

HPV knowledge

by Zeynu Muhammad

Submission date: 15-Oct-2024 11:07AM (UTC+0300)

Submission ID: 2485866073

File name: Parental_K_A_OF_HPv_vaccination_For_Report_approval.docx (1.14M)

Word count: 18473

Character count: 102139



**ADDIS ABABA UNIVERSITY
COLLEGE OF HEALTH SCIENCES
DEPARTMENT OF OBSTETRICS AND GYNECOLOGY**

Knowledge and Attitude Toward ²HPV Vaccination Among Mothers of Girls Aged 9-14 Years Attending Obstetrics & Gynecology Outpatient Clinics at Three Teaching Hospitals of Addis Ababa University, Addis Ababa, Ethiopia

Principal Investigator:

Dr. Zeynu Mohammed (MD, Obstetrics and Gynecology Resident)

Advisors:

1. Dr. Husnia Hussen (MD, ¹Assistant Professor in Gynecology and Obstetrics, Gynecologic Oncologist, Addis Ababa University, College Of Health Sciences)
2. Dr. Salih Hassen ¹MD, Assistant Professor in Gynecology and Obstetrics, Urogynecologist, Addis Ababa University, College Of Health Sciences)

A Thesis Submitted to the Department of Obstetrics and Gynecology, School of Medicine, Addis Ababa University, for Partial Fulfillment of the Specialty Certificate in Obstetrics and Gynecology

July, 2024

ADDIS ABABA, ETHIOPIA

Acknowledgment

I would like to express my gratitude to Addis Ababa University's Department of Obstetrics and Gynecology for allowing me to perform this study. I would also want to thank my advisors, Dr. Husnia Hussen and Dr. Salih Hassen for their invaluable advice, comments and suggestions in carrying out this thesis.

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Abbreviations and Acronyms:

CC: Cervical Cancer

HPV: Human Papillomavirus

LR HPV = Low-Risk HPV

HR HPV = High-Risk HPV

VLPs = Viral-Like Particles

TLR4= Toll/Like Receptor 4

GAVI = Global Alliance for Vaccine and Immunization

STD= Sexually Transmitted Disease

STI= Sexually Transmitted Infection

LMICs= Low and Middle Income Countries

HICs= High-Income Countries

SSA= Sub-Saharan Africa

WHO: World Health Organization

LAGT: Lower Ano-genital Tract

AAU: Addis Ababa University

TASH = Tikur Anbesa Specialized Hospital

ZMH= Zewditu Memorial Hospital

GMH= Ghandi Memorial Hospital

ANC= Antenatal clinic

OBGYN: Obstetrics and Gynecology

FMOH: Federal Ministry of Health

SPSS: Statistical Package for the Social Sciences

UK= United Kingdom

USA= United States of America

Abstract

Background: Human papillomavirus (HPV) is responsible for nearly all cases of cervical cancer, the second leading cause of cancer death among Ethiopian women. Vaccination against HPV is an effective primary prevention strategy. Ethiopia initiated HPV vaccination on December 6, 2018, targeting girls aged 9–14 years, although coverage remains low. Mothers are typically the primary decision-makers regarding their daughters' HPV vaccination, yet their knowledge and attitudes towards the vaccine have been minimally studied in Ethiopia.

Objective: To assess knowledge and attitude towards HPV vaccination among mothers of girls aged 9-14 years attending obstetrics and gynecology outpatient clinics at three teaching hospitals of Addis Ababa University, Ethiopia.

Method: An institution-based cross-sectional study was conducted with 392 mothers selected through simple consecutive sampling from November 1, 2023, to February 29, 2024. Data were collected via face-to-face interviews using a semi-structured questionnaire and analyzed using SPSS version 25. Descriptive, bivariate, and multivariate binary logistic regression analyses were performed, with p-values ≤ 0.05 indicating statistical significance.

Results: Results showed that 50.0% of respondents had good knowledge and 48.2% had a positive attitude towards the HPV vaccine. Knowledge was significantly influenced by awareness of the HPV vaccine (AOR = 57.676, 95% CI: 23.421, 142.028), knowledge of cervical cancer (AOR = 6.722, 95% CI: 3.745, 12.063), family history of cancer (AOR= 38.106, 95% CI: 4.123, 352.176), and knowledge of other parents' vaccination (AOR = 2.842, 95% CI: 1.309, 6.172). Attitude was influenced by knowledge of cervical cancer (AOR = 4.958, 95% CI: 2.709, 9.072), knowledge of HPV infection (AOR= 3.007, 95% CI: 1.563, 5.785), and awareness of the HPV vaccine (AOR = 1.987, 95% CI: 1.131, 3.493).

Conclusion: Only half of the mothers had good knowledge about the HPV vaccine, indicating significant knowledge gaps. Nearly half held favorable attitudes towards the vaccine, suggesting that misconceptions and cultural concerns persist.

Recommendation: Addressing these knowledge gaps and leveraging associated factors can improve HPV vaccination uptake, contributing to cervical cancer prevention in Ethiopia.

Key words: Knowledge, attitude, HPV vaccine, cervical cancer, mothers, Ethiopia

1. INTRODUCTION

1. Background

Human papillomavirus (HPV) is the most common sexually transmitted infection worldwide, affecting approximately 80% of sexually active men and women (1-3). While 90% of HPV infections clear or become undetectable within 1 to 2 years, 10-20% persistent and lead to various cancers (4, 5).

There are over 200 different HPV genotypes categorized as “oncogenic” (high risk/HR) and “non-oncogenic” (low risk/LR). High-risk HPV (HR-HPV) is responsible for over 99.7% of cervical cancers in women. Specifically, HPV 16 and 18 account for 70% of invasive cervical cancers, while HPV types 16, 18, 31, 33, 45, 52, and 58 together cause more than 95% of all cervical cancer cases (4, 6, 7).

Persistent HPV infection is responsible for approximately 90% of anal and cervical cancers, 70% of vaginal/vulvar cancers, 60% of penile cancers, and up to 70% of oropharyngeal cancers (2, 5, 8). Overall, HPV accounts for about 5% of all human cancers, resulting in an estimated 690,000 cancers annually worldwide (4, 9). Low-risk genotypes, HPV 6 and 11, which are not classified as oncogenic, cause almost all cases of anogenital warts (90%) and recurrent respiratory papillomatosis(4, 10).

A systematic review in Ethiopia found that the most prevalent HPV genotypes were HPV 16 (37.3%), HPV 52 (6.8%), HPV 35 (4.8%), HPV 18 (4.4%), and HPV 56 (3.9%). Other high-risk types included HPV 31 (3.8%), HPV 45 (3.5%), HPV 58 (3.1%), HPV 59 (2.3%), and HPV 68 (2.3%). Among the high-risk types, the combined prevalence of HPV 16/18 was 53.7%, while the most common low-risk types were HPV 11 (2.7%), HPV 42 (2.1%), and HPV 6 (2.1%)(11).

Multi-parity, early sexual debut, and other sexually transmitted infections (STIs) are risk factors for HPV and cervical cancer (CC). The evolution of HPV-related diseases depends on the host's immune response, virus characteristics, and co-factors like alcohol, smoking, and other infections (12).

Despite its oncogenic potential, HPV vaccination effectively prevents cervical cancer and other HPV-associated cancers by providing primary prevention against over 90% of infections in a cost-effective manner (3, 5, 13).

Cervical cancer (CC) is the fourth most common cancer and cause of cancer death among women globally, and it ranks as the second most common cancer in women aged 15 to 44 years (14). In 2018, approximately 570,000 women were diagnosed with CC, leading to 311,000 deaths, with 84% of cases and 88% of deaths occurring in lower-resource countries (15). The

global burden is expected to rise to 700,000 cases and 400,000 deaths by 2030. CC is both preventable and curable if detected early (16).

HPV vaccination can prevent over 90% of HPV-related cancers (17). Three vaccines are available: bivalent (Cervarix: targets HPV 16/18, licensed in 2007), quadrivalent (Gardasil: targets HPV 6/11/16/18, licensed in 2006), and 9-valent (Gardasil 9: targets HPV 6/11/16/18/31/33/45/52/58; licensed in 2014) (18-20)

All are based on non-infectious recombinant type-specific L1 capsid proteins assembled into virus-like particles (VLPs) as immunogens (19). Since VLPs are merely proteins and do not contain the viral genome, they are considered non-infectious and non-oncogenic, making them safer than HPV-attenuated vaccines (18). VLPs can be produced in bacteria, yeast, or insect cells. Cervarix comprises HPV 16 and 18 VLPs, monophosphoryl lipid A (MPL), and aluminum hydroxide (together called adjuvant system 04, AS04) as an adjuvant. MPL is a toll-like receptor 4 (TLR4) agonist that can induce higher levels of antibodies compared to Gardasil and Gardasil 9, both of which contain only aluminum hydroxide as an adjuvant and are produced in *Saccharomyces cerevisiae* yeast (9, 18). Efficacy against HPV 16/18 is similar across vaccines (9).

The current HPV vaccine recommendations apply to individuals 9 to 26 years old and adults aged 27–45 years who might be at risk of new HPV infection and benefit from vaccination. The primary target population recommended by the World Health Organization (WHO) is girls aged 9–14 years, prior to their becoming sexually active, to undergo a two-dose schedule, and girls ≥ 15 years of age, to undergo a three-dose schedule. HPV vaccines are safe, with local symptoms being the most common adverse side effect (4, 5, 16, 19).

Over the past decade, the 4-valent HPV vaccine has led to approximately 90% reductions in HPV 6/11/16/18 infections, genital warts, and high-grade cervical abnormalities, along with about a 60% reduction in low-grade cervical abnormalities. The estimated vaccine effectiveness with one dose or more is 83–96.1% (19).

The cumulative incidence of cervical cancer (CC) is 47 cases per 100,000 persons among vaccinated women and 94 cases per 100,000 among unvaccinated women. Women vaccinated before age 17 have an 88% lower risk of CC compared to those unvaccinated. The incidence rate ratio is 0.12 for women vaccinated before age 17 and 0.47 for those vaccinated between ages 17 and 30 (21).

The best protection against HPV-related diseases is before exposure. Vaccination prior to first sexual contact can protect over 90% against infections and precancerous lesions, while post-exposure vaccination offers only 50–60% protection (18). Timely vaccination is crucial, as it is most effective when given at younger ages (22). Additionally, protection from the vaccine is long-lasting (4). The HPV vaccine is contraindicated for individuals allergic to the vaccine or yeast and should not be given to pregnant or breastfeeding females. It does not protect against existing infections or all cervical cancer-causing HPV types, so cervical cancer screening is still necessary (23).

The WHO aims to eliminate cervical cancer by 2030, targeting an incidence of fewer than 4 cases per 100,000 women annually. The 90-70-90 targets include vaccinating 90% of girls by age 15, screening 70% of women by ages 35 and 45, and ensuring 90% of women with cervical disease receive treatment (16, 19). However, fewer than 30% of low- and middle-income countries (LMICs) have adopted HPV vaccination, compared to over 85% of high-income countries. By October 2020, 110 of 194 countries (57%) had integrated the HPV vaccine into

their programs, with 27 countries implementing gender-neutral vaccination, including 7 in Europe (10, 19, 24, 25).

¹¹ Ethiopia launched the HPV vaccine for 14-year-old girls on December 6, 2018, with GAVI's support, using Gardasil-4™. The vaccine is administered in schools and health facilities, but coverage is low due to global shortages, with plans to expand to more age cohorts as vaccines become available (26-30).

Because HPV vaccination in adolescents is usually determined by parents and families, Parental knowledge and attitudes significantly influence the willingness which indirectly affects the uptake of the vaccine (31, 32). Inadequate knowledge is a key barrier, as parents must first understand HPV risks to make informed vaccination decisions (33).

Mothers, in particular, play a critical role in healthcare decisions for their children, making their awareness and attitudes regarding HPV and HPV vaccination vital for effective vaccination program implementation (34-36).

1.2 Statement of the problem

Cervical cancer is a global public health problem, with a particularly high burden in many LMICs (37). Globally, in 2020, there were an estimated 604,127 cervical cancer cases and 341,831 deaths, accounting for an 88.1% incidence and 91.4% mortality rate in LMICs (14, 38). The highest age-standardized incidence rates are observed in eastern Africa—40 cases per 100,000 women years—followed by southern Africa at 36.4 (37).

Ways to prevent and treat cervical cancer are well known, and death from cervical cancer is considered preventable and unnecessary (39). Approximately 95% of cervical cancer patients are diagnosed in late-stage or end-stage disease in Africa, which can be attributable to the knowledge levels and gaps as well as the attitudes and practices of all the stakeholders (40).

In developed countries, cervical cancer has been declining for many years, largely due to the cervical cytology screening program, which is now being replaced by HPV screening.

⁹ In contrast, it is rising in developing countries without national wide screening, accounting for 230,000 cases and deaths (80% of the total) and remaining the second-most common cancer in these regions (7, 28).

⁹ Women in Sub-Saharan Africa (SSA) are disproportionately affected, with the highest incidence and mortality rates in the world, accounting for more than 70% of the global cervical cancer burden. In 2018, cervical cancer caused over 20% of cancer deaths among women in SSA (24). It ranks as the second greatest cancer burden in Ethiopia, India, Nigeria, and Pakistan, with 148,000 new cases and 94,000 deaths estimated in these countries in 2020(41).

In Ethiopia, CC is the second most common cancer after breast cancer and ² the second leading cause of cancer death among women with an increase in trend (29, 42, 43). In 2020, there were an estimated 7,445 new CC cases and 5,338 deaths, with an incidence rate of 21.5 cases and a

mortality rate of 16.0 per 100,000 women annually (44). Most patients present at advanced stages, which complicates outcomes (45).

Cervical cancer prevention is more cost-effective than treatment, making it the highest priority for control efforts (39). HPV vaccination can reduce CC incidence by 70% globally, while regular screening can prevent the remaining 30% of cases (46)

Despite evidence supporting the effectiveness and safety of the HPV vaccine, global vaccination uptake remains low, with only 39.7% of women vaccinated (29). Coverage is 30% in LMICs, 55% in upper middle-income countries, and 80% in high-income countries (47). In the U.S.A, 59% of teens were up-to-date with vaccinations in 2020 (48), while Kenya reported 33% for the first dose and 16% for the second (49). Nigeria had only 1.4% (50), and Cameroon reported a mere 5% vaccination rate in 2020 (47).

Hence, the least uptake of HPV vaccines occurs in high-burden countries, driven by lack of knowledge among healthcare providers and the public, low acceptance among parents and adolescents, and supply problems. While there are many stakeholders involved in the process of HPV vaccination, knowledge and attitude of mothers of children in the eligible age range play a key role (47). Adolescents aged 11–14 years contribute less to the decision-making process concerning their vaccinations than do their parents (51).

11 In Ethiopia, misconceptions about the cause and prevention of cervical cancer are common due to a lack of awareness and health-seeking behavior (26). Even among informed people, there is a lack of knowledge or false perceptions towards HPV. There is evidence that acceptance of HPV vaccination is increased when parents or young women are well informed about its risks and benefits (52). Studies revealed that parental acceptance to vaccinate their daughters is affected by the knowledge and attitude of the parents (26, 53). So, knowledge and attitude toward HPV infection and HPV vaccines will greatly influence the success of an immunization program against cervical cancer (52).

To our knowledge, however, there is no study on the topic in our setup and limited studies in Ethiopia. Therefore, this study is aimed to find out the current level of knowledge and attitude towards HPV vaccine among mothers with daughters aged 9-14 in the three teaching hospitals of Addis Ababa University, Addis Ababa, Ethiopia, 2023.

5 1.3 Significance of the study

The significance of this study lies in its potential to provide critical insights into the understanding of mothers' knowledge and attitudes towards HPV vaccination for their daughters aged 9-14 years in Ethiopia.

Since mothers play a pivotal role in preventing cervical cancer for themselves and their daughters, the research is expected to generate valuable data by assessing mothers' current levels of knowledge on HPV infection, cervical cancer, and the HPV vaccine, as well as their attitudes towards the HPV vaccine. This information will help identify knowledge gaps and misconceptions that may affect understanding and attitudes towards the HPV vaccine. The results of the study will offer detailed insights into knowledge gaps and perceptions of HPV infection, the HPV vaccine, and cervical cancer.

Additionally, the study aims to identify factors that influence knowledge and attitudes so that by addressing these factors, HPV vaccination rates can be improved, providing a comprehensive understanding of the determinants of HPV vaccine acceptance in this population. The findings are expected to inform targeted educational programs that address misconceptions, ultimately promoting informed decision-making and increasing vaccine uptake. Furthermore, the study seeks to empower healthcare providers with insights to effectively communicate the vaccine's benefits.

The primary beneficiaries of the study's output are the three teaching hospitals (TASH, ZMH, and GMH) where the research will be conducted. Beyond the immediate hospital settings, the findings will be valuable to healthcare providers, public health officials, and policymakers at the city and national levels in designing strategies to improve HPV vaccine uptake and public health initiatives tailored to the local context.

Ultimately, this research aims to contribute to the broader goal of reducing cervical cancer incidence in Ethiopia by enhancing vaccine acceptance and uptake. Furthermore, the study may contribute to the limited literature on this topic in Ethiopia and also benefit other researchers as a reference for further investigations

2 Literature Review

2.1 Knowledge about HPV vaccine

A systematic literature review was conducted to assess HPV knowledge and vaccine acceptance among European adolescents and their parents. The review found that 51.8% of adolescents (ranging from 0% to 98.6%) and 64.4% of parents (ranging from 1.7% to 99.3%) were aware of HPV infection. Parental awareness of HPV varied, with 29.5% to 93.8% having heard of HPV and 6.2% to 90.6% aware of the HPV vaccine. Overall knowledge of HPV among parents was highest in Finland (approximately 79%) and lowest in the Netherlands (37.9%). HPV vaccination knowledge also varied significantly among parents, ranging from 6.2% to 90.6%, with the highest levels of awareness in the UK and the lowest in the Netherlands. Key sociodemographic factors linked to HPV knowledge included female gender, higher education levels, and higher income groups (10).

A cross-sectional, multicenter survey among parents of children aged 9 to 14 years in Spain (N=1405) revealed that 90.7% had heard of HPV infection and 92.1% of its vaccine. Participants demonstrated a medium-to-high level of HPV knowledge, averaging 28.9 out of 40. While 73.7% linked HPV to cervical cancer and 80.0% believed the vaccine could prevent it, awareness of its prevention for other diseases was lower. Pediatricians were the main source of information (62.3%), followed by family and friends (34.5%) and gynecologists (27.8%) (8).

Similarly, a cross-sectional survey in Poland involving 360 parents of children aged 9 to 15 found that 74.2% were aware of HPV and 61.4% knew about the vaccine. Higher parental education levels correlated with greater HPV knowledge. Additionally, women, parents of girls, and those living in urban areas were more likely to be aware of HPV and its vaccine (3). Likewise, a study of Italian mothers demonstrated good knowledge about the correlation

between HPV and cervical cancer (over 85%), but they were less aware of other HPV-related diseases (54).

A cross-sectional survey on the knowledge of HPV and the acceptability of the HPV vaccine among 1,109 women in western China revealed that only 28.85% (n = 320) had heard of HPV. Among these, 53.44% recognized its link to cervical cancer, 49.38% understood it as an STD, and 23.75% knew it could be asymptomatic. Only 8.13% answered all questions correctly. Multivariate analysis indicated that those aware of HPV were more likely to have a family history of cancer, undergo regular Pap tests, and have completed at least secondary education (55). In a similar study among 1,074 parents in Zunyi City, 28.2% had heard of HPV and 38.0% knew about the vaccine. Awareness sources included physicians (23.5%), school education (8.8%), and media (46.1%) (56). In contrast, a larger study involving 5,623 parents of girls aged 9 to 14 found that an impressive 93.1% were aware of HPV vaccination (32).

A systematic review on HPV vaccination in developing countries of Southeast Asia highlighted significant discrepancies in knowledge, with awareness levels ranging from 7.8% to 97.5% (57). In Karachi, Pakistan, a study found that only 41.2% of women were aware of CC, and just 1.8% knew about the HPV vaccine (58). In Turkey, a study revealed that 60.7% of mothers had never heard of HPV, 54.8% were unaware of the HPV vaccine, and 98.8% had not vaccinated their daughters. Factors such as educational background and income positively influenced awareness levels (59). In Korea, awareness of the link between HPV and CC was only 51% (35).

A systematic review on HPV vaccine acceptability in Africa revealed significant knowledge gaps regarding HPV and cervical cancer. While awareness of cervical cancer was moderate at 67%, awareness of HPV (26%) and the HPV vaccine (15%) was notably low. Only 24% recognized HPV as a sexually transmitted infection (STI), and many (89%) were unaware that HPV infections could be asymptomatic. Additionally, less than a third (24%) understood the link between HPV infection and cervical cancer. Among university students, knowledge that HPV also causes genital warts was similarly low, at 20% and 13%, respectively (60).

In a survey of mothers in Ilorin, Nigeria (N=470), 34.3% identified HPV as an STI, and 40.4% recognized it as a cause of cervical cancer. Awareness of the HPV vaccine was 35.1%, but only a small percentage (29.1%, 25.5%, and 9.6%) knew it could prevent HPV infection, cervical cancer, and genital warts, respectively (31). A similar study in Lagos showed that while awareness of cervical cancer was relatively high at 53.5%, only 19% had good knowledge of HPV vaccination (46). Another study in Lagos found that only 36.5% of women attending gynecological clinics had heard of HPV, and just 18.9% knew about HPV vaccines (25).

In contrast, a study in Harare, Zimbabwe, revealed poor knowledge of cervical cancer among mothers of girls aged 9 to 14 years (N=406), with only 23.7% identifying HPV as its cause. 24.6% of mothers were unaware of the causes of cervical cancer, while many (57.8%) believed it was caused by witchcraft, and 9.6% attributed it to miscarriages. Only 24.6% thought cervical cancer could be transmitted sexually, while 55.2% believed that HPV could not be sexually transmitted, and 35.7% thought cervical cancer was incurable. Despite these misconceptions, knowledge of the HPV vaccine was moderate, 49.3% believed the HPV vaccine could protect

against cervical cancer, and over half correctly identified the right age for vaccination (9–14 years) (39).

A systematic review on knowledge and awareness of the HPV vaccine and its acceptability in Sub-Saharan Africa revealed low levels of knowledge and awareness of CC, HPV, or the HPV vaccine. Education for increasing awareness was a strong theme throughout the majority of studies (61).

In Kenya, a study involving parents of children aged 9 to 14 years at a major referral hospital revealed concerning gaps in understanding. Among 195 participants, 46.4% of males and 35.1% of females did not know the vaccine is meant to prevent HPV infections. While 71.2% of females recognized its role in preventing cervical cancer, fewer than 36% knew it also prevents genital warts. Alarming, 40.1% believed Pap smears were unnecessary after vaccination, and many struggled to connect HPV to cervical cancer—only 60% of women and 41.7% of men made that link. Knowledge about HPV transmission and symptoms was generally poor, although 95% had heard of cervical cancer, and 80% knew it was preventable. Most information about the vaccine came from coworkers, while religious leaders were the least common source of information (49). Similarly, a study in Western Kenya found that while 85% of mothers of adolescent girls were aware of cervical cancer, awareness of HPV and the vaccine was lower, at 62% and 64%, respectively (62).

A systematic review on CC awareness among Ethiopian women reveals significant gaps in knowledge. Only 56% had heard of CC, with mass media (television and radio) being the primary source of information. Alarming, just 21% recognized HPV as the main cause of CC. Awareness of risk factors, symptoms, and screening was low, at 52%, 43%, and 39%, respectively, while only 43% demonstrated good understanding, and previous screening practices stood at 14% (63). Another systematic review and meta-analysis focused on HPV vaccination acceptance in Ethiopia shows only 38% of mothers were knowledgeable about the vaccine (64).

1 A community-based cross-sectional study conducted in Debre Markos town, Northwest Ethiopia, involving 601 mothers with eligible daughters, revealed that 47.6% had good knowledge about the HPV vaccine. While 75.4% of parents reported awareness of CC, only 42.9% understood that CC is a genital tract disease, and just 29.8% recognized HPV as a cause of CC. Many parents were unaware that HPV is an STI, and a significant number believed the vaccine was only for women with multiple sexual partners. Factors influencing mothers' knowledge about the HPV vaccine included educational attainment, lack of exposure to information about the HPV vaccine, and a positive attitude towards vaccination (34).

In contrast, a study conducted in Akaki-Kality Sub-city, Addis Ababa, Ethiopia, with 422 participants, found that 41.7% had poor knowledge of cervical cancer, while 72.0% had poor knowledge of HPV. However, 73% of participants were aware of the HPV vaccine, and 61% believed it could prevent CC, with 77.9% reporting that they learned about the vaccine through mass media (27).

Another study in Debre Tabor Town, Northwest Ethiopia (N=638), revealed that 33.7% had heard of the HPV vaccine, and 35.4% were knowledgeable about it. The primary sources of information included radio/television (45.0%) and health extension workers (36.8%) (65). A

parallel study conducted in the same area with 738 participants found that 54% had inadequate knowledge regarding HPV infection and vaccination (66). Lastly, a study in Meta Robi District, Central Ethiopia, with 619 respondents, revealed that only 39.1% were knowledgeable about the HPV vaccine, and 40.2% held a favorable attitude towards it (67).

2.2 Attitude towards HPV vaccine

A systematic literature review on HPV knowledge and vaccine acceptance among European adolescents and their parents found that over half of parents (59.2%) intended to vaccinate their children against HPV, with a range of 32.2% to 65.6%. Factors positively associated with vaccine acceptance included the female gender and younger age of the parent, female gender of the adolescent, higher household income, and prior childhood vaccinations. The primary barriers identified were safety concerns (7.9% to 68.1%), the belief that vaccination might encourage sexual activity (10.5% to 42%), low perceived susceptibility to HPV, and doubts about vaccine efficacy (10).

In Spain, a cross-sectional multicenter survey of 1,405 parents of children aged 9 to 14 revealed a medium-to-high degree of HPV vaccine acceptability. The main motivations for vaccination included protection against STDs (67.4%) and cancer or genital warts (77.4%). Barriers included lack of information (27.9%), fear of adverse events (20.9%), and unspecified reasons (29.3%) (8). Similarly, a cross-sectional survey conducted among 360 parents of children (girls and boys) aged 9–15 in Poland shows that 35.2% of parents refuse to vaccinate, especially for boys. Education and the child's gender affect decisions (3).

In the USA, a nationwide cross-sectional study of 82,297 parents of adolescents aged 13 to 17 found that 37.1% were unvaccinated, and 10.8% had received only one dose. Common reasons for not initiating or completing the vaccine series included safety concerns (22.8%) and lack of healthcare provider recommendations (22.2%) (68). Another survey among 987 caregivers in 13 southern states indicated that about one in three (37.3%) adolescents had received at least one dose of the HPV vaccine. Concerns centered on vaccine ingredients, perceived vaccine overload, and side effects. Caregivers' discomfort discussing sexual topics correlated with lower vaccination rates for older adolescents (69). A Minnesota survey involving 342 parents identified attitudinal barriers to HPV vaccination, including beliefs that children were too young for the vaccine (17.8%), concerns about safety (16.3%), and perceptions that the vaccine was unnecessary (6.2%) (70).

A survey in western China on Knowledge of HPV and acceptability of HPV vaccine involving 1,109 women found that 51.22% were willing to receive the HPV vaccine, with younger women (ages 18-29) and those with a family history of non-cervical cancer showing higher acceptance (55). On the contrary, a result from similar study among 5623 parents of girls 9–14 in China, only 8% of mothers had received the vaccine themselves, but an impressive 94.3% intended to vaccinate their daughters. Additionally, 31.9% of vaccinated mothers had also vaccinated their daughters, highlighting the influence of personal vaccination history (32). Similarly, another study in Zunyi City, Southwest China, revealed that 73.9% (N=1,074) of parents of middle school students were willing to vaccinate their daughters (56).

A systematic review of studies from Southeast Asia showed varying positive attitudes toward the HPV vaccine, with over 50% of participants in 80% of the studies expressing willingness to get vaccinated (57). A study done in Turkey & Korea revealed that 70.6% & 70% of participants intended to have their daughters vaccinated respectively (35, 59). In contrast, a cross-sectional study conducted among Saudi females to assess their knowledge, perceptions, and acceptance of HPV vaccination and cervical cancer screening found that only 1.9% of participants had a positive perception. A significant proportion (41%) had a negative perception, with 38% expressing fear of vaccine side effects and 22.2% doubting its effectiveness (71).

In Brazil, a cross-sectional study involving 826 parents showed high acceptance rates for the HPV vaccine among children under 18, with 92% for daughters and 86% for sons. The main reason for acceptance was the belief that vaccination is important, while fear of adverse reactions was the primary reason for refusal among 51% of parents (72).

A systematic review on HPV vaccine acceptability in Africa found high acceptance rates (59% to 100%) among parents for vaccinating their daughters, but low awareness and knowledge about the vaccine. Key barriers to acceptance included concerns about accessibility and costs, as well as prompts from healthcare providers and government initiatives (60).

In Ilorin, Nigeria, a study of 470 mothers revealed that only 1.9% had vaccinated their daughters, and less than half (44.9%) were willing to do so. Higher knowledge of HPV and cervical cancer increased willingness. This willingness was linked to education and knowledge; once informed, most parents were ready to vaccinate (31). In Lagos and Abakaliki, Nigeria vaccination rates were similarly low at 4% and 6.9%, despite 79.2% and 89.1% expressing willingness (46, 50).

A similar study involving mothers of girls aged 9 to 14 years (N=406) in Harare, Zimbabwe revealed negative attitudes toward cervical cancer, with 58% believing it was caused by witchcraft and viewing it as a death sentence. Traditional practices were commonly relied upon. While vaccine acceptability was high at 90%, actual uptake was very low, with only 8% having vaccinated their daughters. Identified obstacles included unavailability, religious beliefs, and cost (39).

A systematic review in Sub-Saharan Africa highlighted a similar trend: high willingness to vaccinate but low knowledge about HPV. Factors influencing acceptability included access to the vaccine, concerns about side effects, and support from healthcare providers (61).

A descriptive cross-sectional study in Kenya, found high levels of vaccine acceptance (90%), although one-third (37.9%) had negative perceptions regarding the vaccine's effectiveness. Hesitancy was often due to safety concerns (76%) and the belief that their children were too young (48%). Low levels of parental education and a younger age among mothers were negatively associated with willingness to vaccinate (49). In Western Kenya, a similar study indicated that 95% of mothers intended to vaccinate their daughters, but negative attitudes toward early sexual activity reduced uptake, while positive views on the vaccine's cost encouraged it (62).

A systematic review and meta-analysis on HPV vaccination in Ethiopia found that 58% of mothers had a positive attitude toward the vaccine, and 74% were willing to vaccinate their children (64).

A community-based cross-sectional study on knowledge and attitude towards HPV vaccine and associated factors among mothers who have eligible daughters (N= 601) in Debre Markos town, Northwest Ethiopia revealed that 77.4% had positive attitudes towards the HPV vaccine. However, more than half (54.9%) of the respondents did not perceive their daughters is susceptible to HPV infection. Doubts about the vaccine's safety were common, as 25.6% of mothers questioned its effectiveness. Misconceptions persisted, with some (33.8%) believing the vaccine could lead to risky sexual behaviors. Attitude of mothers towards HPV vaccine were influenced by their awareness and knowledge it (34).

A similar study in Akaki-Kaltè sub-city, Addis Ababa, Ethiopia (N= 422) shows about two-thirds (63.5%) of participants had a positive attitude towards the vaccine. Despite concerns about side effects (17.8%), especially fears of infertility (46.7%), an impressive 94.3% were willing to vaccinate their daughters (27).

Another similar study in Gondar town, Northwest Ethiopia (N=731) reveals 81.3% of parents ready to vaccinate their daughters. Here, 55.2% had some knowledge about HPV, although only 28.6% received information from health workers. Additionally, 41.6% of the participants have poor knowledge about CC and its risk factors and the majority of the participants 59.9% had positive attitudes towards the HPV vaccination. The acceptance was affected by being from the richest household, good knowledge about CC, and positive attitude towards HPV vaccination (26).

In Debre Tabor, willingness varied, with only 44.8% ready to vaccinate (65), while another study showed 61.4% had a positive attitude and 79.1% were willing (66). Finally, studies in Hadiya Zone, Southern Ethiopia and Bench-Sheko Zone, southwest Ethiopia showed strong acceptance of the HPV vaccine, with 84.9% and 79.5% of parents, respectively (28, 53).

2.3 Conceptual framework

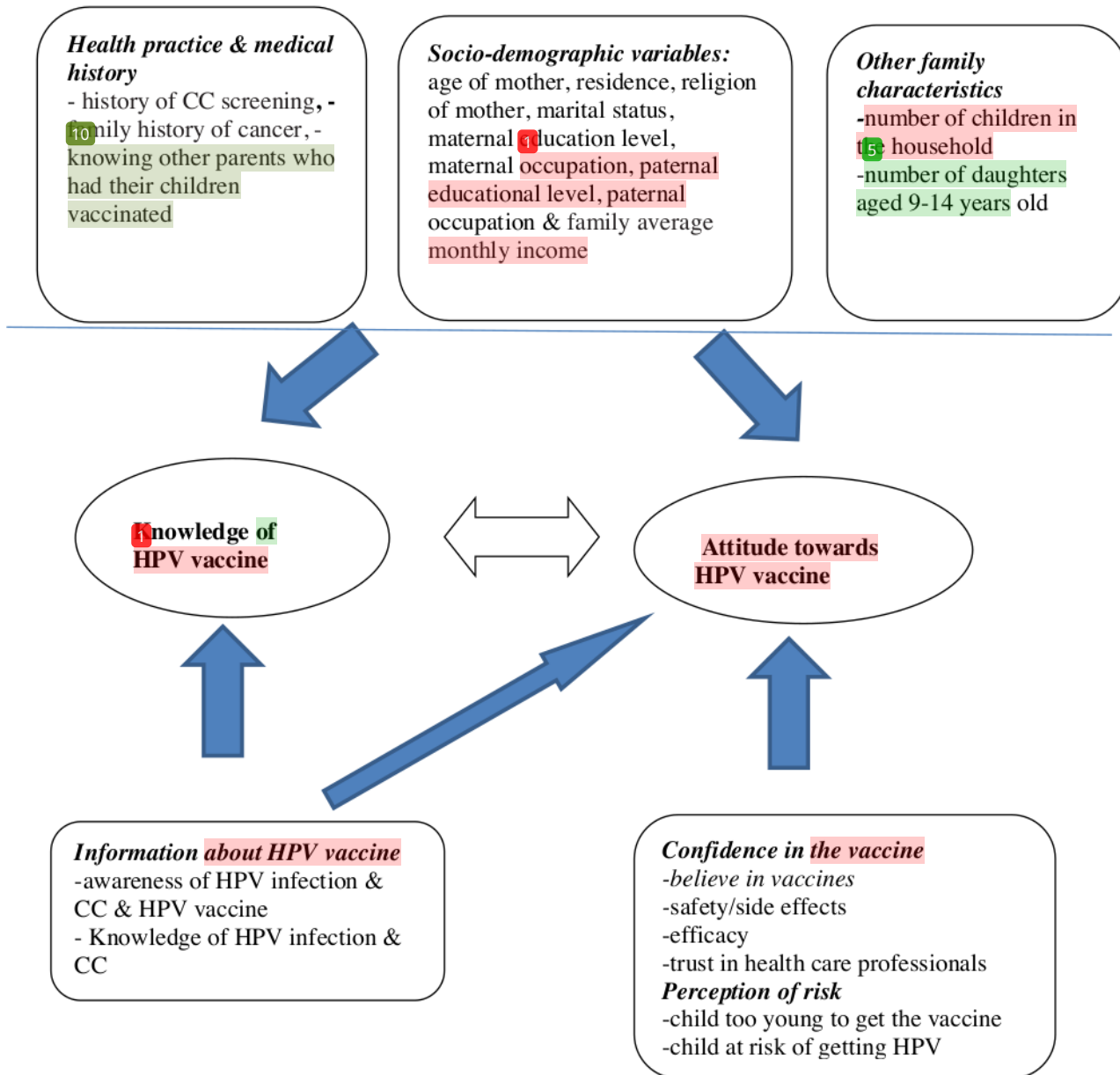


Figure 1 Conceptual framework of factors associated with knowledge and attitude of mothers towards HPV vaccination of girls aged 9-14

3. Objective

3.1 General Objective

To assess the knowledge and attitude towards HPV vaccination among mothers of girls aged 9-14 years attending obstetrics and gynecological outpatient clinics at three teaching hospitals of Addis Ababa University, Addis Ababa, Ethiopia, in 2023.

3.2 Specific objectives

- ✓ To determine the level of knowledge of HPV vaccination among mothers of girls aged 9-14 years attending obstetrics and gynecological outpatient clinics at three teaching hospitals of Addis Ababa University, Addis Ababa, Ethiopia, during the study period.
- ✓ To investigate the attitudes towards HPV vaccination among mothers of girls aged 9-14 years attending obstetrics and gynecological outpatient clinics at three teaching hospitals of Addis Ababa University, Addis Ababa, Ethiopia, during the study period
- ✓ To identify factors associated with the knowledge and attitudes towards HPV vaccination among mothers of girls aged 9-14 years attending obstetrics and gynecological outpatient clinics at three teaching hospitals of Addis Ababa University, Addis Ababa, Ethiopia, during the study period.

4. Methods and Materials

4.1 Study design

An institution-based descriptive cross-sectional study design was used to assess the knowledge and attitudes towards HPV vaccination among mothers of girls aged 9-14 years attending obstetrics and gynecological outpatient clinics at three teaching hospitals affiliated with Addis Ababa University, College of Health Sciences, Addis Ababa, Ethiopia, in 2023.

4.2 Study area and period

The study was undertaken at three teaching hospitals affiliated with Addis Ababa University College of Health Sciences, specifically in the obstetrics and gynecology department, located in Addis Ababa, the capital city of Ethiopia, from November 1, 2023, to February 29, 2024. The hospitals included Tikur Anbesa Specialized Hospital (TASH), Zewditu Memorial Hospital (ZMH), and Ghandi Memorial Hospital (GMH). TASH is the largest teaching and referral hospital in Ethiopia, located in the capital city. The hospital receives patients from all over the country and has more than 700 beds. The department of obstetrics and gynecology has two inpatient wards, one labor ward, one ANC, and one regular gynecologic clinic. ZMH and GMH are prominent public hospitals located in Addis Ababa, serving as teaching hospitals affiliated with Addis Ababa University College of Health Sciences.

4.3 Source population

All mothers who have daughters aged 9-14 years attending obstetrics and gynecological outpatient clinics at three teaching hospitals affiliated with Addis Ababa University, College of Health Sciences, obstetrics and gynecology department, during the study period.

4.4 Study population

All selected mothers who have daughters aged 9-14 years attending obstetrics and gynecological outpatient clinics at three teaching hospitals affiliated with Addis Ababa University, College of Health Sciences, obstetrics and gynecology department, during the study period.

4.5 Eligibility Criteria

4.5.1 Inclusion criteria

Mothers who have at least one daughter aged 9-14 years attending obstetrics and gynecological outpatient clinics at three teaching hospitals affiliated with Addis Ababa University during the study period and who provided informed written consent for participation.

4.5.2 Exclusion criteria

Mothers who are critically ill during the time of data collection.

4.6 Sample Size Determination

The sample size was determined using a single population proportion formula, assuming that 63.5% had a positive attitude towards HPV vaccination based on a study conducted in Akaki-Kalty Sub-city in Addis Ababa, Ethiopia (27). A 95% confidence level and a 5% margin of error were used, along with a consideration of a 10% non-response rate.

$$n = \frac{Z^{\alpha/2} P(1-P)}{d^2}$$

$$n = \frac{(1.96)^2 0.63(1-0.63)}{0.05^2} = 357$$

n = minimum sample size required

Z= the standardized normal distribution curve value for the 95% confidence interval (1.96)

P= proportion of positive attitude towards HPV vaccination

d= margin of error

This calculation yielded a sample size of 357. After adding a 10% non-response rate, the final sample size was 392. The calculated sample size was then proportionally allocated to each hospital's ANC and regular outpatient department.

4.7 Sampling procedures

A simple consecutive sampling technique was used. All mothers with daughters aged 9-14 who fulfilled the inclusion criteria and who came for ANC and regular outpatient clinic visits in the three teaching hospitals were selected until the calculated sample size was reached.

4.8 Study variables

4.8.2 Dependent variables

- Knowledge of HPV vaccine & Attitude towards HPV vaccination

4.8.2 Independent variables/Possible factors

- Socio-demographic variables: - age of mother, residence, religion of mother, marital status, maternal education level, maternal occupation, paternal educational level, paternal occupation & family average monthly income
- Other family characteristics variables:- number of children in the household, number of daughters aged 9-14 years old
- Health practice & medical history variables:- history of CC screening, family history of cancer, knowing other parents who had their children vaccinated
- Awareness of HPV, awareness of HPV vaccine, awareness of CC, Knowledge of HPV infection & knowledge of cervical cancer
- ✓ Cost of the vaccine & its effect on attitude was not studied since the HPV vaccine is provided free of charge through donor programs.

4.9 Operational definitions

Knowledge: This is divided into three subsections: knowledge of HPV infection, knowledge of cervical cancer (CC), and knowledge of the HPV vaccine. Knowledge questions have three response options: 1) Yes, 2) No, and 3) I don't know. For descriptive analysis, knowledge scores were computed by assigning 1 point for each correct answer and 0 for incorrect responses, with a possible maximum score of 35. The three sections on knowledge of HPV infection, CC, and knowledge of the HPV vaccine contained 13, 11, and 11 knowledge-related items, respectively. For knowledge of the HPV vaccine, the knowledge score ranged from 0-11. The total score was computed, and scores at or below the mean were considered as not knowledgeable (poor knowledge), while scores above the mean were categorized as knowledgeable (good knowledge). One question regarding the source of information for the HPV vaccine & another question inquiring the awareness of HPV, CC & HPV vaccine was included in each subsection (31, 34, 49, 59, 62, 67, 72-74). Awareness was not included in knowledge and analyzed independently.

Attitude: The ¹ attitude score was computed by assigning 1 point for participants who correctly answered the questions and 0 for those who did not. Attitude was measured using 13 item attitude questions and categorized as "negative attitude" for scores at or below the mean, while scores above the mean were categorized as "positive attitude". There were also 2 mixed multiple-choice questions addressing the reasons for accepting or refusing HPV vaccination (31, 34, 49, 59, 62, 67, 72-74).

4.10 Data collection tool and procedure

Data was collected using a semi-structured questionnaire administered through face-to-face interviews by the data collectors. Three general practitioners (MDs) served as data collectors, and one supervisor with an MPH degree coordinated the data collection. After receiving services at the ANC and regular gynecologic outpatient departments, potential participants were approached by the data collector, who ascertained their willingness to participate in the study after explaining the purpose using an information sheet (Annex 1). Informed written consent was obtained using the informed consent form (Annex 2) for those willing to participate. Once consent was obtained, participants were interviewed using the questionnaire (Annex 3). The interview was conducted privately. The questionnaire consisted of four parts: part one included socio-demographic information, part two assessed knowledge, part three evaluated attitudes towards the HPV vaccine, and part four allowed for additional comments; adapted from different reviewed literature (31, 34, 49, 59, 62, 67, 72-74).

The questionnaire was initially prepared in English and translated into Amharic by language experts, then translated back to English by a third person to check for consistency. The Amharic version was used for data collection. No health education on the subject was provided to the participants before completing the questionnaire.

4.11 Data quality control

The questionnaire was pretested with 5% (20) of the sample in a health facility outside the study area. Questions that raised concerns regarding comprehension were modified before the actual data collection commenced.

A two-day training session was conducted for the data collectors and supervisor about the contents of the questionnaire and proper data collection methods to minimize errors. The principal investigator and the coordinator closely monitored the overall activities on a daily basis to ensure the completeness of the questionnaire and to provide further clarification and support to data collectors. The collected data was reviewed and checked for completeness before data entry. A data entry format template was prepared and programmed by the principal investigator.

4.12 Data processing and analysis

The collected data was checked with EPIIDATA for completeness, and any incomplete or misfiled questions were excluded from the study. The clean and complete data was then entered and analyzed using SPSS version 25.0 software. Descriptive statistics were used to describe the study variables and were presented using tables and figures. Initially, bivariate logistic regression was conducted to assess the association of each independent variable with the outcome variable. All independent variables with a p-value < 0.25 were transferred to multivariate logistic regression to adjust for confounding effects and to identify associated factors. A p-value of < 0.05 and a 95% confidence level were used to determine statistical significance in the multivariable analysis. Odds ratios with 95% confidence intervals were reported as measures of association. Finally, the results were presented in text, tables, and graphs.

4.13 Ethical consideration

Ethical clearance was obtained from the Department of Obstetrics and Gynecology Research & Publication Committee (DRPC). The ethical clearance and support letter were then submitted to the selected hospitals to obtain permission and cooperation during the data collection process. Each participant was informed about the purpose of the study using the annexed information sheet (Annex 1), and informed written consent was obtained using the annexed informed consent form (Annex 2). Those who did not consent were free to opt out, and only those who consented proceeded to the next part of the questionnaire. Privacy and confidentiality were ensured by not writing the name or any other identifying information of respondents on the questionnaire. The interview was conducted in a separate room. The researcher answered all questions asked by the participant. The information was used only for study purposes. The hard copy of the data is kept in a locked cabinet, and the soft copy is password protected and accessible only to the researchers.

4.14 Dissemination plan and use of findings

The findings of the study will first be presented to TASH's Department of Obstetrics and Gynecology. The final report will be submitted to TASH and shared with GMH and ZMH. Similarly, the findings will be submitted to the Addis Ababa City Administration Health Bureau, the Federal Ministry of Health (FMOH), and other concerned stakeholders to consider the findings in their planning for the HPV vaccination program. Finally, efforts will be made to publish the results in an internationally reputable journal to make them accessible to the international scientific community.

5. Results

5.1. Socio-demographic characteristics

A total of 392 women participated in this study, with a response rate of 100%. The mean age of the respondents was 33.97 years (SD \pm 3.69). The majority of the respondents, 384 (98.0%), were urban residents. Most were Orthodox Christians, 290 (74.0%), and 378 (96.4%) were married. Regarding education, 143 (36.5%) of the respondents had completed primary school. In terms of occupation, 189 (48.2%) of mothers and 288 (73.5%) of fathers were self-employed. The average monthly income for 144 (36.7%) of respondents was between 7,801-10,900 ETB. The majority of the respondents, 263 (67.1%), had 1 or 2 children, and 360 (91.8%) had one daughter aged 9–14 years. Of the 392 mothers, 63 (16.1%) had a history of cervical cancer screening, 112

(28.6%) knew other parents whose children received the HPV vaccine, and 21 (5.4%) had a family history of cancer.

Table 1 Socio-demographic characteristics among mothers of girls aged 9-14 years at three teaching hospitals of AAU, Addis Ababa, Ethiopia (n =392).

Variables	Category	Frequency(%)	
		N	%
Age (years)	≤30	87	22.2
	31-39	287	73.2
	≥40	18	4.6
Residence	Urban	384	98
	Rural	8	2
Religion	Orthodox Christian	290	74.0
	Muslim	62	15.8
	Protestant	38	9.7
	Other	2	.5
Marital status	Single	6	1.5
	Married	378	96.4
	Divorced	8	2.1
Maternal education	Illiterate	24	6.1
	Primary school	143	36.5
	Secondary school	124	31.6
	College and above	101	25.8
Maternal occupation	Housewife	146	37.2
	Civil servant	51	13.0
	Self-employed	189	48.2
	Others	6	1.5
Paternal occupation	Farmer	10	2.6
	Civil servant	74	18.9
	Self-employed	288	73.5
	Others	20	5.1
Paternal education	Illiterate	18	4.6
	Primary school	125	31.9

	Secondary school	125	31.9
	College and above	124	31.6
Family average monthly income	Below 2000	8	2
	2001-5000	57	14.5
	5001-7800	46	11.7
	7801-10900	144	36.7
	Above 10901	137	34.9
<i>Other family characteristics</i>			
Number of children of respondents	1-2	263	67.1
	≥3	129	32.9
Number of daughters aged 9-14 years	1	360	91.8
	≥2	32	8.2
Health Practices and Medical History			
Had a history of cervical cancer screening at least once before	Yes	63	16.1
	No	329	83.9
Family history of cancer	Yes	21	5.4
	No	371	94.6
Know other parents who had their children vaccinated with HPV vaccine	Yes	112	28.6
	No	280	71.4

5.2. Knowledge of mothers toward HPV infection

Among the study participants, only 48 mothers (12.2%) had heard of HPV infection, while 153 mothers (39.0%) had good knowledge about it. The questions with the highest rates of correct responses were: HPV infections are preventable (182, 46.4%), followed by the HPV vaccine against HPV infection exists (178, 45.4%). Additionally, 122 mothers (31.1%) recognized that HPV is a sexually transmitted infection, and 95 mothers (24.2%) were aware that condoms can protect against HPV infection (Table 2).

To generate the summarized level of knowledge, responses to each question were first scored and tallied. The total for each respondent ranged from 0-13 (0%-100%). The mean score for correctly answered knowledge questions was 3.0 (SD ±3.2).

Table 2 Knowledge of HPV Infection among mothers of girls aged 9-14 years at three teaching hospitals of AAU, Addis Ababa, Ethiopia (n =392).

Variables	Category	Frequency	
		N	%
Have you ever heard of Human Papillomavirus (HPV)?	Yes	48	12.2
	No	344	87.8
Is HPV a sexually transmitted disease?	Yes	122	31.1
	No	270	68.9
Is HPV spread by airborne transmission	Yes	8	2
	No	384	98
Is HPV the main cause of cervical cancer?	Yes	81	20.7
	No	311	79.3
Can HPV cause genital warts?	Yes	85	21.7
	No	307	78.3
Can men catch HPV?	Yes	62	15.8
	No	330	84.2
Does HPV cause cancer in men?	Yes	53	13.5
	No	339	86.5
Are HPV infections preventable	Yes	182	46.4
	No	210	53.6
Can HPV infection be prevented by use of condom?	Yes	95	24.2
	No	297	75.8
Does Condom use fully protect against HPV?	Yes	26	6.6
	No	366	93.4
Can HPV infection be prevented by having only one sexual partner?	Yes	94	24.0
	No	298	76.0
Can HPV be prevented by abstinence from sex	Yes	102	26.0
	No	290	74.0
Does a vaccine against HPV infection exist?	Yes	178	45.4
	No	214	54.6
Does someone with HPV usually have symptoms?	Yes	99	25.3
	No	293	74.7

5.3. Knowledge of mothers toward cervical cancer

Out of the total participants, 338 mothers (86.2%) had heard of cervical cancer, and 208 mothers (53.1%) had good knowledge about it. Among those who were aware of cervical cancer, a significant majority, 328 mothers (83.7%), recognized it as a disease affecting only the female genital tract, while 322 mothers (82.1%) understood that cervical cancer is a serious disease that can cause death. Additionally, 320 mothers (81.6%) acknowledged that early detection significantly increases the chance of successful treatment, and 288 (73.5%) of mothers correctly identified post-coital bleeding as a potential symptom of cervical cancer.

To assess overall knowledge, responses to each question were scored and aggregated. Individual scores ranged from 0-11, representing 0% to 100% correct answers. The average score for correctly answered knowledge questions was 6.0, with a standard deviation of 2.9.

Table 3 Knowledge of ³ cervical cancer among mothers of girls aged 9-14 years at three teaching hospitals of AAU, Addis Ababa, Ethiopia (n =392).

Variables	Category	Frequency	
		N	(%)
Have you ever heard about cervical cancer?	Yes	338	86.2
	No	54	13.8
¹ Cervical cancer is a disease of female genital tract only	Yes	328	83.7
	No	64	16.3
Cervical cancer is a serious disease that cause a death	Yes	322	82.1
	No	70	17.9
Persistent infection with certain strains of HPV is the main ⁹ cause of cervical cancer?	Yes	26	6.6
	No	366	93.4
Are women with multiple sexual partners at higher risk for cervical cancer?	Yes	199	50.8
	No	193	49.2
Cervical cancer at early stage produces no signs or symptoms	Yes	118	30.1
	No	274	69.9
Can bleeding after intercourse be a symptom of cervical cancer	Yes	104	26.5
	No	288	73.5
Can abnormal vaginal bleeding between periods be a symptom of cervical cancer?	Yes	106	27.0
	No	286	73.0
Can regular pap tests or cervical screenings help detect cervical cancer early	Yes	247	63.0
	No	145	37.0
Can early detection of cervical cancer significantly increase	Yes	320	81.6

the chance of successful treatment	No	72	18.4
Is cervical cancer preventable	Yes	248	63.3
	No	144	36.7
Can practicing safe sex, such as using condom, reduce the risk of contracting HPV and developing cervical cancer	Yes	182	46.4
	No	210	

5.4. Knowledge of mothers toward HPV vaccine

Out of 392 respondents, 255 mothers (65.1%) reported having heard of the HPV vaccine. The primary source of information was mass media (141 mothers, 55.3%), followed by health professionals (60 mothers, 23.5%). Knowledge among mothers included the understanding that the HPV vaccine is used to prevent cervical cancer (225 mothers, 57.4%), its free availability (226 mothers, 57.7%), and knowledge of where to receive it (209 mothers, 53.3%). However, only 162 mothers (41.6%) knew that the vaccine is recommended for girls aged 9-14 years, and just 45 mothers (11%) were aware that it is administered in 2 doses. Overall, 196 mothers (50.0%) demonstrated good knowledge about the HPV vaccine, with a mean score of 3.9 (SD ± 2.8) out of a possible 11 points (Table 3).

Table 4 Knowledge of HPV vaccine among mothers of girls aged 9-14 years at three teaching hospitals of AAU, Addis Ababa, Ethiopia (n =392).

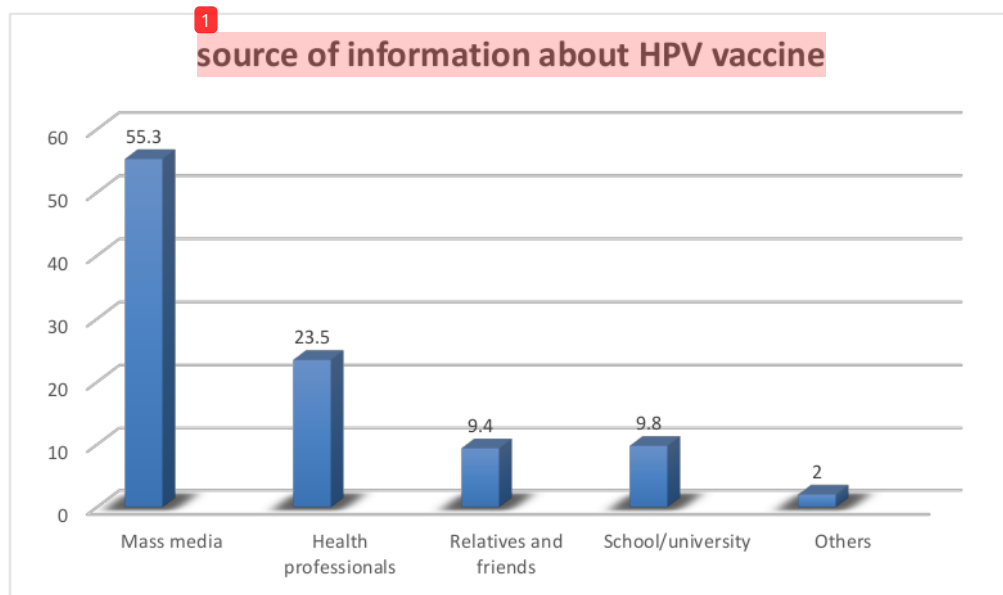
Variables	Category	Frequency	
		N	(%)
Have you heard of HPV vaccine?	Yes	255	65.1
	No	137	34.9
If yes for from Where have you heard about HPV? (Select all that apply, multiple response) Source of Information for HPV vaccine	Mass media	141	55.3
	Health professionals	60	23.5
	Relatives and friends	24	9.4
	School/university	25	9.8
	Others	5	2
Is HPV vaccine recommended for girls aged 9-14	Yes	162	41.6
	No	230	58.7
Does HPV vaccine Prevent HPV infection?	Yes	225	57.4

	No	167	42.6
Does HPV vaccine Prevent CC	Yes	244	62.2
	No	148	37.8
Does HPV vaccine Prevent genital warts	Yes	97	24.7
	No	295	75.3
Is HPV vaccine most effective when given before onset of sexual activity	Yes	168	42.9
	No	224	57.1
Does HPV vaccine have serious side effects?	Yes	52	13.3
	No	340	86.7
Does HPV vaccine cause HPV infection	Yes	65	16.6
	No	327	83.4
How many doses of HPV vaccine is given for girls aged 9-14 years	Two dose	45	11.5
	One dose and didn't know	347	88.5
Do you know that the government offer HPV vaccine free of charge	Yes	226	57.7
	No	166	42.3
Do you know HPV vaccine is given in schools?	Yes	209	53.3
	No	183	46.7
There is a need for regular cervical cancer screening after receiving HPV vaccine	Yes	46	11.7
	No	346	88.3

Table 5 Total score of each knowledge question of HPV vaccine (based on number of correctly questions answered)

Number of correctly answered questions	Frequency	Percent
0.00	92	23.5
	18	4.6
1.00		
2.00	16	4.1
3.00	37	9.4
4.00	33	8.4
5.00	50	12.8
6.00	65	16.6
7.00	51	13.0

8.00	24	6.1
9.00	2	.5
10.00	4	1.0
Total	392	100.0



1

Figure 2 The percentage distribution of sources of information about HPV vaccine among mothers of girls aged 9-14 years at three teaching hospitals of AAU, Addis Ababa, Ethiopia, 2024.

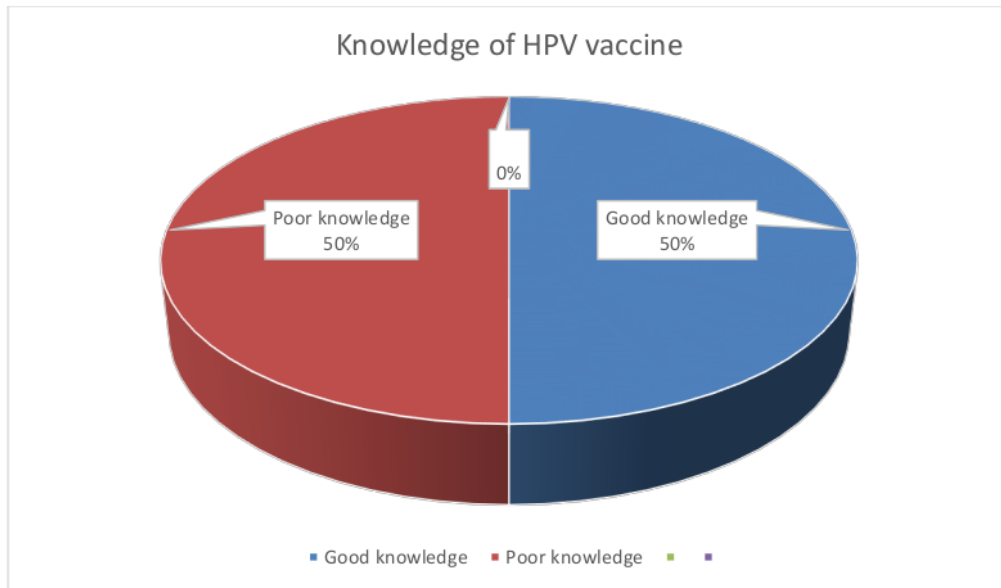


Figure 3 Knowledge of HPV vaccine among mothers of girls aged 9-14 years at three teaching hospitals of AAU, Addis Ababa, Ethiopia, 2024.

5.5. Attitude of mothers toward HPV vaccine

Out of 392 mothers surveyed, an overwhelming 98.2% (385) expressed general confidence in vaccines, with 301 mothers (76.8%) believing the HPV vaccine is safe and 298 mothers (76.0%) affirming its effectiveness in preventing HPV-related diseases, such as cervical cancer. Trust in health care professionals was notably high, with 380 mothers (96.9%) relying on their recommendations.

However, misconceptions persist; 58.4% (229 mothers) perceived their daughters to be at risk of HPV infection, while 37.8% (148 mothers) believed that only promiscuous girls would benefit from vaccination. Cultural concerns were also evident, with 13.3% (52 mothers) feeling that the HPV vaccine contradicts cultural norms and religious beliefs. Despite those concerns, a significant majority, 354 mothers (90.3%) expressed willingness to vaccinate their daughters. This study revealed a division in attitudes toward the HPV vaccine: 189 mothers (48.2%) held favorable attitudes towards the HPV vaccine, while 203 mothers (51.8%) had unfavorable attitudes (Table 5). The mean score of correctly answered attitude questions was 5.3 (SD ±1.7).

Table 6 Attitude of HPV vaccine among mothers of girls aged 9-14 years at three teaching hospitals of AAU, Addis Ababa, Ethiopia (n =392).

Variables	Category	Frequency	
		N	(%)
Confidence in vaccines(efficacy/safety)			

Do you generally believe in vaccines?	Yes	385	98.2
	No	7	1.8
Do you believe HPV vaccine is safe?	Yes	301	76.8
	No	91	23.2
Do you think HPV vaccine is effective in preventing HPV related diseases, such as CC	Yes	298	76.0
	No	94	24.0
Do you trust the recommendations of health care professionals regarding the HPV vaccine?	Yes	380	96.9
	No	12	3.1
Do you think that HPV vaccine can cause infertility for your daughter in the future	Yes	31	7.9
	No	361	92.1
Are you afraid of minor side effect of HPV vaccine (like redness and pain on the injection site) for your daughter	Yes	61	15.6
	No	331	84.4
Perception of risk			
Do you think your daughter is at risk/has a chance of getting HPV infection?	Yes	229	58.4
	No	163	41.6
Do you think only those who are promiscuous would benefit from the vaccine	Yes	148	37.8
	No	244	62.2
Do you think girls between 9 -14 years are too young to get the vaccine?	Yes	150	38.3
	No	242	61.7
Do you think getting the HPV vaccine can cause girls to become sexually active much earlier?	Yes	25	6.4
	No	367	93.6
Do you think HPV vaccine promote risky sexual behaviors among teenagers	Yes	18	4.6
	No	374	95.4
Does HPV vaccination violate your cultural norms and religious beliefs	Yes	52	13.3
	No	340	86.7
Are you willing to vaccinate your daughter against HPV?	Yes	354	90.3
	No	38	9.7
Reasons for accepting & refusing HPV vaccination			
If your answer for Q no 13 is Yes, what is the	Protection against cancer	243	68.6

main reason you would want to get the vaccine?	Recommendation by physician	8	2.3
	Being in at-risk group	15	4.2
	Vaccination is good /important	86	24.3
	Being in age group for vaccination	2	.6
If your answer for Q no 13 is NO, what is the <i>main reason</i> you would not want to get the vaccine?	Not aware of HPV vaccine	10	26.3
	HPV vaccine is not necessary	4	10.5
	Vaccine is not safe and short term side effect	6	15.8
	Unknown future side effects	10	26.3
	Vaccine promotes early sexual activity	6	15.8
	I am against all vaccinations	2	5.3

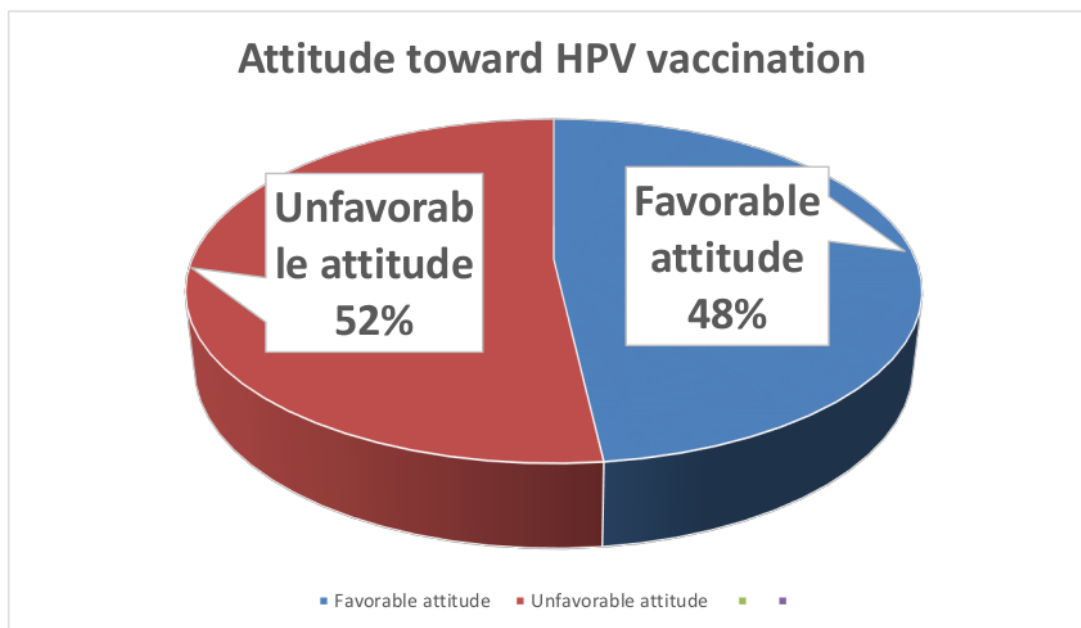


Figure 4 Attitude toward HPV vaccination among mothers of girls aged 9-14 years at three teaching hospitals of AAU, Addis Ababa, Ethiopia, 2024.

5.6 Reasons for acceptance or refusal of HPV vaccination

This study demonstrated that a significant majority of mothers were willing to vaccinate their daughters against HPV, with 90.3% (354 mothers) expressing support for the vaccination. The primary motivations for this acceptance included the desire for protection against cancer (68.6% or 243 mothers), recognition of the importance of vaccination (24.3% or 86 mothers), and acknowledgment of being in a risk group (4.2% or 15 mothers). Additionally, recommendations from healthcare professionals influenced 2.3% (8 mothers), while 0.6% (2 mothers) noted that their daughters were in the appropriate age group for vaccination.

Conversely, 9.7% (38 mothers) were unwilling to vaccinate their daughters, citing reasons such as a lack of awareness about the HPV vaccine (26.3% or 10 mothers) and concerns regarding unknown future side effects (26.3% or 10 mothers). Other reasons for refusal included beliefs that the vaccine promoted early sexual activity (15.8% or 6 mothers), doubts about its safety and worries about short-term side effects (15.8% or 6 mothers), and a general opposition to all vaccinations (5.3% or 2 mothers).

5.7. Factors Associated with Knowledge of Mothers toward HPV vaccine

The analysis employed bivariate logistic regression, examining a total of twenty variables, of which seven were identified as candidates for multivariable analysis. These variables included maternal educational level, family history of cancer, awareness of other parents who had vaccinated their children with the HPV vaccine, hearing about cervical cancer, hearing about the HPV vaccine, knowledge of HPV infection, and knowledge of cervical cancer.

The findings revealed that several factors were significantly associated with mothers' knowledge of the HPV vaccine, with a p-value of less than 0.05. Specifically:

Family History of Cancer: Mothers with a family history of cancer were found to be 38 times more likely to possess knowledge about the HPV vaccine compared to those without such a history (AOR= 38.106, 95% CI: 4.123, 352.176).

Knowledge of Other Parents' Vaccination: Mothers who were aware of other parents who had vaccinated their children against HPV were 2.8 times more likely to be knowledgeable about the HPV vaccine than those who were not aware (AOR = 2.842, 95% CI: 1.309, 6.172).

Awareness of the HPV Vaccine: Those who had heard of the HPV vaccine were 57.6 times more likely to have good knowledge of it compared to mothers who had not heard of the vaccine (AOR = 57.676, 95% CI: 23.421, 142.028).

Knowledge of Cervical Cancer: Participants who demonstrated good knowledge of cervical cancer were 6.7 times more likely to have good knowledge of the HPV vaccine compared to those with poor knowledge (AOR = 6.722, 95% CI: 3.745, 12.063).

Table 7 Bivariate and multivariate analysis of factors associated with knowledge of HPV vaccine among mothers of girls aged 9-14 years attending outpatient clinics in three teaching hospitals of AAU, Addis Ababa, Ethiopia (n = 392)

Variables	knowledge of HPV vaccine		COR[95% CI]	AOR[95% CI]	P-value
	Good	Poor			
Maternal education					
Illiterate	6(3%)	18(9.2%)	1	1	
Primary school	57(29.1%)	86(43.9%)	.503(.188-1.344)	.215(.040-1.166)	.075
Secondary school	68(34.7%)	56(28.6%)	.275(.102-.738)*	.440(.069-2.796)	.384
College and above	65(33.2%)	36(18.3%)	.185(.067-.507)*	.559(.085-3.689)	.546
Family history of cancer					
Yes	19(9.7%)	2(1%)	1	1	
No	177(90.3)	194(99%)	10.412(2.391-45.340)*	38.106(4.123-352.176)**	.001
Know other parents who had their children vaccinated with HPV vaccine					
Yes	86(43.9%)	26(13.3%)	1	1	
No	110(56.1%)	170(86.7%)	5.112(3.101-8.428)*	2.842(1.309-6.172)**	.008
Have you ever heard about cervical cancer					
Yes	188(95.9%)	150(76.5%)	1	1	
No	8(4.1%)	46(23.5%)	7.207(3.301-15.735)*	.625(.157-2.481)	.504
Have you heard of HPV vaccine					
Yes	190(96.9%)	65(33.2%)	1	1	
No	6(3.1%)	131(66.8%)	63.821(26.861-151.632)*	57.676(23.421-142.028)**	.001
knowledge of HPV infection					
Good knowledge	113(57.7%)	40(20.4%)	1	1	
Poor knowledge	83(42.3%)	156(79.6%)	5.310(3.391-8.313)	1.674(.728-3.852)	.226
knowledge of cervical Cancer					

Good knowledge	150(76.5%)	58(29.6%)	1	1	
Poor knowledge	46(23.5%)	138(70.4%)	7.759(4.943-12.177)*	6.722(3.745-12.063)**	.001

Notes: 1, reference category: *candidate for multivariate at p<0.25: **significance at p<0.05

Abbreviations: COR, crude odds ratio; AOR, adjusted odds ratio; CI, confidence interval

5.8. Factors Associated with Attitude of Mothers toward HPV vaccine

A total of twenty variables were analyzed using bivariate logistic regression, of which five were identified as significant factors affecting attitudes toward the HPV vaccine. These variables included maternal occupation, ever hearing about cervical cancer, knowledge of HPV infection, ever hearing about the HPV vaccine, and knowledge of cervical cancer.

In the multivariate logistic regression analysis, three factors—knowledge of HPV infection, ever hearing about the HPV vaccine, and knowledge of cervical cancer—emerged as significantly associated with attitudes toward the HPV vaccine, with a p-value of less than 0.05.

Mothers with good knowledge of HPV infection were 3 times more likely to have a positive attitude compared to those with poor knowledge (AOR= 3.007, 95% CI: 1.563, 5.785). Similarly, mothers who had heard about the HPV vaccine were almost twice as likely to exhibit a favorable attitude (AOR = 1.987, 95% CI: 1.131, 3.493).

Notably, women with good knowledge of cervical cancer were nearly 5 times more likely to have a positive attitude toward the HPV vaccine than those with poor knowledge (AOR = 4.958, 95% CI: 2.709, 9.072).

Table 8 Bivariate and multivariate analysis of factors associated with attitude of HPV vaccination among mothers of girls aged 9-14 years attending outpatient clinics in three teaching hospitals of AAU, Addis Ababa, Ethiopia (n = 392)

Variables	Attitude of HPV vaccine		COR[95% CI]	AOR[95% CI]	P-value
	Favorable	Unfavorable			
Maternal occupation					
Housewife	62(32.8%)	84(41.4%)	1	1	
Civil servant	20(10.6%)	31(15.3%)	1.144(.597-2.193)	1.844(.719-4.733)	.203
Self employed	103(54.5%)	86(42.3%)	.616(.399-.953)*	.518(.296-1.007)	.021
Others employee	4(2.1%)	2(1%)	.369(.066-2.079)	.132(.017-1.013)	.052
Have you ever heard about					

cervical cancer					
Yes	173(91.5%)	165(81.3%)	1	1	
No	16(8.5%)	38(18.7%)	2.490(1.337-4.637)*	.818(.364-1.839)	.627
knowledge of HPV infection					
Good knowledge	104(55%)	49(24%)	1	1	
Poor knowledge	85(45%)	154(76%)	3.845(2.500-5.915)*	3.007(1.563-5.785)**	.001
Ever heard about HPV vaccine					
Yes	146(77.2%)	109(53.7%)	1	1	
No	43(22.8%)	94(46.3%)	2.928(1.890-4.537)*	1.987(1.131-3.493)**	.017
Knowledge of cervical Cancer					
Good knowledge	143(75.7%)	65(32%)	1	1	
Poor knowledge	46(24.3%)	138(68%)	6.60(4.233-10.291)*	4.958(2.709-9.072)**	.000

¹

Notes: 1, reference category: *candidate for multivariate at $p < 0.25$; **significance at $p < 0.05$

Abbreviations: COR, crude odds ratio; AOR, adjusted odds ratio; CI, confidence interval

¹

6. DISCUSSION

The study was conducted to assess the knowledge and attitude toward HPV vaccination among mothers of girls aged 9-14 years attending obstetrics and gynecologic outpatient clinics at three teaching hospitals of AAU, Addis Ababa, Ethiopia.

In this study, 50% of mothers exhibited good knowledge about the HPV vaccine. This finding is consistent with results from Debre Markos (47.6%) (34) and Debretabor (46%) (66) in Ethiopia, but it is significantly higher than the national pooled estimate of 38% reported in a systematic review (64). Additionally, it surpasses knowledge levels found in Central Ethiopia, which were 39.1% (67) and 35.4% in another study at Debretabor (65), as well as a study in Woldiya Town, where 69.8% of participants lacked knowledge about HPV vaccination (75). The higher knowledge level in this study may be attributed to the overall health literacy expected in the capital city, as well as the educational exposure mothers receive in a tertiary hospital setting.

Regional variations in knowledge levels highlight the need for targeted interventions tailored to local contexts.

The results of this study are consistent with international research, particularly with findings from Bamako, Mali (47.3%) (76) and Sharjah (52.1%) (77). However, they are notably higher than the 26.7% observed in Lagos, Nigeria (78), and the 6.2% reported in the Netherlands (10). Conversely, the study's findings are lower than the 62% reported in a Malaysian study (79) and the 90.6% found in the UK (10). Variations in study findings arise from differences in sociodemographic factors, sample sizes, cultural norms, access to information, and the effectiveness of promotional efforts by public and private sectors.

The study revealed that 48.2% of women had a favorable attitude toward HPV vaccination, consistent with a study in Cameroon where 45.6% held a positive view (80). It is slightly higher than that found in Central Ethiopia, where only 40.2% (67) of participants expressed a positive attitude. However, this is lower than the national pooled estimate of 58% from a systematic review (64) and the rates in Debre Markos (77.4%) (34), Addis Ababa 63.5% (27), and Nigeria (84%) (81). The higher positive attitude in the Akaki Kality sub-city may be linked to a recent HPV vaccination campaign that began shortly before data collection that increased awareness, while recall and social desirability bias may have influenced participants' responses.

The data indicate that 51.8% of mothers hold unfavorable attitudes towards the HPV vaccine, highlighting significant misconceptions and cultural concerns. A substantial portion of mothers, 41.6%, do not perceive their daughters to be at risk of HPV infection. This misconception is compounded by the belief held by 37.8% of mothers that only promiscuous girls would benefit from the vaccine, while 6.4% fear it could lead to earlier sexual activity. Such attitudes reflect limited knowledge of HPV. In Debre Berhan City, Ethiopia, 60% of mothers think their daughters are not susceptible to HPV, and 43.6% believe vaccination encourages early sexual activity (82). Similarly, in western Kenya, negative attitudes towards early sexual activity significantly reduced vaccine uptake (62).

Additionally, 38.3% of mothers believe girls aged 9-14 are too young for the vaccine, possibly due to discomfort discussing sexually transmitted infections or a lack of understanding of its preventive nature. Only 42.8% knew the vaccine is most effective before sexual activity begins. About 13.3% of mothers feel that the HPV vaccine contradicts cultural norms and religious beliefs, indicating the need for culturally sensitive educational campaigns. In Zimbabwe, obstacles to vaccination included unavailability, religion, and cost, while in Imo State, Nigeria, vaccine uptake was significantly associated with the mother's religion (39, 83).

Concerns about vaccine safety persist, with 7.9% of mothers fearing infertility, despite research confirming the vaccine's safety (84). In Debre Berhan, 35.75% of mothers share this fear (82). Addressing these safety concerns through education and reassurance from healthcare providers is crucial. The study underscores the need for targeted interventions to address misconceptions and cultural concerns about the HPV vaccine, including addressing safety concerns and educating parents about the age-specific risk of HPV infection.

Despite low knowledge levels (50%) and a 51.8% negative attitude, 90.3% of mothers expressed willingness to vaccinate their daughters, comparable to studies in Gonder (81.3%) (26), Kenya

(90%) (49), Nigeria (89.1%) (50), but higher than the national pooled estimate (74%) (64), Sharjah (76.6%) (77) and Romania (64.4%) (85). Primary motivations included cancer prevention (68.6%) and recognizing vaccination importance (24.3%), suggesting concerns about cervical cancer ¹⁰ may drive acceptance regardless of knowledge or attitudes, similar to West Nigeria (46). General belief in vaccination was the primary reason for parental acceptance in Brazil (72), while ¹⁰ prevention of HPV infection and cervical cancer was the main reason in Romania (85). Differences in study populations may account for diverse findings.

Conversely, 38 mothers (9.7%) were unwilling ⁵ to vaccinate their daughters against HPV. The reasons for this refusal varied by country. In Brazil, 51% cited "fear of reactions or adverse events" (72), while in Korea, 49% expressed concerns about possible side effects (35). In the USA, safety concerns accounted for 22.8% of refusals (68). In Nigeria, 51.5% of mothers reported not knowing where to access the vaccine (86), and in China, 31% believed their daughters were too young to be at risk of cervical cancer (87). In Turkey, low awareness of HPV was the primary reason for refusal (67.2%) (88). Our data indicated that the most common reasons for refusing HPV vaccination were a lack of awareness (26.3%) and concerns about unknown future side effects (26.3%).

¹ Factors associated with knowledge of the HPV vaccine include hearing about the vaccine, understanding cervical cancer, having a family history of cancer, and knowing other parents who have vaccinated their children. Key variables influencing attitudes toward the vaccine include knowledge of HPV infection, awareness of the vaccine, and understanding cervical cancer

The findings indicate a significant association between awareness of the HPV vaccine and knowledge about it. Specifically, individuals who had heard of the HPV vaccine were found to be 57.6 times more likely to possess good knowledge compared to those unaware, aligning with studies conducted in Arba Minch town (89) and Debre Markos (34), Ethiopia, and the United States (5), which highlight the critical role of information dissemination in increasing parental knowledge about the vaccine.

The primary sources of information about the HPV vaccine for the surveyed mothers were mass media (55.3%) and health professionals (23.5%). The study revealed a high level of trust in healthcare providers, with 96.9% of mothers relying on their recommendations. Additionally, 98.2% of mothers expressed general confidence in vaccines, highlighting the significant role healthcare professionals can play in promoting vaccination. However, the study also identified a concerning gap in foundational knowledge about HPV infection, as only 12.2% of mothers had heard of it. This lack of awareness may impede effective communication regarding the vaccine. Therefore, educational initiatives delivered through mass media and healthcare professionals should address not only the vaccine but also the virus and its implications to foster a more informed public.

The study found that mothers with a family history of cancer were 38 times more likely to possess knowledge about the HPV vaccine compared to those without such a history. This result aligns with a study conducted in Woldia (75), Ethiopia, underscoring the significant impact of familial health history on awareness and understanding of the HPV vaccine.

Furthermore, the findings revealed that study participants who knew ¹⁰ other parents who had their children vaccinated against HPV were 2.8 times more likely to be knowledgeable about the vaccine compared to those who did not have such social connections. This observation is consistent with a study conducted in Saudi Arabia (90), suggesting that social influence can serve as a catalyst for increasing overall vaccination rates.

The study findings indicate a significant association between mothers' knowledge of cervical cancer and their knowledge of the HPV vaccine. Mothers with good knowledge of cervical cancer were 6.7 times more likely to understand the HPV vaccine compared to those with poor knowledge. Furthermore, these mothers were nearly five times more likely to hold positive attitudes toward vaccination. This underscores the critical need for educational programs aimed at increasing awareness of cervical cancer to improve understanding and acceptance of the HPV vaccine. Such initiatives are essential for enhancing vaccine uptake and reducing cervical cancer incidence. Similar findings from a study in Debre Tabor, Ethiopia (65), further support the necessity of these educational efforts

The study reveals a significant correlation between mothers' knowledge of HPV infection and their attitudes toward the HPV vaccine. Mothers with good knowledge of HPV infection were three times more likely to exhibit a positive attitude toward vaccination. This finding is consistent with other studies conducted in Ethiopia, such as those in Akaki-Kalty sub-city (27) and Debretabor town (66), as well as in Korea (35), highlighting the importance of enhancing knowledge about HPV infection to foster positive attitudes and acceptance of the HPV vaccine. This correlation may stem from mothers' perceptions of the seriousness of HPV infection and the vaccine's potential benefits, motivating them to seek vaccination for their daughters.

Furthermore, the study indicates that mothers who had heard about the HPV vaccine were nearly twice as likely to exhibit a positive attitude compared to those who had not. This result aligns with findings from studies in Bahir Dar (91) and Debre Berhan City (82), Ethiopia, as well as research from Italy (12) and Shenzhen, China (36). The increased awareness likely helps mothers recognize the vaccine's benefits, thereby fostering a more favorable outlook toward vaccination.

These findings underscore the critical need for targeted health education initiatives that inform mothers about HPV and the vaccine. Such efforts could significantly improve attitudes toward vaccination, ultimately enhancing HPV vaccine uptake and contributing to cervical cancer prevention in Ethiopia.

7. Strength and Limitation of the study

The study has several limitations¹¹ that should be acknowledged. Firstly, the cross-sectional design restricts the ability to establish true cause-and-effect relationships between the dependent and independent variables, making it difficult to infer directionality.

Additionally, the institution-based nature of the study may limit the generalizability of the findings, as it was conducted in selected government hospitals, which may not reflect the broader population in Ethiopia. Furthermore, the sample was drawn from outpatient clinics, potentially introducing selection bias by over representing mothers who exhibit health-seeking behaviors and are more likely to be informed about health issues.

Despite these limitations, the study offers significant strengths that enhance its contribution to the field. Notably, it is the first institution-based study to comprehensively assess knowledge and attitude towards HPV vaccination among parents from different communities, providing a diverse population perspective. The use of a semi-structured questionnaire administered through face-to-face interviews allowed for detailed data collection and minimized misunderstandings. With a remarkable 100% response rate from 392 participants, the findings are robust and representative of the target population. Additionally, the study identified key associations between knowledge of HPV, cervical cancer and HPV vaccination, offering valuable insights for public health initiatives aimed at improving awareness and acceptance of the HPV vaccine in Ethiopia.

3 8. Conclusion and recommendation

Conclusion

This study investigated the knowledge and attitudes of mothers regarding HPV vaccination for their daughters aged 9-14 years attending obstetrics and gynecology outpatient clinics at Addis Ababa University, Ethiopia.

The findings revealed that only half of the mothers had good knowledge about the HPV vaccine, indicating that significant knowledge gaps remain. Additionally, nearly half of the mothers held favorable attitudes towards the vaccine, suggesting that misconceptions and cultural concerns persist.

Awareness of the HPV vaccine and knowledge of cervical cancer were key factors influencing both parent knowledge and attitudes toward HPV vaccination. Additionally, a family history of cancer and knowing other parents who had their children vaccinated were also important factors associated with knowledge of the HPV vaccine. Furthermore, knowledge of HPV infection emerged as a significant factor related to attitudes toward HPV vaccination.

The strong trust that mothers have in healthcare professionals presents a valuable opportunity for effective health education initiatives. Addressing the identified knowledge gaps and leveraging these associated factors is essential for improving HPV vaccination uptake, which can ultimately contribute to the reduction of cervical cancer incidence in Ethiopia.

Recommendation

Based on the study findings, several targeted recommendations are proposed for different stakeholders to improve HPV vaccine knowledge and acceptance among Ethiopian mothers, particularly in three teaching hospitals in Addis Ababa.

For Teaching Institutions (TASH, ZMH, GMH):

Educational Programs: Develop and implement programs for mothers attending obstetrics and gynecology clinics. These should cover basic HPV information, cervical cancer, vaccine importance and safety, and address misconceptions and cultural concerns.

Utilize Waiting Times: Provide educational materials such as posters, brochures, and videos in waiting areas.

Peer Educator Programs: Facilitate peer support groups where parents can share their vaccination experiences.

Targeted Programs for Families with Cancer History: Emphasize HPV vaccination's role in cancer prevention to families with heightened awareness due to a cancer history.

For Health Professionals:

Proactive Discussions: Discuss HPV vaccination with mothers during routine visits, leveraging the trust in healthcare providers.

Culturally Sensitive Information: Provide clear information about HPV, cervical cancer, and vaccine benefits, addressing concerns empathetically.

Awareness Campaigns: Use mass media and community outreach to raise awareness about the HPV vaccine and its benefits.

For the Addis Ababa City Health Bureau:

City-wide Campaigns: Launch awareness campaigns using TV, radio, and social media to increase knowledge about HPV, cervical cancer and the vaccine.

Community Collaboration: Work with community leaders and religious organizations to address cultural concerns and promote vaccine acceptance.

Outreach Programs: Organize programs targeting mothers of girls aged 9-14, involving medical students and healthcare professionals.

Community Events: Host events featuring testimonials from parents who have vaccinated their children to encourage others.

For the Scientific Community:

Research on Effective Strategies: Conduct studies on strategies to increase knowledge on HPV, cervical cancer & its vaccine in diverse Ethiopian communities.

Mixed-Methods Research: Use mixed-methods designs to explore socio-cultural factors and decision-making processes.

Further Study: Conduct studies other than cross-sectional to explore cause-effect relationships.

Prospective Studies: Investigate the transition from vaccine awareness to action by following mothers through their decision-making process.

For the Federal Ministry of Health and Policymakers:

Resource Allocation: Allocate resources for ongoing public health campaigns to enhance awareness about HPV, cervical cancer and the vaccine.

Media Engagement: Arrange airtime for health professionals to address misconceptions about the vaccine on TV and radio.

For Other Stakeholders (NGOs, Educational Institutions):

Community Education Initiatives: Support community-based education efforts to improve understanding and attitudes toward HPV vaccination.

Offer Resources: Provide resources to improve understanding through various channels.

By implementing these recommendations, stakeholders can collaboratively enhance HPV vaccine knowledge and attitudes, ultimately increasing vaccine uptake and reducing cervical cancer incidence in Ethiopia.

6 References

1. Garland SM, Kitchin H, Noller KL, et al. NEJM Impact and Effectiveness Of the Quadrivalent Human Papillomavirus Vaccine: A Systematic Review of Ten Years of Real-World Experience. *Clinical Infectious Diseases Advance Access* 2016;VOL. 383 NO.14.
2. Dike S, Freysteinson WM. Factors Associated With African American Mothers' Perceptions of Human Papillomavirus Vaccination of Their Daughters: An Integrated Literature Review. *Oncol Nurs Forum*. 2021;48(4):371-89.
3. Sobierajski T, Malecka I, Augustynowicz E. Feminized vaccine? Parents' attitudes toward HPV vaccination of adolescents in Poland: A representative study. *Hum Vaccin Immunother*. 2023;19(1):2186105.
4. Markowitz LE, Unger ER. Human Papillomavirus Vaccination. *N Engl J Med*. 2023;388(19):1790-8.
5. Boitano TKL, Ketch PW, Scarinci IC, Huh WK. An Update on Human Papillomavirus Vaccination in the United States. *Obstet Gynecol*. 2023;141(2):324-30.
6. Graham SV. The human papillomavirus replication cycle, and its links to cancer progression: a comprehensive review. *Clin Sci (Lond)*. 2017;131(17):2201-21.
7. Netfa F, Tashani M, Booy R, King C, Rashid H, Skinner SR. Knowledge, Attitudes and Perceptions of Immigrant Parents Towards Human Papillomavirus (HPV) Vaccination: A Systematic Review. *Trop Med Infect Dis*. 2020;5(2).
8. Lopez N, de la Cueva IS, Taborga E, de Alba AF, Cabeza I, Raba RM, et al. HPV knowledge and vaccine acceptability: a survey-based study among parents of adolescents (KAPPAS study). *Infect Agent Cancer*. 2022;17(1):55.
9. Paluch M, Tomkiewicz M, Olko P, Radulski J, Sałata P, Żuchnik M, et al. HPV virus as the main cause of cervical cancer, vaccination - literature review. *Journal of Education, Health and Sport*. 2023;13(3):292-301.
10. Lopez N, Garcés-Sánchez M, Panizo MB, de la Cueva IS, Artes MT, Ramos B, et al. HPV knowledge and vaccine acceptance among European adolescents and their parents: a systematic literature review. *Public Health Rev*. 2020;41:10.
11. Derby A, Mekonnen D, Nibret E, Maier M, Woldeamanuel Y, Abebe T. Human papillomavirus genotype distribution in Ethiopia: an updated systematic review. *Virol J*. 2022;19(1):13.

12. Trucchi C, Amicizia D, Tafuri S, Sticchi L, Durando P, Costantino C, et al. Assessment of Knowledge, Attitudes, and Propensity towards HPV Vaccine of Young Adult Students in Italy. *Vaccines (Basel)*. 2020;8(1).
13. Bitariho GK, Tuhebwe D, Tigaiza A, Nalugya A, Ssekamatte T, Kiwanuka SN. Knowledge, perceptions and uptake of human papilloma virus vaccine among adolescent girls in Kampala, Uganda; a mixed-methods school-based study. *BMC Pediatr*. 2023;23(1):368.
14. Bruni L AG, Serrano B, Mena M, Collado JJ, Gómez D, Muñoz J, Bosch FX, de Sanjosé S. Human Papillomavirus and Related Diseases in the World Summary Report. ICO/IARC Information Centre on HPV and Cancer (HPV Information Centre). 10 March 2023.
15. Arbyn M, Weiderpass E, Bruni L, de Sanjosé S, Saraiya M, Ferlay J, et al. Estimates of incidence and mortality of cervical cancer in 2018: a worldwide analysis. *Lancet Glob Health*. 2020;8(2):e191-e203.
16. Global strategy to accelerate the elimination of CC as a public health problem 2020.17 november 2020 2020.
17. Escoffery C, Petagna C, Agnone C, Perez S, Saber LB, Ryan G, et al. A systematic review of interventions to promote HPV vaccination globally. *BMC Public Health*. 2023;23(1):1262.
18. Cheng L, Wang Y, Du J. Human Papillomavirus Vaccines: An Updated Review. *Vaccines (Basel)*. 2020;8(3).
19. Kamolratanakul S, Pitisuttithum P. Human Papillomavirus Vaccine Efficacy and Effectiveness against Cancer. *Vaccines (Basel)*. 2021;9(12).
20. Spagnoletti BRM, Bennett LR, Wahdi AE, Wilopo SA, Keenan CA. A Qualitative Study of Parental Knowledge and Perceptions of Human Papillomavirus and Cervical Cancer Prevention in Rural Central Java, Indonesia: Understanding Community Readiness for Prevention Interventions. *Asian Pac J Cancer Prev*. 2019;20(8):2429-34.
21. Lei J, Ploner A, Elfstrom KM, Wang J, Roth A, Fang F, et al. HPV Vaccination and the Risk of Invasive Cervical Cancer. *N Engl J Med*. 2020;383(14):1340-8.
22. Ellingson MK, Sheikha H, Nyhan K, Oliveira CR, Niccolai LM. Human papillomavirus vaccine effectiveness by age at vaccination: A systematic review. *Hum Vaccin Immunother*. 2023;19(2):2239085.
23. Kavuluru VP. An Insight: HPV Vaccine for prevention of cervical cancer. *International Journal of Advance Research in Nursing*. Jan-Jun 2020;Volume 3(Issue 1):133-5.
24. Doshi RH, Casey RM, Adrien N, Ndiaye A, Brennan T, Roka JL, et al. Feasibility and acceptability of nationwide HPV vaccine introduction in Senegal: Findings from community-level cross-sectional surveys, 2020. *PLOS Glob Public Health*. 2022;2(4):e0000130.
25. Okunade KS, Sunmonu O, Osanyin GE, Oluwole AA. Knowledge and Acceptability of Human Papillomavirus Vaccination among Women Attending the Gynaecological Outpatient Clinics of a University Teaching Hospital in Lagos, Nigeria. *J Trop Med*. 2017;2017:8586459.
26. Alene T, Atnafu A, Mekonnen ZA, Minyihun A. Acceptance of Human Papillomavirus Vaccination and Associated Factors Among Parents of Daughters in Gondar Town, Northwest Ethiopia. *Cancer Manag Res*. 2020;12:8519-26.
27. Dereje N, Ashenafi A, Abera A, Melaku E, Yirgashewa K, Yitna M, et al. Knowledge and acceptance of HPV vaccination and its associated factors among parents of daughters in Addis Ababa, Ethiopia: a community-based cross-sectional study. *Infect Agent Cancer*. 2021;16(1):58.

28. Larebo YM, Elilo LT, Abame DE, Akiso DE, Bawore SG, Anshebo AA, et al. Awareness, Acceptance, and Associated Factors of Human Papillomavirus Vaccine among Parents of Daughters in Hadiya Zone, Southern Ethiopia: A Cross-Sectional Study. *Vaccines (Basel)*. 2022;10(12).
29. Zewdie A, Kasahun AW, Habtie A, Gashaw A, Ayele M. Human papillomavirus vaccine acceptance among adolescent girls in Ethiopia: a systematic review and meta-analysis. *BMC Public Health*. 2023;23(1):1369.
30. Derbie A MD, Nibret E, Misgan E, Maier M, Woldeamanuel Y, Abebe T. Cervical cancer in Ethiopia: a review of the literature. *Cancer Causes Control*. 2023 Jan;34((1)):1-11.
31. Adesina KT, Saka A, Isiaka- Lawal SA, Adesiyun OO, Gobir A, Olarinoye AO, et al. Knowledge, practice and acceptability of HPV vaccine by mothers of adolescent girls in Ilorin, Nigeria. *Sudan Journal of Medical Sciences*. 2018;13(1).
32. Yi Y, Xiu S, Shi N, Huang Y, Zhang S, Wang Q, et al. Perceptions and acceptability of HPV vaccination among parents of female adolescents 9-14 in China: A cross-sectional survey based on the theory of planned behavior. *Hum Vaccin Immunother*. 2023;19(2):2225994.
33. Choi J, Kim S, Lee SJ, Bae S, Kim S. Human Papillomavirus (HPV) Vaccination Intent among Mothers of Adolescent Sons: A National Survey on HPV Knowledge, Attitudes and Beliefs in South Korea. *World J Mens Health*. 2023;41(2):413-21.
34. Sinshaw MT, Berhe S, Ayele SG. Knowledge and Attitude Towards Human Papillomavirus Vaccine and Associated Factors Among Mothers Who Have Eligible Daughters in Debre Markos Town, Northwest Ethiopia. *Infect Drug Resist*. 2022;15:781-93.
35. Lee KN, Chang KH, Cho SS, Park SH, Park ST. Attitudes Regarding HPV Vaccinations of Children among Mothers with Adolescent Daughters in Korea. *J Korean Med Sci*. 2017;32(1):130-4.
36. Lin W, Wang Y, Liu Z, Chen B, Yuan S, Wu B, et al. Awareness and attitude towards human papillomavirus and its vaccine among females with and without daughter(s) who participated in cervical cancer screening in Shenzhen, China. *Trop Med Int Health*. 2019;24(9):1054-63.
37. Singh D, Vignat J, Lorenzoni V, Eslahi M, Ginsburg O, Lauby-Secretan B, et al. Global estimates of incidence and mortality of cervical cancer in 2020: a baseline analysis of the WHO Global Cervical Cancer Elimination Initiative. *Lancet Glob Health*. 2023;11(2):e197-e206.
38. Li M, Zhao C, Zhao Y, Li J, Wei L. Immunogenicity, efficacy, and safety of human papillomavirus vaccine: Data from China. *Front Immunol*. 2023;14:1112750.
39. Zibako P, Tsikai N, Manyame S, Ginindza TG. Knowledge, attitude and practice towards cervical cancer prevention among mothers of girls aged between 9 and 14 years: a cross sectional survey in Zimbabwe. *BMC Womens Health*. 2021;21(1):426.
40. Jedy-Agba E, Joko WY, Liu B, Buziba NG, Borok M, Korir A, et al. Trends in cervical cancer incidence in sub-Saharan Africa. *Br J Cancer*. 2020;123(1):148-54.
41. Portnoy A, Abbas K, Sweet S, Kim JJ, Jit M. Projections of human papillomavirus (HPV) vaccination impact in Ethiopia, India, Nigeria and Pakistan: a comparative modelling study. *BMJ Glob Health*. 2021;6(11).
42. Biyazin T, Yetwale A, Fenta B. Willingness to accept human papillomavirus vaccination in Jimma town, Ethiopia. *Hum Vaccin Immunother*. 2022;18(6):2125701.
43. Migbaru Abate S. Trends of Cervical Cancer in Ethiopia. *Gynecology & Obstetrics*. 2017;s3.

44. Bruni L AG, Serrano B, Mena M, Collado JJ, Gómez D, Muñoz J, Bosch FX, de Sanjosé S. Human Papillomavirus and Related Diseases in Ethiopia. Summary Report. ICO/IARC HPV Information Centre. 10 March 2023.
45. Dereje N, Gebremariam A, Addissie A, Worku A, Assefa M, Abraha A, et al. Factors associated with advanced stage at diagnosis of cervical cancer in Addis Ababa, Ethiopia: a population-based study. *BMJ Open*. 2020;10(10):e040645.
46. Akinleye1 HW, OJK-O, & Ifeoma Peace Okafor1, KAO. Parental willingness to vaccinate adolescent daughters against human papilloma virus for cervical cancer prevention in Western Nigeria. 19 Jun 2020;Volume 36, Article 112,.
47. Elit L, Ngalla C, Afugchwi GM, Tum E, Fokom Domgue J, Nouvet E. Assessing knowledge, attitudes and belief toward HPV vaccination of parents with children aged 9-14 years in rural communities of Northwest Cameroon: a qualitative study. *BMJ Open*. 2022;12(11):e068212.
48. McKenzie AH, Shegog R, Savas LS, Healy CM, Shay LA, Preston S, et al. Parents' stigmatizing beliefs about the HPV vaccine and their association with information seeking behavior and vaccination communication behaviors. *Hum Vaccin Immunother*. 2023;19(1):2214054.
49. Kolek CO, Opanga SA, Okalebo F, Birichi A, Kurdi A, Godman B, et al. Impact of Parental Knowledge and Beliefs on HPV Vaccine Hesitancy in Kenya-Findings and Implications. *Vaccines (Basel)*. 2022;10(8).
50. Azuogu BN, Umeokonkwo CD, Azuogu VC, Onwe OE, Okedo-Alex IN, Egbuji CC. Appraisal of willingness to vaccinate daughters with human papilloma virus vaccine and cervical cancer screening uptake among mothers of adolescent students in Abakaliki, Nigeria. *Niger J Clin Pract*. 2019;22(9):1286-91.
51. Wang Z, Wang J, Fang Y, Gross DL, Wong MCS, Wong ELY, et al. Parental acceptability of HPV vaccination for boys and girls aged 9-13 years in China - A population-based study. *Vaccine*. 2018;36(19):2657-65.
52. Taebi M, Riazi H, Keshavarz Z, Afrakhteh M. Knowledge and Attitude Toward Human Papillomavirus and HPV Vaccination in Iranian Population: A Systematic Review. *Asian Pac J Cancer Prev*. 2019;20(7):1945-9.
53. Destaw A, Yosef T, Bogale B. Parents willingness to vaccinate their daughter against human papilloma virus and its associated factors in Bench-Sheko zone, southwest Ethiopia. *Heliyon*. 2021;7(5):e07051.
54. La Torre G, De Vito E, Ficarra MG, Firenze A, Gregorio P, Miccoli S, et al. Knowledge, opinions and attitudes of Italian mothers towards HPV vaccination and Pap test. *Tumori*. 2015;101(3):339-46.
55. He J, He L. Knowledge of HPV and acceptability of HPV vaccine among women in western China: a cross-sectional survey. *BMC Womens Health*. 2018;18(1):130.
56. Xie Y, Su LY, Wang F, Tang HY, Yang QG, Liu YJ. Awareness regarding and vaccines acceptability of human papillomavirus among parents of middle school students in Zunyi, Southwest China. *Hum Vaccin Immunother*. 2021;17(11):4406-11.
57. Kristina SA, Permitasari NPAL. Knowledge, Attitudes and Barriers towards Human Papillomavirus (HPV) Vaccination in Developing Economies Countries of South-East Asia Region: A Systematic Review. *Systematic Reviews in Pharmacy*. 2018;10(1):81-6.

58. Shamaun S, Jaleel R, Gull Y, Shahid A, Iqbal M, Qazi TN. Knowledge and Attitude of Cervical Cancer Screening and Vaccination in Patients Attending Gynecology Outpatient Clinic at a Tertiary Care Hospital in Pakistan. *South Asian J Cancer*. 2023;12(1):17-22.
59. Ulus B. The human papilloma virus vaccination: Turkish mothers' views. *Eurasian Journal of Medicine and Oncology*. 2017.
60. Cunningham MS, Davison C, Aronson KJ. HPV vaccine acceptability in Africa: a systematic review. *Prev Med*. 2014;69:274-9.
61. Perlman S, Wamai RG, Bain PA, Welty T, Welty E, Ogembo JG. Knowledge and awareness of HPV vaccine and acceptability to vaccinate in sub-Saharan Africa: a systematic review. *PLoS One*. 2014;9(3):e90912.
62. Hillary Mabeya JO, Davy Vanden Broeck. Mothers of adolescent girls and Human Papilloma Virus (HPV) vaccination in Western Kenya. 04 Feb 2021.
63. Derby A, Mekonnen D, Misgan E, Alemu YM, Woldeamanuel Y, Abebe T. Low level of knowledge about cervical cancer among Ethiopian women: a systematic review and meta-analysis. *Infect Agent Cancer*. 2021;16(1):11.
64. Derby A, Mekonnen D, Misgan E, Maier M, Woldeamanuel Y, Abebe T. Acceptance of human papillomavirus vaccination and parents' willingness to vaccinate their adolescents in Ethiopia: a systematic review and meta-analysis. *Infect Agent Cancer*. 2023;18(1):59.
65. Mihretie GN, Liyeh TM, Ayele AD, Belay HG, Yimer TS, Miskr AD. Knowledge and willingness of parents towards child girl HPV vaccination in Debre Tabor Town, Ethiopia: a community-based cross-sectional study. *Reprod Health*. 2022;19(1):136.
66. Aragaw GM, Anteneh TA, Abiy SA, Bewota MA, Aynalem GL. Parents' willingness to vaccinate their daughters with human papillomavirus vaccine and associated factors in Debretabor town, Northwest Ethiopia: A community-based cross-sectional study. *Hum Vaccin Immunother*. 2023;19(1):2176082.
67. Humnesa H, Aboma M, Dida N, Abebe M. Knowledge and attitude regarding human papillomavirus vaccine and its associated factors among parents of daughters age between 9-14 years in central Ethiopia, 2021. *J Public Health Afr*. 2022;13(3):2129.
68. Sonawane K, Zhu Y, Montealegre JR, Lairson DR, Bauer C, McGee LU, et al. Parental intent to initiate and complete the human papillomavirus vaccine series in the USA: a nationwide, cross-sectional survey. *Lancet Public Health*. 2020;5(9):e484-e92.
69. Vasudevan L, Ostermann J, Wang Y, Harrison SE, Yelverton V, Fish LJ, et al. Association of caregiver attitudes with adolescent HPV vaccination in 13 southern US states. *Vaccine X*. 2022;11:100181.
70. Zhu X, Jacobson RM, MacLaughlin KL, Sauver JS, Griffin JM, Finney Rutten LJ. Parent-reported Barriers and Parental Beliefs Associated with Intentions to Obtain HPV Vaccination for Children in a Primary care Patient Population in Minnesota, USA. *J Community Health*. 2023;48(4):678-86.
71. Rezaq KA, Algamdi M, Alanazi R, Alanazi S, Alhujairy F, Albalawi R, et al. Knowledge, Perception, and Acceptance of HPV Vaccination and Screening for Cervical Cancer among Saudi Females: A Cross-Sectional Study. *Vaccines (Basel)*. 2023;11(7).
72. Mendes Lobao W, Duarte FG, Burns JD, de Souza Teles Santos CA, Chagas de Almeida MC, Reingold A, et al. Low coverage of HPV vaccination in the national immunization programme in Brazil: Parental vaccine refusal or barriers in health-service based vaccine delivery? *PLoS One*. 2018;13(11):e0206726.

73. Bianco A, Pileggi C, Iozzo F, Nobile CG, Pavia M. Vaccination against human papilloma virus infection in male adolescents: knowledge, attitudes, and acceptability among parents in Italy. *Hum Vaccin Immunother.* 2014;10(9):2536-42.
74. Ezat SW, Hod R, Mustafa J, Mohd Dali AZ, Sulaiman AS, Azman A. National HPV immunisation programme: knowledge and acceptance of mothers attending an obstetrics clinic at a teaching hospital, Kuala Lumpur. *Asian Pac J Cancer Prev.* 2013;14(5):2991-9.
75. Bittew SM, Masresha SA, Mulaw GF, Yimam MA, Zimamu AA, Abriham AA, et al. Parental willingness to vaccinate their daughters against human papilloma virus and its associated factors in Woldia town, Northeast Ethiopia. *Front Glob Womens Health.* 2024;5:1243280.
76. De Groot AS, Tounkara K, Rochas M, Beseme S, Yekta S, Diallo FS, et al. Knowledge, attitudes, practices and willingness to vaccinate in preparation for the introduction of HPV vaccines in Bamako, Mali. *PLoS One.* 2017;12(2):e0171631.
77. Aida Bianco CP, Francesca Iozzo, Carmelo Giuseppe A Nobile &, Pavia M. Knowledge and Awareness about Cervical Cancer Vaccine (HPV) Among Parents in Sharjah. *Human Vaccines & Immunotherapeutics.* May 2017 10:9:2536-42.
78. Rabiu KA AT, Akinlusi FM, Davies NO, , Shittu KA AO. Parental acceptance of human papillomavirus vaccination for adolescent girls in Lagos, Nigeria. *J Family Med Prim Care.* 2020;9:2950-7.
79. Mohd Sopian M, Shaaban J, Mohd Yusoff SS, Wan Mohamad WMZ. Knowledge, Decision-Making and Acceptance of Human Papilloma Virus Vaccination among Parents of Primary School Students in Kota Bharu, Kelantan, Malaysia. *Asian Pac J Cancer Prev.* 2018;19(6):1509-14.
80. Ayissi CA, Wamai RG, Oduwo GO, Perlman S, Welty E, Welty T, et al. Awareness, acceptability and uptake of human papilloma virus vaccine among Cameroonian school-attending female adolescents. *J Community Health.* 2012;37(6):1127-35.
81. Ogochukwu TN, Akabueze J, Ezeome IV, Aniebue UU, Oranu EO. Vaccination against Human Papilloma Virus in Adolescent Girls: Mother's Knowledge, Attitude, Desire and Practice in Nigeria. *Journal of Ancient Diseases & Preventive Remedies.* 2017;05(01).
82. Tsige AW, Ayenew KD, Ayele SG. Assessment of knowledge and perceptions of human papillomavirus vaccine and its determinants among women who have eligible daughters in Debre Berhan City, Ethiopia: a cross-sectional study. *Front Oncol.* 2024;14:1348288.
83. Chinedu Anthony Iwu1, Ifeanyi Charles Nwagbara1,2, Ikrama Hassan3, PKB, EI, 2 and , Pius5 OM. Human Papillomavirus Prevention; Challenges for Mothers in Rural Areas in the Uptake of HPV Vaccines among Their Children in a Developing Country. *Archives of Infectious Diseases & Therapy* 2023, Dec 11;7(3):100-9.
84. Schmuhl NB, Mooney KE, Zhang X, Cooney LG, Conway JH, LoConte NK. No association between HPV vaccination and infertility in U.S. females 18-33 years old. *Vaccine.* 2020;38(24):4038-43.
85. Voidazan S, Tarcea M, Morariu SH, Grigore A, Dobreanu M. Human Papillomavirus Vaccine - Knowledge and Attitudes among Parents of Children Aged 10-14 Years: a Cross-sectional Study, Tirgu Mures, Romania. *Cent Eur J Public Health.* 2016;24(1):29-38.

86. Ezenwa BN, Balogun MR, Okafor IP. Mothers' human papilloma virus knowledge and willingness to vaccinate their adolescent daughters in Lagos, Nigeria. *Int J Womens Health*. 2013;5:371-7.
87. Yu Y, Xu M, Sun J, Li R, Li M, Wang J, et al. Human Papillomavirus Infection and Vaccination: Awareness and Knowledge of HPV and Acceptability of HPV Vaccine among Mothers of Teenage Daughters in Weihai, Shandong, China. *PLoS One*. 2016;11(1):e0146741.
88. Seven M, Guvenc G, Sahin E, Akyuz A. Attitudes to HPV Vaccination among Parents of Children Aged 10 to 13 Years. *J Pediatr Adolesc Gynecol*. 2015;28(5):382-6.
89. Ukumo EY, Woldehawariat FG, Dessalegn SA, Minamo DM, Ukke GG. Assessment of Knowledge About Human Papillomavirus Vaccination Among Primary School Girls in Arba Minch Town, South Ethiopia, 2020 an Institution-Based Cross-Sectional Study. *Cancer Manag Res*. 2022;14:2205-14.
90. Tobaiqy MA, Mehdar SA, Altayeb TI, Saad TM, Alqutub ST. Parental knowledge, views, and perceptions of human papilloma virus infection and vaccination-cross-sectional descriptive study. *J Family Med Prim Care*. 2023;12(3):556-60.
91. Lakneh EA, Mersha EA, Asresie MB, Belay HG. Knowledge, attitude, and uptake of human papilloma virus vaccine and associated factors among female preparatory school students in Bahir Dar City, Amhara Region, Ethiopia. *PLoS One*. 2022;17(11):e0276465.

Annex

Annex 1: Information sheet for study subjects

Greetings : My name isI am one of the data collectors for the study entitled “Knowledge and attitude of human papillomavirus vaccination among mothers of girls aged 9-14 years attending obstetrics & gynecological outpatient clinics at three teaching hospitals of AAU”. The principal investigator of the study is Dr. Zeynu Mohammed, who is an Obstetrics and Gynecology resident at Addis Ababa University, conducting this study for the partial fulfillment of his specialty degree in obstetrics & gynecology. I kindly request you to give me your attention to explain about the study and about you being selected as a study participant.

Purpose of the study: The purpose of this study is to assess Knowledge and attitude of human papillomavirus vaccination among mothers of girls aged 9-14 years attending obstetrics & gynecological outpatient clinics at three teaching hospitals of AAU

Procedures to be carried on: If you agree to participate, you will be asked about your knowledge of HPV, CC & HPV vaccine and attitude towards HPV vaccine and basic socio demographic information. The survey should take approximately 30-40 minutes. If you are willing to participate in this project, you need to understand and sign on the consent form.

Risk and discomfort: There is no risk in participating in this survey; you may feel some discomfort in wasting your time (a maximum of 40 minutes). However, the information you

provide is very important to know the knowledge & attitude of mothers towards HPV vaccination. So you are kindly requested to be included in the study. Your decision to take part or not participate in this interview, refuse to answer any question, or withdraw at any time will have no impact on the medical care you receive now or in the future.

Expected benefits: There is no special and direct benefit to you for participating in this study. However, your participation will help to understand the knowledge and attitude of mothers about HPV vaccination of adolescent girls. The finding of this survey will benefit society by helping improve education and policies around HPV vaccination of young girls.

Confidentiality: Your response to the survey will be kept completely confidential & anonymous. No identifying information such as your name or phone number will be collected, but a code number will be assigned to it. The interview will be conducted in a separate room. The information will be used only for the study purpose. The hard copy of the data will be kept in a locked cabinet and the soft copy will be password protected & only accessed by the researchers

Right to refuse or withdraw: Your Participation is voluntary and you have the full right not to participate in the study & to opt out at any point in the questionnaire. You can skip any question that you don't want to respond to. However, we hope that you will participate fully in this assessment since your views are important.

I would also like to inform you that this study have approval and ethical clearance from the department of obstetrics & gynecology research and publication committee of Addis Ababa University.

Given the information above, are you willing to participate in this study?

1. If Yes, Continue the interview / go to next page
2. If No, thank the mother and stop interviewing

If you have any questions regarding the study or would like to be informed of the result after its completion you can contact the principal investigator.

Address of the principal investigator:

Dr. Zeynu Mohammed

Mobile phone: +251 911340964

E-mail: zeynugr1989@gmail.com

Annex II: Individual consent form

I am informed of a study done on Knowledge and attitude of human papillomavirus vaccination among mothers of girls aged 9-14 years attending obstetrics & gynecological outpatient clinics at three teaching hospitals of AAU. My participation in this study is completely voluntary, with no risk in not participating and with no direct gain in answering the questions. I am informed that it may take up to 40 minutes for the interview. I have also been assured that I can withdraw my consent at anytime without penalty or loss off benefits. I have been told that my answers will be kept anonymous & confidential. All the needed information has been explained to me in the language I understand. I have read all of the information mentioned above and I am willing to participate in the interview.

By signing below, I confirm that I have read and understood this consent form and agree to participate in this research.

Signature of participant.....

Date.....

Annex III: English version of the questionnaire

Date:.....Name of data collector.....Supervisor name.....

ID no:.....Hospital.....Outpatient clinic.....

Part I: Socio demographic background of respondents; Other characteristics & Health Practices and Medical History			
S. no	Questions	Response	Skip code
1	Age(in years)		
2	Residence	1 Urban 2 Rural	
3	Religion	1 Muslim 2 Orthodox Christian 3. Protestant 4. Other-----	
4	Marital status	1. Single 2. Married 3. Divorced 4.Widowed 5.Separated	
5	Level of education	1. can't read and write 2. only read and write 3. primary school 4. secondary school 5. Diploma 6. degree and above	
6	Maternal occupation	1. Housewife 2. Civil servant 3. Self-employed 4. Merchant 5. Daily labor 6. Others -----	
7	Paternal occupation	1. Farmer 2. Civil servant 3. Self-employed 4. Merchant 5 Daily labor 6. Others -----	
8	Paternal educational level	1. can't read and write 2. only read and write 3. primary school 4. secondary school 5. Diploma 6. degree and above	
9	Family average monthly	(Ethiopian birr).....	

	income		
Other family characteristics			
10	Number of children of respondents		
11	Number of daughters aged 9-14 years		
Health Practices and Medical History			
12	Had a history of cervical cancer screening at least once before	1 Yes 2 No	
13	Family history of cancer	1 Yes 2 No	
14	Know other parents who had their children vaccinated with HPV vaccine	1 Yes 2 No	
2 Part II Questions about knowledge			
Knowledge of HPV			
1	Have you ever heard of Human Papillomavirus (HPV)?	1. Yes 2. No	
2	Is HPV a sexually transmitted disease?	1. Yes 2.No 3.I don't know	
3	Is HPV spread by airborne transmission?	1. Yes 2.No 3.I don't know	
4	Is HPV the main cause of cervical cancer?	1. Yes 2.No 3.I don't know	
5	Can HPV cause genital warts?	1. Yes 2.No 3.I don't know	
6	Can men catch HPV?	1. Yes 2.No 3.I don't know	
7	Does HPV cause cancer in men?	1. Yes 2.No 3.I don't know	
8	Are HPV infections preventable?	1. Yes 2.No 3.I don't know	
9	Can HPV infection be prevented by use of condom?	1. Yes 2.No 3.I don't know	
10	Does Condom use fully protect against HPV?	1. Yes 2.No 3.I don't know	
11	Can HPV infection be prevented by having only one sexual partner?	1. Yes 2.No 3.I don't know	
12	Can HPV be prevented by abstinence from sex?	1. Yes 2.No 3.I don't know	
13	Does a vaccine against HPV infection exist?	1. Yes 2.No 3.I don't know	
14	Does someone with HPV usually have symptoms?	1. Yes 2.No 3.I don't know	
Knowledge of CC			
1	Have you ever heard about CC?	1. Yes 2. No	
2	Cervical cancer is a disease of female genital tract only	1. Yes 2.No 3.I don't know	
3	Cervical cancer is a serious disease that cause a death	1. Yes 2.No 3.I don't know	
4	Persistent infection with certain strains of HPV is the main cause of CC?	1. Yes 2.No 3.I don't know	
5	Are women with multiple sexual partners at higher risk for CC?	1. Yes 2.No 3.I don't know	
6	Cervical cancer at early stage produces no signs or	1. Yes 2.No 3.I don't	

	symptoms	know	
7	Can bleeding after intercourse be a symptom of cervical cancer?	1. Yes 2.No 3.I don't know	
8	Can abnormal vaginal bleeding between periods be a symptom of cervical cancer?	1. Yes 2.No 3.I don't know	
9	Regular pap tests or cervical screenings can help detect cervical cancer early	1. Yes 2.No 3.I don't know	
10	Early detection of CC can significantly increase the chance of successful treatment	1. Yes 2.No 3.I don't know	
11	Cervical cancer is preventable	1. Yes 2.No 3.I don't know	
12	Practicing safe sex ,such as using condom, can reduce the risk of contracting HPV and developing CC	1. Yes 2.No 3.I don't know	
Knowledge of HPV vaccine			
1	Have you heard of HPV vaccine?	1. Yes 2. No	
2	If yes for from Where have you heard about HPV ? (Select all that apply, multiple response) Source of Information for HPV vaccine	1.Television 2.Radio 3.News 4.Internet/websites 5.Printed materials (brochures, pamphlets, etc) 6.Health professionals (doctors, nurses, etc) 7.Friends or family members 8.School/university 9.Other (please specify)	
3	Is HPV vaccine recommended for girls aged 9-14?	1. Yes 2.No 3.I don't know	
4	Does HPV vaccine Prevent HPV infection?	1. Yes 2.No 3.I don't know	
5	Does HPV vaccine Prevent CC?	1. Yes 2.No 3.I don't know	
6	Does HPV vaccine Prevent genital warts?	1. Yes 2.No 3.I don't know	
7	Is HPV vaccine most effective when given before onset of sexual activity?	1. Yes 2.No 3.I don't know	
8	Does HPV vaccine have serious side effects?	1. Yes 2.No 3.I don't know	
9	Does HPV vaccine cause HPV infection?	1. Yes 2.No 3.I don't know	
10	How many doses of HPV vaccine is given for girls aged 9-14 years?	1. 2 2.1 3.I don't know	
11	Do you know that the government offer HPV	1. Yes 2.No 3.I don't know	

	vaccine free of charge		
12	Do you know HPV vaccine is given in schools?	1. Yes 2.No 3.I don't know	
13	There is a need for regular cervical cancer screening after receiving HPV vaccine	1. Yes 2.No 3.I don't know	
Part 3: Questions on attitude			
Confidence in vaccines (efficacy/safety)			
1	Do you generally believe in vaccines?	1. Yes 2.No 3.I don't know	
2	Do you believe HPV vaccine is safe?	1. Yes 2.No 3.I don't know	
3	Do you think HPV vaccine is effective in preventing HPV related diseases, such as CC	1. Yes 2.No 3.I don't know	
4	Do you trust the recommendations of health care professionals regarding the HPV vaccine?	1. Yes 2.No 3.I don't know	
5	Do you think that HPV vaccine can cause infertility for your daughter in the future	1. Yes 2.No 3.I don't know	
6	Are you afraid of minor side effect of HPV vaccine(like redness and pain on the injection site) for your daughter	1. Yes 2.No 3.I don't know	
Perception of Risk			
7	Do you think your daughter is at risk/has a chance of getting HPV infection?	1. Yes 2.No 3.I don't know	
8	Do you think only those who are promiscuous would benefit from the vaccine	1. Yes 2.No 3.I don't know	
9	Do you think girls between 9 -14 years are too young to get the vaccine?	1. Yes 2.No 3.I don't know	
10	Do you think getting the HPV vaccine can cause girls to become sexually active much earlier?	1. Yes 2.No 3.I don't know	
11	Do you think HPV vaccine promote risky sexual behaviors among teenagers	1. Yes 2.No 3.I don't know	
12	Does HPV vaccination violate your cultural norms and religious beliefs	1. Yes 2.No 3.I don't know	
13	Are you willing to vaccinate your daughter against HPV?	1. Yes 2. No 3. Not sure	
Reasons for accepting & refusing HPV vaccination			
14	If your answer for Q no 13 is Yes, what is the main reason you would want to get the vaccine?	1 Protection against cervical cancer 2 Recommendation by physician 3 Being in age group for vaccination 4 Being in at-risk group 5 Vaccination is good/important 6 Cancer prevention 7 I trust the National Immunization Programme 8 Other.....	

15	If your answer for Q no 13 is NO, what is the <i>main reason</i> you would not want to get the vaccine?	1. Not aware of HPV vaccine 2. Inadequate information for decision 3. HPV vaccine is not necessary 4. Vaccine not available in the country 5. Do not know where to get the vaccine 6. Vaccine is not safe 7. Short term Side effects 8. Unknown future side effects 9. Vaccine promotes early sexual activity 10. Vaccination stigma as promiscuous 11. My religion doesn't allow vaccination 12. My Daughter is too young for the vaccine 13. child refusal 14. Lack of provider recommendation 15. I am against all vaccinations 16. Other.....;.....	
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Part 4: Additional comments

Is there anything else you would like to share about your knowledge or attitudes towards the HPV vaccine?

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Thank you for your time and cooperation in this study

HPV knowledge

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