***
	Employed-Salaried	62(13.1)	18(3.8)	0.85(0.44-1.62)	1.86(0.68-5.12)	.227

	Casual labour	57(12.1)	27(5.7)	1.38(0.76-2.51)	1.07(0.43-2.66)	.889
	Farmer	32(6.8)	13(2.7)	1.18(0.56-2.51)	1.57(0.55-4.54)	.402
	Unemployed	16(3.4)	40(8.5)	7.65(3.83-15.28)	8.19(3.05-21.96)	**.000***
	Self employed	102(21.6)	35(7.4)	Reference	Reference	.
Household income	Ksh 10,000 and below	148(31.3)	108(22.8)	1.96(1.05-3.67)	1.06(0.39-2.88)	.907
	Ksh 10,001-20,000	123(26.0)	35(7.4)	0.77(0.39-1.52)	0.60(0.22-1.64)	.323
	Above Ksh 20,000	43(9.1)	16(3.4)	Reference	Reference	.
Education level	No Basic	6(1.3)	20(4.2)	9.89(3.63-26.93)	2.11(0.43-10.48)	.361
	Primary School	61(12.9)	52(11.0)	2.53(1.45-4.41)	0.96(0.37-2.51)	.932
	Secondary School	158(33.4)	57(12.1)	1.07(0.64-1.79)	0.49(0.22-1.12)	.092
	Tertiary Education	89(18.8)	30(6.3)	Reference	Reference	.
Religious affiliation	Protestant	222(46.9)	92(19.5)	0.41(0.82-2.09)	0.80(0.07-9.19)	.859
	Catholic	89(18.8)	64(13.5)	0.72(0.14-3.68)	1.08(0.10-12.40)	.948
	Muslim	3(0.6)	3(0.6)	Reference	Reference	.
Which health facility do you visit	County Referral	126(26.6)	41(8.7)	1.10(0.51-2.34)	1.37(0.46-4.03)	.572
	Sub County Hospital	49(10.4)	10(2.1)	0.69(0.26-1.79)	0.82(0.22-3.06)	.766
	Dispensary	102(21.6)	97(20.5)	3.20(1.54-6.63)	1.96(0.64-6.04)	.240
	Private Hospital	37(7.8)	11(2.3)	Reference	Reference	.
Health facility reasons	Quality services	156(33.0)	25(5.3)	0.21(0.13-0.34)	0.69(0.32-1.47)	.334

	Cost	11(2.3)	22(4.7)	2.63(1.22-5.64)	2.54(0.80-8.11)	.115
	Distance	147(31.1)	112(23.7)	Reference	Reference	.
Payment for health care and medical expenses	National Health Insurance Fund	200(42.3)	52(11.0)	0.28(0.19-0.42)	0.46(0.24-0.88)	**.019***
	Self-Pay	114(24.1)	107(22.6)	Reference	Reference	.
Knowledge	Poor Knowledge	33(7.0)	42(8.9)	3.06(1.85-5.06)	2.02(0.94-4.32)	**.042***
	Good Knowledge	281(59.4)	117(24.7)	Reference	Reference	.
Perception	Negative Perception	28(5.9)	94(19.9)	14.77(8.95-24.37)	11.08(5.70-21.57)	**.000***
	Positive Perception	286(60.5)	65(13.7)	Reference	Reference	.

Key;
* Statistically significant
Base category: Not acceptable

The findings of this study indicated that occupation was a statistically significant predictor of HPV vaccine acceptability (AOR = 8.16, 95% CI [3.05, 21.96], $p < 0.001$). These study findings were consistent with a study in Poland where HPV vaccine acceptability was associated with guardians employment (OR 2.09, p=0.03) (Ganczak et al., 2018).

Consequently, results from our study indicated that the odds ratios for all monthly family income categories were extremely low, indicating that the likelihood of accepting the vaccine was very low across all income levels. This suggests that family income did not significantly influence the likelihood of guardians accepting the HPV vaccine for their daughters. Different research of guardians of Kansas, U.S. however shows that income levels had a positive correlation to HPV vaccine acceptability to their daughters(p=0.014) and hence wealthier guardians had a higher likelihood of accepting HPV vaccine to their daughters (Luisi, 2020). This is also indicated in other studies conducted in Hong Kong (Wong et al., 2018) and Vietnam (Tran et al., 2018). The latter studies were however different from our study and could be because of different socioeconomic situations whereby our study was in a low- and medium-income country while the studies in U.S, Vietnam and Hong Kong were from high income countries hence different contexts.

Findings revealed that access to the National Health Insurance Fund (NHIF) was a statistically significant predictor of HPV vaccine acceptability, with guardians using NHIF for healthcare payments being 0.46 times less likely to reject HPV vaccine for their daughters as compared to those who preferred self-pay (AOR = 0.46, 95% CI [0.24, 0.88], p = 0.019).This suggests that having access to health insurance coverage, such as the NHIF, may positively influence HPV vaccine acceptability, potentially due to reduced financial barriers to accessing healthcare services.

According to our study, guardians with poor knowledge were 2.02 times more likely not to accept the HPV vaccine for their daughters compared to those with good knowledge (AOR = 2.02, 95% CI [0.94, 4.32], p = 0.042). Our study results were consistent with studies from other countries like Canada (Fernandes et al., 2018) and Nigeria (Bisi-Onyemaechi et al., 2018) which showed that insufficient knowledge resulted in low vaccine acceptability and the fear of HPV vaccine side effects. Additionally, another study in the Akaki-Kality sub-city in Addis Ababa indicated that the odds of HPV vaccine acceptability among guardians of adolescents was 2.24 higher (AOR=2.24,95% CI 1.12-8.60) in participants with good knowledge levels about HPV vaccine than those with poor knowledge (Dereje et al., 2021).

This suggests that improving knowledge about HPV among guardians may positively influence HPV vaccine acceptability, potentially leading to increased vaccination rates. Healthcare providers and policymakers should consider implementing educational interventions to enhance knowledge about HPV, which could lead to higher vaccine uptake and improved public health outcomes. Additionally, interventions focusing on increasing guardians confidence of HPV vaccine should be adopted. Guardians should be informed about the effectiveness and benefits of the HPV vaccine in preventing cervical cancer, which may help lower the risk of severe disease outcomes (Kolek et al., 2022).

Our study differed from research conducted in Poland, where no statistically significant association was found between guardians' knowledge of the HPV vaccine and their acceptance of it (Ganczak et al., 2018). Similarly, a study in the United States equally indicated lack of association between guardians knowledge levels and HPV vaccine acceptability (Kolek et al., 2022). This suggests that while knowledge about HPV plays a

role in vaccine acceptability, there are other factors at play, possibly including societal attitudes, healthcare accessibility, or personal beliefs about vaccines.

Conversely, this study found that guardians with a negative perception of HPV were 11.08 times more likely to reject the HPV vaccine for their daughters compared to those with a positive perception (AOR = 11.08, 95% CI [5.70, 21.57], $p < 0.001$). This finding aligns with a study done in Gondar, Ethiopia, which demonstrated that a positive perception of the HPV vaccine was significantly associated with its acceptability (AOR=21.53,95% CI=11.60,39.96) (Alene et al., 2020). Additionally, another study in the Akaki-Kality sub-city in Addis Ababa indicates that participants with a positive perception had a 5.03% likelihood (AOR=5.03,95% CI 1.63-9.56) of accepting HPV vaccination to their daughters as compared to those with a negative perception (Dereje et al., 2021). Our study was also in agreement with research conducted in the Bench-Sheko Zone, South-West Ethiopia, and Gondar, where 79.5% of guardians accepted the HPV vaccine for their daughters, and vaccine acceptability was linked to a positive perception (AOR=2, 95% CI 1.30,3.41) (Destaw et al., 2021). This suggests that addressing negative perceptions and misconceptions about HPV may be crucial in promoting vaccine acceptability and consecutive uptake.

A key concern regarding HPV vaccine perception was that some guardians felt their children were too young to receive the vaccine and emphasized the importance of administering it before the first sexual encounter. Similar concerns have been reported in other studies (Ganczak et al., 2018), with some guardians fearing that the HPV vaccine might encourage unsafe sexual behavior among adolescents (Mburu et al., 2019). These findings highlight the importance of guardians education in improving future vaccine

acceptability. This is especially crucial, as our study identified a statistically significant relationship between guardians knowledge of the HPV vaccine and their willingness to vaccinate their daughters. Similar results were observed in the United States (Baumgaertner et al., 2020), though they contrast with studies in Thailand (Grandahl et al., 2018). This suggests that perceptions of the HPV vaccine may vary by continent and country.

These findings contribute to the growing body of evidence suggesting that improving HPV vaccine coverage in Kenya requires more than availability—it requires trust, knowledge, and enabling socio-cultural contexts. Studies in Uganda and Tanzania similarly found that guardians' positive attitudes and prior exposure to health education significantly influenced vaccine acceptance (Nabirye et al., 2020). The influence of education as a predictor emphasizes the need to embed HPV messaging into broader reproductive health education efforts. Additionally, while religious beliefs were not a barrier for all, they moderated access to accurate information in some communities. This reinforces the importance of faith-based partnerships in vaccine promotion. The relatively high proportion of guardians with a positive perception yet moderate overall acceptability also suggests a gap between belief and action—possibly explained by competing priorities, misinformation, or structural barriers. Addressing these will require integrated strategies that go beyond health facilities to schools, churches, and homes.

CHAPTER 5: SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

This chapter summarizes the study's findings based on the research objectives. Conclusions drawn from the findings and discussions are presented, followed by recommendations directed at authorities, stakeholders, beneficiaries, and areas for further research.

5.2 Summary of findings

5.2.1 Summary of the socio-demographic characteristics and its influence on HPV vaccine acceptability

Bivariate analysis revealed that age, education level, and religion were significantly associated with acceptability ($p < 0.05$). Guardians aged 36–45 years, those with higher education, and those from supportive religious affiliations were more likely to accept the vaccine. Participants cited payment of health care and medical expenses to be majorly through NHIF 252 (53.3%).

5.2.2 Summary of the knowledge about HPV and its influence on HPV vaccine acceptability

The overall knowledge about HPV was relatively high, with 398 (84.1%) respondents demonstrating a good understanding of the virus. Bivariate analysis showed that knowledge was significantly associated with vaccine acceptability ($p < 0.05$), and multivariable regression confirmed it as an independent predictor, with knowledgeable guardians being 2.4 times more likely to accept the vaccine.5.2.3 Summary of the perception on HPV

he majority of guardians, 350 (74.2%), had a positive overall perception of HPV. Most respondents demonstrated a positive outlook on the severity of cervical cancer, the perceived benefits of the HPV vaccine, its effectiveness, and their daughters' susceptibility to HPV infection. However, most respondents mentioned barriers against vaccination as high cost, the likelihood of HPV vaccine interfering with fertility, potential of side effects from the vaccine, pain during injection and the limited knowledge towards HPV vaccine source and ability of HPV vaccine to encourage unsafe sex among young girls.

5.2.3 Summary of the perception about HPV and its influence on HPV vaccine acceptability

About 74.2% of guardians had a positive perception of HPV and its vaccine. Perception was also significantly associated with vaccine acceptability ($p < 0.05$). In the logistic regression model, positive perception remained a strong predictor of acceptance.

5.2.4 Summary of the HPV vaccine acceptability

More than half of the guardians, 314 (66.4%), exhibited a high acceptability of HPV vaccination for their daughters, and a majority, 299 (63.2%), reported that their daughters had already received the vaccine. While this indicates moderate acceptability, it also shows that a significant proportion remain hesitant, highlighting a need for sustained public health engagement.

5.3 Conclusions to the study

The conclusions of this study were drawn strictly based on the research objectives, ensuring that the findings align with the study's aims and scope.

5.3.1 Conclusions to the socio-demographic characteristics

Most of the guardians were of the age group 36-45 years and the highest education level of the primary guardians was secondary education. Additionally, most of the households, preferred visiting dispensaries as their health facility and used NHIF to pay for their medical expenses.

5.3.2 Conclusions to knowledge about HPV

The majority of respondents were aware that HPV is a virus and had prior knowledge about the HPV vaccine. Furthermore, most respondents understood that the HPV vaccine does not pose any harm to one's health.

5.3.3 Conclusions to perception on HPV

Majority of the respondents reported that pap smear screening was necessary after HPV vaccination. Additionally, the respondents mentioned that guardians needed to be well informed in deciding towards vaccinating their daughters. The results of this study show guardians trust and perception of the vaccine was at a relatively good level.

5.3.4 Conclusions to HPV acceptability

The majority of respondents indicated their willingness to have their daughters receive the HPV vaccine. Additionally, the study revealed that more than half of the respondents reported that their daughters had already received the HPV vaccine. Despite the presence of several barriers to HPV vaccination, the findings indicated a strong willingness among respondents to ensure their daughters were vaccinated.

Findings indicated that several demographic factors such as duration of residence, occupation, and medical insurance were significantly associated with the likelihood of

guardians getting their daughters vaccinated against HPV. These findings highlight the influence of demographic, socioeconomic, and attitudinal factors on guardians' decisions regarding HPV vaccination for their daughters. The study demonstrated that positive perceptions of the HPV vaccine and higher knowledge levels were significantly associated with vaccine acceptability. This suggests that addressing negative perceptions, dispelling misconceptions about HPV and the vaccine, and bridging existing knowledge gaps could be essential in enhancing vaccine acceptability and increasing uptake.

5.4 Recommendation from the study

Based on the findings, this study suggests the following recommendations:

5.4.1 Recommendation for policy

The Ministry of Health and all stakeholders should intensify their efforts to expand mass education regarding the HPV virus, its impacts, and the significance of the HPV vaccine. They should consider demographic, socioeconomic, and attitudinal factors when designing and implementing HPV vaccination programs to ensure equitable access and uptake across different demographic and socioeconomic groups. Healthcare providers and policymakers should consider the role of health insurance coverage in promoting HPV vaccination programs to ensure equitable access and uptake among different socioeconomic groups.

5.4.2 Recommendation for practice

The study emphasizes the need for increased awareness regarding the effects, prevention measures, and global impact of HPV, contributing to a deeper understanding of the factors influencing HPV vaccine acceptability in Kenya. Given that the findings indicate a relatively high level of parental trust and positive perception of the vaccine, interventions

should focus on further strengthening awareness about the vaccine's effectiveness and safety while enhancing guardians' confidence in accepting the vaccine.

While general knowledge levels were relatively good, efforts by the Ministry of Health and stakeholders should now focus on changing perceptions by addressing lingering myths and promoting vaccine safety through trusted community figures. Additionally, enhancing guardians' awareness of HPV can significantly improve their confidence and acceptance of vaccinating adolescent girls (Gualano et al., 2018). Therefore, conducting community awareness programs aimed at raising awareness on HPV vaccination should be emphasized and especially targeting less educated guardians.

High acceptance levels observed in our study would inform the scaling up of HPV vaccine campaigns and vaccination programs in Laikipia County as well as in other counties. We therefore recommend that the Ministry of Health intensify community-based campaigns and sensitization programs to foster positive perceptions of the HPV vaccine and enhance residents' knowledge about its importance.

We also recommend that guardians to be involved during school vaccination programs for increase of knowledge and build of positive perception and this will result to them increasing their consent towards vaccination of their girls. Health providers should be at the forefront to inform guardians directly through different platforms like media, campaigns and hospital visits about HPV and cervical cancer screening services. To reach many community members, community health workers should be engaged in provision of community education on HPV vaccine. Various stakeholders need to be instituted.

5.4.3 Recommendation for further research

This study was cross-sectional and focused on one sub-county. Future research should explore longitudinal data to assess actual vaccine uptake and how perceptions evolve over time. Additionally, qualitative studies could provide deeper insights into how socio-cultural and religious factors influence vaccine decision-making at household and community levels.

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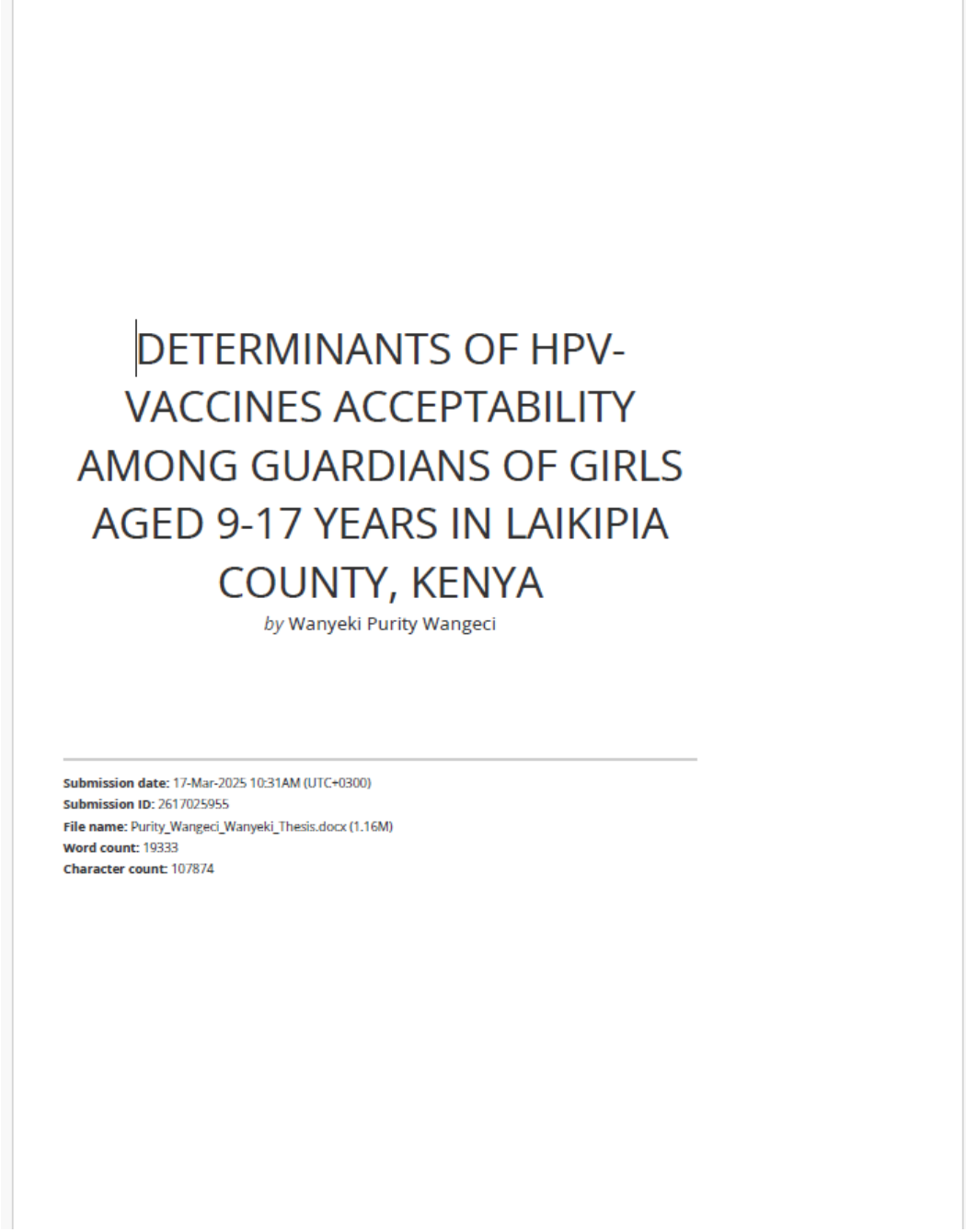
APPENDICES

Appendix 1: Plagiarism report



DETERMINANTS OF HPV-VACCINES ACCEPTABILITY AMONG GUARDIANS OF GIRLS AGED 9-17 YEARS IN LAIKIPIA COUNTY, KENYA

by Wanyeki Purity Wangeci

Submission date: 17-Mar-2025 10:31AM (UTC+0300)
Submission ID: 2617025955
File name: Purity_Wangeci_Wanyeki_Thesis.docx (1.16M)
Word count: 19333
Character count: 107874

DETERMINANTS OF HPV-VACCINES ACCEPTABILITY AMONG GUARDIANS OF GIRLS AGED 9-17 YEARS IN LAIKIPIA COUNTY, KENYA

ORIGINALITY REPORT

18%	15%	7%	8%
SIMILARITY INDEX	INTERNET SOURCES	PUBLICATIONS	STUDENT PAPERS

Exclude quotes	Off	Exclude matches	Off
Exclude bibliography	Off		

Appendix 2: Informed consent form

Mount Kenya University

Investigator: Wanyeki Purity Wangeci

Supervisors: Dr. … and Dr. …

TITLE OF STUDY: Determinants of HPV-vaccines acceptability among guardians of girls aged 9-17years in Laikipia county, Kenya.

INVESTIGATOR: Wanyeki Purity Wangeci

INSTITUTION: Mount Kenya University

INTRODUCTION $ PURPOSE OF THE STUDY: This is a study being conducted by Purity Wangeci Wanyeki a Masters student at Mount Kenya University. The aim is to find out the knowledge, perception and other factors affect HPV vaccine acceptability among guardians of girls aged 9-17years in Laikipia County, Kenya.

STUDY PROCEDURES: The principal investigator together with research assistant will recruit residents of Nyahururu subcounty for interviews. Participants will be asked questions including their demographic characteristics, knowledge on HPV, perception of HPV vaccine and HPV vaccine acceptability. If you are willing to participate, the principal investigators request you give permission by signing or putting thumb print at the bottom of this page.

RISKS/DISCOMFORTS: There are no direct risks to the subjects who will participate.

BENEFITS: This research is purely academic and as such there are no direct benefits to the participants. the findings however will benefit the government and the society at large by providing information to solve HPV vaccine acceptability. Participants taking part in the study will get to ask questions and seek clarifications on various issues on HPV vaccine.

CONFIDENTIALITY: All information given will be treated with utmost confidentiality, no names will be used in the study documents, unique identification codes will be used.

All documents with personal identifying information such as this consent will be safely locked separately from questionnaires to ensure confidentiality.

CONTACTS: In case of any queries or concerns, please contact the principal investigator on

0710463678 or email: prtwangeci@gmail.com Or MKU email publichealth@mku.ac.ke

CONSENT AGREEMENT

I have read the information, or it has been read to me, I have had the opportunity to ask questions and seek clarifications and all queries addressed to my satisfaction. I consent voluntarily to participate as a subject in the study and understand that I have the right to withdraw from the study at any time without in any way affecting my future health care.

Would you like to participate in the study (*please tick below)*

Yes……..

No…….

Participant name…….. (optional)

Signature/thumb print……

Date…….

Researchers signature…….…… Date……

(You will be given a copy of this form to take with you). Thank you for your time.

Appendix 3: Questionnaire

Questionnaire ID	
County	
Sub- county	
Division	
Location	
Sub-location	
Village	
Date of interview	
Initials of interviewer	

IDENTIFICATION:

I. Age:_____

II. Gender: ( ) M ( ) F

III. How long have you lived in the current area as stated above?.....

IV. How many people(Not including yourself) live in your household?.....

V. Number of Children in the household (below 18 years): ……..

VI. Please indicate the age of your girls(*From the eldest to the yougest*);....., ……..,....., ……, ……, ……..., ……..

VII. Please indicate your relationship with the children in the household

( ) Father

( ) Mother

( ) Others(Specify)……..

VIII. Marital status:

( ) Never married

( ) Married or living together

( ) divorced/separated

IX. Who is the primary guardians of the household?.....

( ) Father

( )Mother

( ) Sibling

( ) Relative

( )Other (Specify).....

X. What is the occupation of the primary guardians:

( ) Unemployed

( ) Employed(salaried)

( ) Business

( ) Casual labor ( ) Other(*specify*)…….

( ) Farmer

XI. Family income per month:……

XII. Education level:

( )No basic education ( ) Other (Specify)……..

( )Primary school level

( )Secondary school level

( ) Tertiary education

XIII. Religious affiliation

( ) Protestant

( ) Catholic

( ) Muslim

( ) Hindu

( ) Other (*Specify*)……

XIV. Which health facility do you visit?

( ) County referral

( ) Sub-County Hospital

( ) Dispensary

( ) Private hospital

XV. Give a reason why you choose the facility named above……

XVI. How do you pay for your health care and medical expenses?

( ) National Health Insurance Fund

( ) Private insurance

( ) Self pay,out of pocket

SECTION 1: Knowledge about HPV

1. Is HPV a virus?

   ( ) Yes ( ) No ( ) I am not sure

2. What is the mode of transmission of HPV? (*Tick any/all that apply*)

   ( ) Physical contact ( ) Other (*specify*) :……

   ( ) Aerosol/Air droplet

   ( ) Sexual intercourse

   ( ) Blood transfusion

   ( ) Using public toilets

   ( ) Mother to child during pregnancy

3. Which of the following persons can be infected by HPV?

   ( ) Girls ( ) Women ( ) Boys ( ) Men ( ) Nobody ( ) I am not sure

4. Cervical cancer is type of disease derived from guardians' genetics

   ( )Yes ( ) No ( ) I am not sure

5. Most Cervical cancer is caused by human papillomavirus (HPV) infection.

( ) Yes ( ) No ( ) I don't know

6. Nearly everyone infected with HPV will have symptoms:

( ) True ( ) False ( ) I don't know

7. Cervical cancer is a leading cause of cancer deaths in women in Kenya:

( ) True ( ) False ( ) I don't know

8. In your own opinion, which measures can be taken to prevent transmission of HPV infection ?*(Please, indicate all that apply)*

( ) Use of condoms

( ) HPV vaccine

( ) Late onset of sexual intercourse ( ) It cannot be prevented

( ) Adequate personal hygiene

( ) Monogamy ( ) I do not know

( ) Antibiotics

( ) Contraceptive pill

9. What diseases does HPV Vaccine protect against (tick any/all that apply).

( ) Cervical Cancer

( ) Anal Cancer ( ) Others (*Specify*):……..

( ) Vulvar Cancer

( ) Warts

( ) HIV/AIDS

( ) Breast Cancer

( ) None of the above:……..

10. Should the HPV vaccine be given before the first sexual intercourse?

( ) Yes ( ) No ( ) I am not sure

11. Can the HPV vaccine be given to people who have had sex?

( ) Yes ( ) No ( ) I am not sure

12. The HPV vaccine is effective to be given to girls aged 9 years old and above

( ) True ( ) False ( ) I don't know

13. The vaccine works in people who have not yet been infected by HPV

( ) True ( ) False ( ) I don't know

14. Can the HPV vaccine be harmful to health?

( ) Yes ( ) No ( ) I am not sure

15. Can the HPV vaccine cause HPV infection?

( ) Yes ( ) No ( ) I am not sure

16. Is the HPV vaccine provided by the government?

( ) Yes ( ) No ( ) I am not sure

17. Is the HPV vaccine part of the girls' immunization record?

( ) Yes ( ) No ( ) I am not sure

18. How many doses are required for complete vaccination?.....

19. What is the youngest age that a girl should receive HPV vaccination?.....

20. Does the HPV vaccine lessen the chance of having cervical cancer?

( ) Yes ( ) No ( ) I am not sure

21. Have you heard about the Pap smear test?

( ) Yes ( ) No ( ) I am not sure

22. What is a Pap smear test used for?

( ) Testing sexually transmitted diseases (STDs)

( ) Treating Cervical Cancer

( ) Cervical cancer screening

SECTION 2: HPV and HPV- Vaccine Related Perception

*Please indicate with a √ the level of your agreement with the following statements from **No being marked with 1 to Yes marked as 5**;*

23. There is no need for Pap smear screening after receiving HPV vaccination?

( ) No

( ) Little

( ) Somewhat

( ) Much

( ) Yes

24. I believe cervical cancer is a serious disease that kills women

( ) No

( ) Little

( ) Somewhat

( ) Much

( ) Yes

25. I believe HPV vaccination is important

( ) No

( ) Little

( ) Somewhat

( ) Much

( ) Yes

26. Should HPV vaccine be required for school entry

( ) No

( ) Little

( ) Somewhat

( ) Much

( ) Yes

27. HPV vaccine's effectiveness against HPV is (*Indicate with a tick in a scale of 1 to 5 with 1 being Don't know to 5 being very effective*)

( ) Don't know

( ) Not effective

( ) Neutral

( ) Somewhat effective

( ) Very effective

Please indicate with a √ the level of your agreement with the following statements from ***Strongly disagree being marked with 1 to Strongly agree marked as 5****;*

28. Guardians need more information to make a decision regarding to daughter's vaccination

( ) Strongly disagree

( ) Disagree

( ) Undecided

( ) Agree

( ) Strongly agree

29. HPV is a serious disease for your daughter

( ) Strongly disagree

( ) Disagree

( ) Undecided

( ) Agree

( ) Strongly agree

30. What is your daughter's risk of HPV infection as compared with other girls of same age (*In a scale of 1 to 5 with 1 being very low to 5 being very high*)

( )Very low

( ) Low

( )Neutral

( ) High

( ) Very high

I would like to know what you feel about the barriers of HPV vaccination programs. **(Please mark the aspects according to your own perception from strongly disagree being marked with 1 to strongly agree marked as 5).**

31. The cost of HPV vaccine is high
    ( ) Strongly disagree
    ( ) Disagree
    ( ) Neutral
    ( ) Agree
    ( ) Strongly agree
32. There is limited knowledge of HPV vaccine source
    ( ) Strongly disagree
    ( ) Disagree
    ( ) Neutral
    ( ) Agree
    ( ) Strongly agree
33. HPV vaccines cause interference with fertility
    ( ) Strongly disagree
    ( ) Disagree
    ( ) Neutral
    ( ) Agree
    ( ) Strongly agree
34. HPV vaccines has side effects
    ( ) Strongly disagree
    ( ) Disagree
    ( ) Neutral
    ( ) Agree
    ( ) Strongly agree
35. There is pain during injection
    ( ) Strongly disagree
    ( ) Disagree
    ( ) Neutral

( ) Agree

( ) Strongly agree

36. HPV vaccination among young girls might encourage unsafe sex

( ) Strongly disagree

( ) Disagree

( ) Neutral

( ) Agree

( ) Strongly agree

SECTION 3: HPV- Vaccine Acceptability

37. Would you allow your daughter or close relative to get HPV vaccines? *(Please rate to which extent you are willing from 1-Very unlikely to 5-very likely)*

( ) Very unlikely

( ) Unlikely

( ) Neutral

( ) Likely

( ) Very likely

38. I would get my daughter vaccinated

( ) Yes ( ) No ( ) Not sure

39. Have your daughter taken the HPV vaccine yet?

( ) Yes ( ) No ( ) I am not sure

40. Would you recommend the HPV vaccine for a child, friend, or relative to take?

( ) Yes ( ) No ( ) I am not sure

Thankyou!

Appendix 4: Introduction Letter

Mount Kenya University

DIRECTORATE OF GRADUATE STUDIES

MPH/2019/48348

22nd February,2023

National Commission for Science Technology & Innovation (NACOSTI)
Off Waiyaki Way, Upper Kabete,
P.O Box 30623- 00100
NAIROBI, KENYA

Dear Sir/Madam,

RE: WANYEKI PURITY WANGECI – REGISTRATION NO. MPH/2019/48348

The purpose of this letter is to introduce the above named student who is pursuing **Master of Public Health** in the department of **Epidemiology and Biostatistics** in the school of **Public Health.**

The title of the research is **"Determinants of HPV-Vaccines Acceptability Among Guardians of Girls Aged 9-17 Years in Laikipia County, Kenya."**

It has been cleared by the University's Ethics Review Committee (Certificate attached) and now has to proceed to the field to collect data between **February, 2023 and April, 2023.**

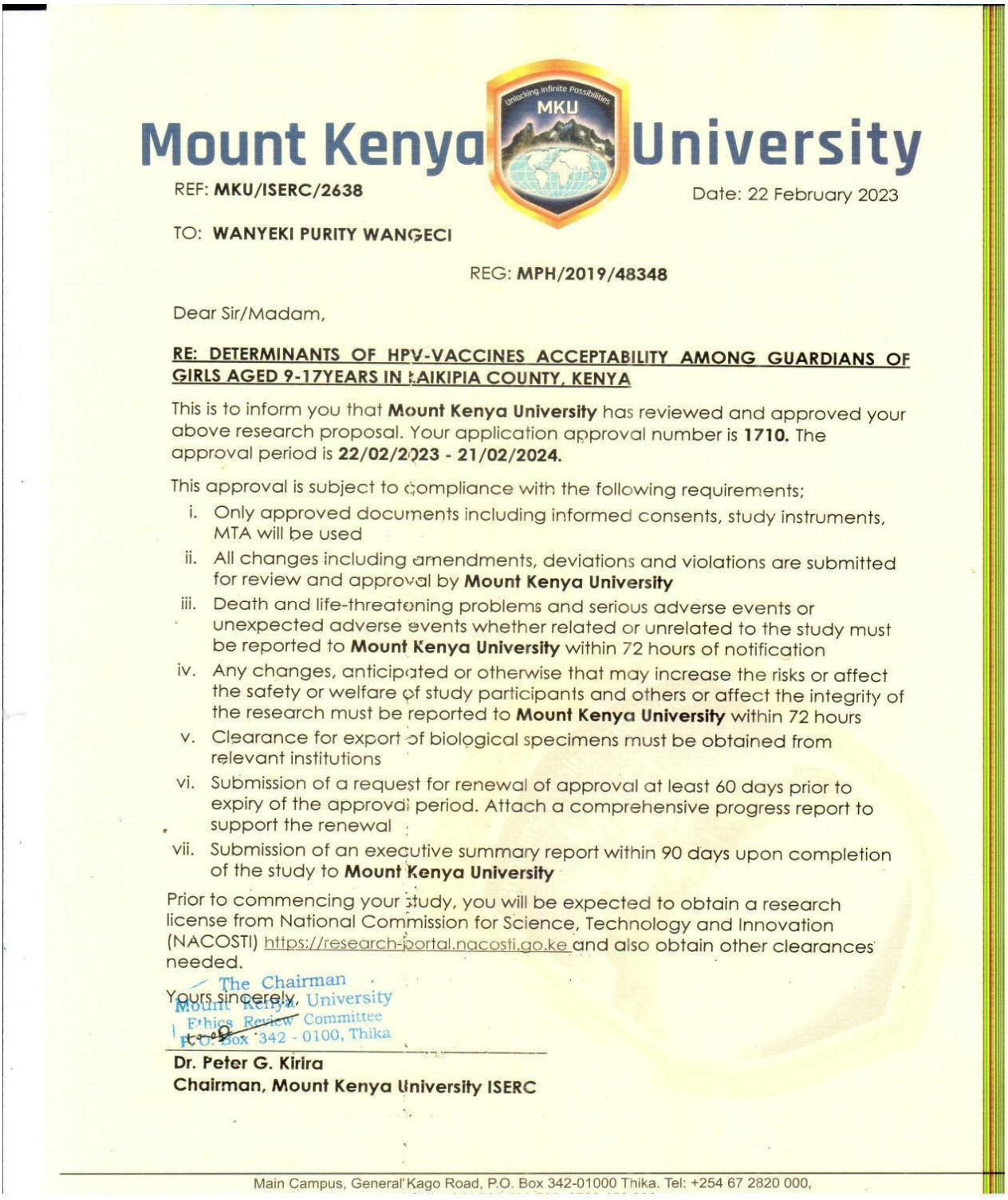
Any assistance accorded to the student will be highly appreciated.

Thank you.

Mount Kenya University
P. O. Box 342 - 01000, THIKA
Office of the Director
Graduate Studies

Dr. Samuel M. Karenga, Ph.D
Director, Graduate Studies
Enc.

Appendix 5: ERC Certificate



Mount Kenya University

REF: **MKU/ISERC/2638**

Date: 22 February 2023

TO: **WANYEKI PURITY WANGECI**

REG: **MPH/2019/48348**

Dear Sir/Madam,

RE: DETERMINANTS OF HPV-VACCINES ACCEPTABILITY AMONG GUARDIANS OF GIRLS AGED 9-17YEARS IN LAIKIPIA COUNTY, KENYA

This is to inform you that **Mount Kenya University** has reviewed and approved your above research proposal. Your application approval number is **1710.** The approval period is **22/02/2023 - 21/02/2024.**

This approval is subject to compliance with the following requirements;

i. Only approved documents including informed consents, study instruments, MTA will be used
ii. All changes including amendments, deviations and violations are submitted for review and approval by **Mount Kenya University**
iii. Death and life-threatening problems and serious adverse events or unexpected adverse events whether related or unrelated to the study must be reported to **Mount Kenya University** within 72 hours of notification
iv. Any changes, anticipated or otherwise that may increase the risks or affect the safety or welfare of study participants and others or affect the integrity of the research must be reported to **Mount Kenya University** within 72 hours
v. Clearance for export of biological specimens must be obtained from relevant institutions
vi. Submission of a request for renewal of approval at least 60 days prior to expiry of the approval period. Attach a comprehensive progress report to support the renewal
vii. Submission of an executive summary report within 90 days upon completion of the study to **Mount Kenya University**

Prior to commencing your study, you will be expected to obtain a research license from National Commission for Science, Technology and Innovation (NACOSTI) https://research-portal.nacosti.go.ke and also obtain other clearances needed.

Yours sincerely,

The Chairman
Mount Kenya University
Ethics Review Committee
P.O. Box 342 - 0100, Thika

Dr. Peter G. Kirira
Chairman, Mount Kenya University ISERC

Main Campus, General Kago Road, P.O. Box 342-01000 Thika. Tel: +254 67 2820 000,

Appendix 6: Research permit by NACOSTI

REPUBLIC OF KENYA

NATIONAL COMMISSION FOR SCIENCE,TECHNOLOGY & INNOVATION

Ref No: **284577**

Date of Issue: **04/April/2023**

RESEARCH LICENSE

This is to Certify that Miss.. Purity Wangeci Wanyeki of Mount Kenya University, has been licensed to conduct research as per the provision of the Science, Technology and Innovation Act, 2013 (Rev.2014) in Laikipia on the topic: DETERMINANTS OF HPV-VACCINES ACCEPTABILITY AMONG GUARDIANS OF GIRLS AGED 9-17YEARS IN LAIKIPIA COUNTY, KENYA. for the period ending : 04/April/2024.

License No: **NACOSTI/P/23/24131**

284577

Applicant Identification Number

Director General
NATIONAL COMMISSION FOR SCIENCE,TECHNOLOGY & INNOVATION

Verification QR Code

NOTE: This is a computer generated License. To verify the authenticity of this document, Scan the QR Code using QR scanner application.

See overleaf for conditions

Appendix 7: Research authorization by Laikipia County

COUNTY GOVERNMENT OF LAIKIPIA

OFFICE OF THE COUNTY DIRECTOR
P.O. Box 1271-10400,
Nanyuki, Kenya

Ref: CGL/HEALTH/RESEARCH/VOL.1/31

Date: 24th February, 2023

WANYEKI PURITY WANGECI
MOUNT KENYA UNIVERSITY

RE: RESEARCH AUTHORIZATION

This is to grant you authority to undertake a research on a Master of Public Health in the department of Epidemiology and Biostatistics on "**Determinants of HPV-Vaccines Acceptability Among Guardians of Girls Aged 9-17 Years in Laikipia County, Kenya**" between 22nd February 2023 to 21st February 2024.

Please share your findings with office of County Director, Department of Health, County Government of Laikipia.

I take this opportunity to wish you success in your research.

Yours faithfully,

LAIKIPIA HEALTH SERVICE
COUNTY DIRECTOR
PREVENTIVE & PROMOTIVE SERVICES
24 FEB 2023
Sign.....
COUNTY GOVERNMENT OF LAIKIPIA

DR. DO[illegible] MOGOI
COUNTY DIRECTOR PREVENTIVE & PROMOTIVE HEALTH
LAIKIPIA COUNTY

Cc. **Chief Officer of Health**
County Director Medical Services