UNIVERSITY FOR DEVELOPMENT STUDIES, TAMALE

SCHOOL OF PUBLIC HEALTH

DEPARTMENT OF SOCIAL AND BEHAVIOURAL CHANGE

KNOWLEDGE ON HUMAN PAPILLOMAVIRUS (HPV) AND THE UPTAKE OF HPV VACCINES AMONG FEMALE ADOLESCENTS IN NKORANZA SOUTH MUNICIPAL OF GHANA

MARY GYAMFUAH

(UDS/CHD/0011/20)

2023

UNIVERSITY FOR DEVELOPMENT STUDIES, TAMALE

SCHOOL OF PUBLIC HEALTH

DEPARTMENT OF SOCIAL AND BEHAVIOURAL CHANGE

KNOWLEDGE ON HUMAN PAPILLOMAVIRUS (HPV) AND THE UPTAKE OF HPV VACCINES AMONG FEMALE ADOLESCENTS IN NKORANZA SOUTH MUNICIPAL

BY

MARY GYAMFUAH (BSC. MIDWIFERY)

UDS/CHD/0011/20

THESIS SUBMITTED TO THE DEPARTMENT OF SOCIAL AND BEHAVIOURAL CHANGE, SCHOOL OF PUBLIC HEALTH, UNIVERSITY FOR DEVELOPMENT STUDIES IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE AWARDS OF MASTERS OF PHILOSOPHY IN COMMUNITY HEALTH AND DEVELOPMENT.

AUGUST, 2023

DECLARATION

I hereby declare that this thesis is the result of my own original work and no part of it has been presented for anther degree in this University or elsewhere. The exceptions are the references made to other works that have been duly cited and acknowledged.

Candidates' Name:

Signature:

Name: Mary Gyamfuah

Date: 31-07-2023

Supervisor

I hereby declare that the preparation and presentation of this thesis was supervised in accordance with the guidelines on supervision of thesis laid down by the University for Development Studies, Tamale, Ghana.

Signature:

Name: Prof. Martin Nyaaba Adokiya

Date: 1st Aug 2023

2

ABSTRACT

Adequate knowledge on Human papilloma Virus (HPV), its vaccines and cervical cancer among adolescents can result in early detection, prevention, treatment, and management. Leading to the reduction in HVP infections and cervical cancer rate. Though there is empirical evidence on adolescents' knowledge on HPV, its effect and the uptake of the vaccine as a preventive measure, not much have been cited within the study site. This study assessed the knowledge of the adolescent girls of ages 12-19 on Human Papillomavirus (HPV) and the uptake of HPV vaccine in Nkoranza South Municipal of Ghana. A cross-sectional design with a quantitative approach was used for this study. The data was taken from a sample size of 341 using open and closed ended questionnaire. Binary logistic regression analysis was employed to examine the relationship between independent and dependent variables at 95% confident level and $P \leq 0.05$ using Statistical Package for the Social Sciences software, version 24.0. The finding of the study revealed that 92% of the adolescents had poor knowledge about HPV infection. About 73% had never heard of HPV. The prevalence of HPV was 8.5% (at 95% CI: 5.2% to 11.8%). Only 17.2% of the respondents know of a vaccine that can prevent HPV infection of which less than 3% (at 95% CI: 0.9% to 4.1%) have been vaccinated. The factors that affected the vaccine uptake were parental consent (72.2%), accessibility of vaccines (25.4%), and lack of information (86%). However, the uptake of HPV vaccines did not show any statistically significant association with age, type of residence and sexual intercourse of respondents ($P > 0.05$). The study recommends enhanced education on reproductive health with collaboration between Ghana Health Services and the Ghana Education Services. Also, the Government of Ghana in conjunction with Ministry of Education should endeavor to breach the rural-urban gap in educational and social infrastructure including technology to enhance teaching and learning of the young ones especially on reproductive health.

ACKNOWLEDMENT

I am very grateful to God the Almighty for the gift of life, good health of body and mind, and the traveling mercies during this period. I would like to express my deepest and sincerest appreciation to my research supervisor, Prof. Martin Nyaaba Adokiya. Your dynamism and motivation have inspired me a lot. May His grace be sufficient for you. I also thank my family and friends for their love, prayers, and support. Mr. Jeremiah Seidu and family are singled out by way of showing my profound appreciation for their assistance throughout my studies. Lastly, the entire staff of the Graduate School is given credit for their tremendous support.

DEDICATION

This work is dedicated to my Parents, Mr. John K Duah (late) and Madam Dora Maanu.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

CHAPTER ONE

INTRODUCTION

1.1 Background of the Study

Human papillomavirus (HPV) is among the major sexually transmitted infection among women and men of active reproductive age (Rijkers & Braas, 2022). It is a high predisposing risk factor for cervical cancer in low and middle income settings (Dantas & Takiuti, 2018). HPV is the commonest reproductive tract viral infection among women of active reproductive age (Ndikom & Oboh, 2017). HPV infection causes a range of conditions in both males and females, from precancerous lesions to cancerous(Isara & Osayi, 2021). The majority of HPV infections may be asymptomatic or non-morbid, but continual infection with high-risk types may cause cervical cancer (Ezeanochie et al., 2020; Loke et al., 2017). HPV is classified into high- or low-risk types, depending on their potential of causing cervical cancer (Zaman *et al*., 2022).

According to reports, both males and females who have anogenital warts are affected by HPV high-risk strains 6 and 11 (Heidari et al., 2022; Lessard et al., 2022). Though these infections can be detrimental to the health of both women and men, it is treatable with few others progressing to cervical cancer if the condition is not identified early and treatment delays (Mburu *et al*., 2019). The lack of knowledge in the identification of the disease condition and its late treatment among the adolescents population is associated with poor education especially within the peripheries of low and middle income settings like Ghana (Angkasekwinai et al., 2021). In view of this, sub-Saharan Africa (SSA) has high incidence of cervical cancer among the adolescents female population (Huang *et al.*, 2022). In the opinion of Ali (2022), effective sensitization and mass

screening of the cervix on HPV for the youth especially those within the underdeveloped zones across the World can lead to reduction in the incidence HPV. According to Cattaruzza *et al.* (2022) and Blose *et al*. (2022), good knowledge on the causes and effects of HPV can potentially lead to the prevention and early detection of the disease condition. As part of this knowledge acquisition process and measures, it has been suggested that effective counseling services for the population prone to the disease condition can also enhance reduction in its rate of infection (Schwendener *et al.*, 2022). This leads to knowledge on the need to avoid multiple sexual partners (Portela & Pires, 2022). Yet, some of the preventive measures including the uptake of vaccination is reported to be low elsewhere and lacking in other jurisdictions, thus, contributing to the incidence of HPV cases in some low and middle income countries (Alagarsamy et al., 2022).

1.2 Problem Statement

The Human Papillomavirus (HPV) infection is a well-established cause of cervical cancer and a significant factor in other anogenital cancers including anus, vulva, vagina and penis as well as head and neck cancers(Agyei-Baffour et al., 2020). The HPV type 16 and 18 are responsible for about 70% of all cervical cancer cases worldwide (Bruni *et al.,* 2022). The prevalence of cervical and other anogenital malignancies may be decreased by HPV vaccinations that protect against HPV 16 and 18 infections (Karanja-chege, 2022). Yet, Africa with a population of 415.49 million women are at risk of developing cervical cancer because their knowledge on preventive measures including the vaccines is limited (Ferlay *et al.,* 2019). According to current statistics, 76,745 women in Africa die from the illness each year and 117,316 are diagnosed with cervical cancer (Bruni *et al.*, 2022).

In Ghana, cervical cancer is the second most common female cancer especially for those within the active sexual age bracket and second leading cause of mortality among women (Khakimova et

al., 2022). This indicates a crude incidence rate of 18.6 per 100,000 per annum as compared to West Africa Sub-Region with 16.8 per 100, 000 (Ferlay *et al.,* 2019; Bruni *et al.,* 2022). At the Korle Bu Teaching Hospital in Ghana for instance, facility-based statistics indicates that, 61% of women presenting with gynecological cancer had cervical cancer (Korle Bu Teaching Hospital, 2021). Even though global evidence of HPV, its vaccines, and its potential causes of cervical cancer is well known, not much is known about its prevalence, and its risk factors, as well as its prevention and treatment options in the study context. In 2018, 92 women were screened in Nkoranza and 11 tested positive and in December 2021, 100 females were screened and 12 tested positive (Nkoranza Municipal Hoaspital, 2021; Nkoranza Municipal Hospital, 2018). Furthermore, Operations Kids and Women International, a United States of America (USA)-Based non-governmental Organization screened 881 women for cervical cancer in five districts of the Bono East Region between 5th and11th March, 2022 and 51 females tested positive. Evidence to established adolescents' knowledge on HPV, its effect and the uptake of the vaccine as a preventive measure have been cited yet not within the study context. Therefore, this study was conducted to establish knowledge and uptake within the context of primary source of information of adolescents within age 12-19 in the Nkoranza South Municipal.

1.3 Justification of the Study

Public Health Importance: HPV is a significant public health concern as it is one of the most common sexually transmitted infections and is associated with various cancers, particularly cervical cancer. Assessing adolescents' knowledge about HPV can help identify gaps in awareness that may hinder vaccination uptake and increase the risk of HPV-related diseases.

Low Vaccination Rates: Despite the availability of effective vaccines to prevent HPV-related diseases, uptake rates among adolescents can be low, especially in rural areas. Understanding the current levels of knowledge and misconceptions about HPV and its vaccine can provide insights into barriers that prevent vaccine uptake, allowing for targeted interventions.

Targeting Adolescents: Adolescents are a crucial demographic for HPV vaccination since the vaccine is most effective when administered before the onset of sexual activity. Evaluating their knowledge and attitudes toward the HPV vaccine is vital for developing educational programs that encourage informed decision-making about vaccination.

Cultural and Socioeconomic Factors: Nkoranza South Municipal may have unique cultural beliefs and socioeconomic conditions influencing health behaviors and perceptions of vaccination. Conducting this study can uncover specific local factors that affect adolescents' knowledge and vaccine uptake, facilitating tailored public health strategies.

Informing Health Policies: The findings from this study can inform local health authorities and policymakers about the level of understanding and acceptance of the HPV vaccine among adolescents. This information can guide the development of health promotion strategies and educational campaigns to increase vaccine uptake and reduce the incidence of HPV-related diseases in the community.

Contribution to Existing Literature: This study will contribute to the existing body of literature on HPV knowledge and vaccination, particularly in Ghana. By focusing on a specific municipality, it can provide localized data that may be beneficial for broader national health initiatives.

Enhancing Community Engagement: By involving adolescents and the community in the research process, the study can enhance awareness of HPV and the importance of vaccination, fostering a more engaged and informed community that advocates for public health measures.

1.4 General Research Question

What is the knowledge of the adolescents on Human Papillomavirus and the uptake of HPV vaccine in Nkoranza South Municipal?

1.4.1 Specific questions

1. What is the prevalence of HPV among female adolescents in Nkoranza South Municipal?
2. What is the knowledge on HPV among female adolescents in Nkoranza South Municipal?
3. What is the coverage of HPV vaccine uptake among female adolescent in Nkoranza South Municipal?
4. What are the factors influencing HPV vaccine uptake among female adolescents in Nkoranza Municipal?

1.5 General Research Objective

To assess the knowledge of the adolescents on Human Papillomavirus and the uptake of HPV vaccine in Nkoranza South Municipal

1.5.1 Specific objectives

1. To determine the prevalence of HPV among female adolescent in Nkoranza South municipal
2. To assess the knowledge on HPV among female adolescents in Nkoranza South Municipal
3. To estimate the coverage of HPV vaccine uptake among female adolescent in Nkoranza South Municipal

4. To determine the factors influencing HPV vaccine uptake among female adolescents in Nkoranza south Municipal

1.6 Theoretical Model

The study employed the Health Belief Model (HBM) as cited in the work of Abraham and Sheeran (2016). The HBM was originated by Rosenstock et al in the 1950s which was revised in the 1980s (Jones et al., 2015). According to the Model, the formation of healthy behaviour is influenced by the perceived seriousness of health risks, believed hazards' capacity to be overcome, and predicted rewards and obstacles. The paradigm is therefore founded on six fundamental constructs: perceived vulnerability, perceived severity, perceived advantages, perceived obstacles, signals to action, and self-efficacy. The term "perceived susceptibility" refers to a person's perception of their risk of contracting a disease. A person's perception of the severity of contracting an illness or of not treating one is known as perceived severity. Perceived advantages refer to an individual's propensity to alter behaviour in light of attempts to lessen the threat of a disease as a result of perceived vulnerability to the sickness. The term "perceived barriers" describes the potential roadblocks to the adoption of a healthy behaviour. The tactics a person uses to do a healthy activity that demonstrates preparation to execute that particular action are known as cues to action. Self-efficacy is the belief that one can effectively carry out the targeted health behaviour to achieve a certain health outcome. As a result, an individual is more likely to adopt a health behaviour based on perceptions about their likelihood of developing a condition, the severity of that illness, its effects, the advantages and disadvantages of that behaviour, and their capacity to act in favour of a desired health behaviour.

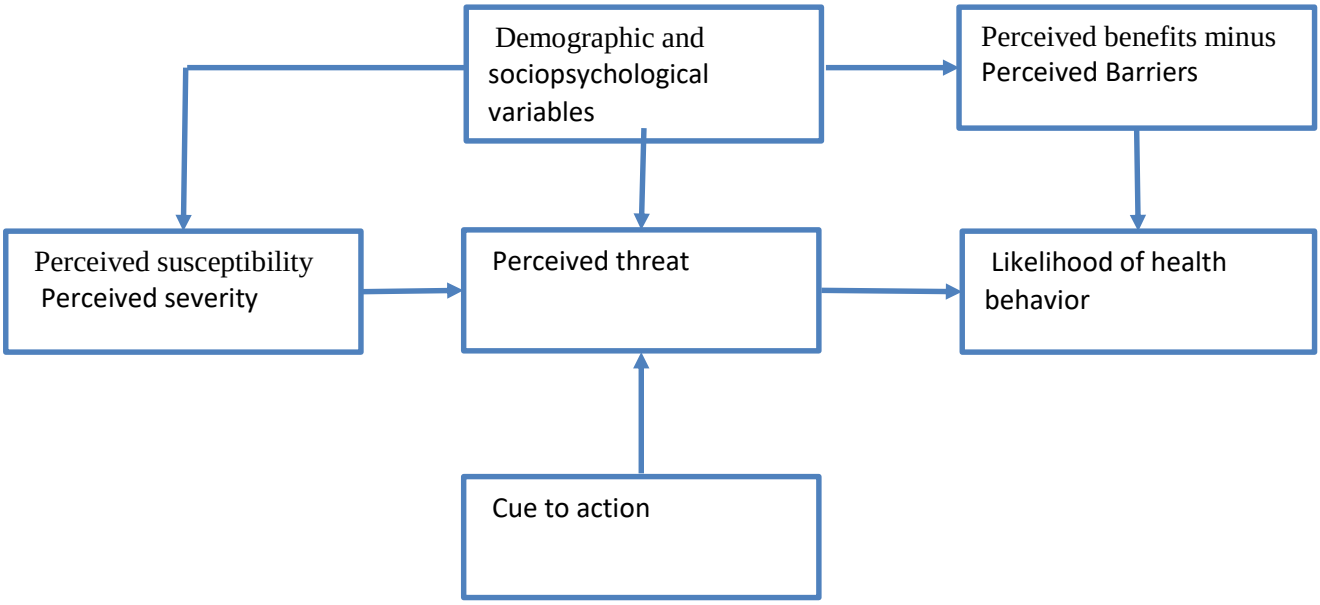

Fig 1.1. Health Belief Model (Becker & Maiman, 1975

1.7 Conceptual Framework

The conceptual framework is based on the model of Health Belief. According to Carpenter and Carpenter (2010) and Jones *et al*., (2014), implication of the health belief model on adolescent knowledge on sexually transmitted infection is significant. The authors established that, the adolescent knowledge on the consequences of sexually transmitted infections including HPV with its ripple effect as cervical cancer will guard against it through the use of condoms during sexual intercourse or abstinence. But Janz and Becker (1984) contend that, though the adolescent may be knowledgeable, other factors such as socio-cultural and economic may serve as barriers to the use of these mode of protection during sexual intercourse. However, the model has failed to indicate the pathway to living a healthy sexual life including receiving formal education which helps to enlighten people in living a good life, sensitization by way of informal education for communities so that those without formal education can also receive some level of education on it and youth friendly economic ventures to enhance their economic fortunes. Based on the theoretical loopholes identified and through the synthesis of empirical literature examined so far, perceived

susceptibility, perceived severity, perceived benefits, perceived barriers, cues to action, self-efficacy, formal education, health education, economic opportunities and socio-cultural factors serve as important factors for healthy adolescent sexual life.

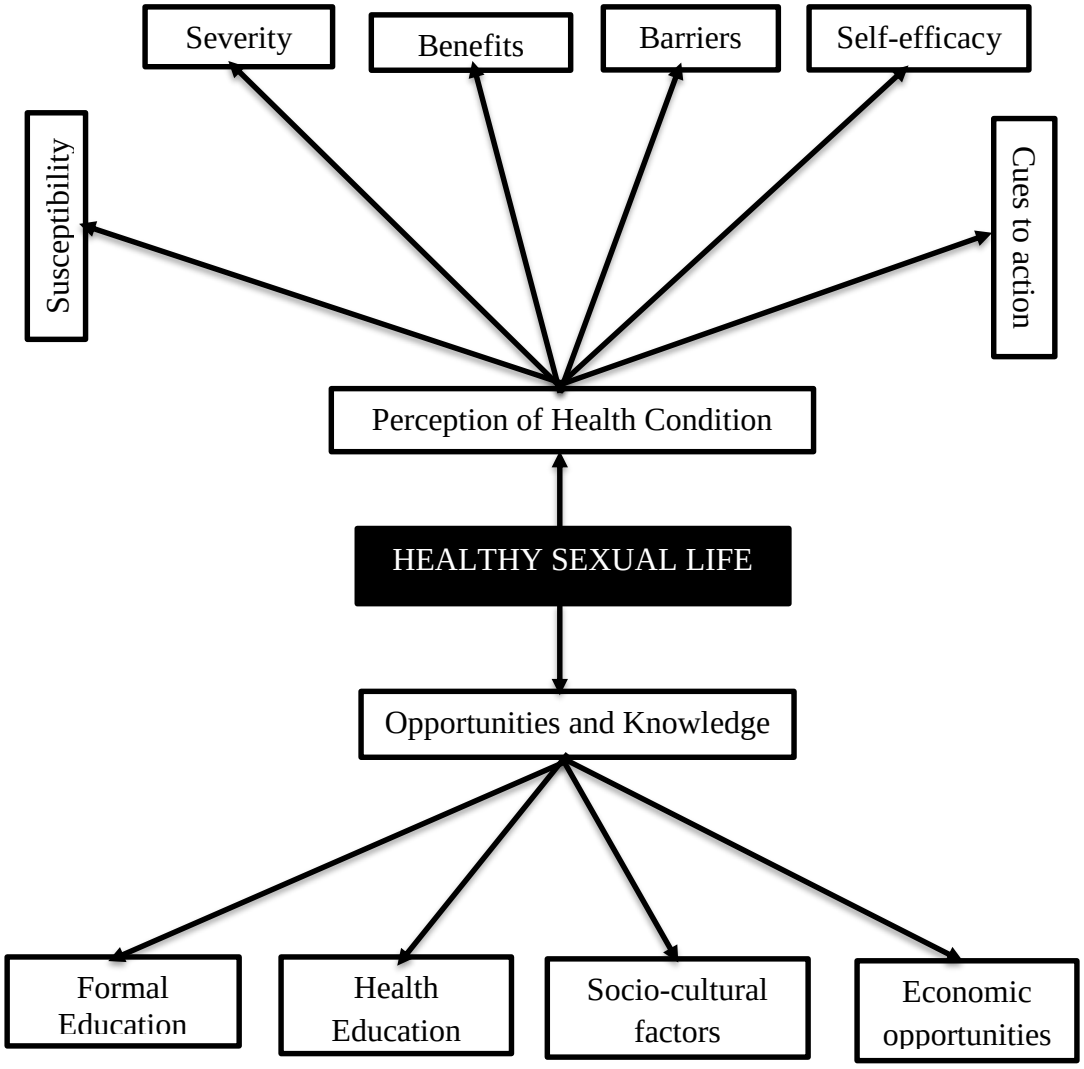

Figure 1. 2: Conceptual framework on adolescent healthy sexual behavior (Jones *et al*., 2014)

A framework on adolescent healthy sexual behavior

The framework explains that, adolescent knowledge in HPV, its vaccine intake and cervical cancer borders on their perceived susceptibility, perceived severity, perceived benefits, perceived barriers,

cues to action, and self-efficacy as established by theorists. However, formal education, health education, economic opportunities and socio-cultural factors serve as important factors in determining the healthy adolescent sexual life. Healthy sexual life is taught as a subject within mainstream educational system. Therefore, adolescents who have the privilege to school within the mainstream educational institutions can acquire acknowledge on the sexual transmitted infections, preventive measures, treatment and management options. Thus, they only need that opportunity to acquire such knowledge. Aside that, adolescents at home and their parents who might not have the opportunity for formal education will require health education from health professionals to be able to understand what Sexually Transmitted infections (STIs). Particularly, HPV, its effects and preventive measures including the vaccines. Without these forms of education, socio-cultural factors can affect the adolescent practice of safe sexual intercourse. This is because some societies and families forbid mentioning sex intercourse among or with adolescents. In such societies and families, the adolescent is likely to know anything related to sexual intercourse and STI's infections including that of HPV, cervical cancer and preventive measures. Also, opportunity for economic ventures can also determine the adolescent sexual behavior. Except for abstinence, most, if not all the preventive measures, treatment and management of HPV, its effects as cervical cancer and the uptake of the vaccine require some financial cost to obtain. Individual adolescents or families without the economic strength cannot afford this, hence can fall prey to it.

1.8 Definition of terms

Human Papillomavirus: It is a sexually transmitted infection that may be acquired and spread through several sexual partners as well as by contact with an infected person through oral, anal, or genital intercourse. Vaginal or anal sex is when it is distributed most frequently (Goldie et al.,

2007). Additionally, during intercourse, it spreads through intimate skin-to-skin contact. (Chakraborty et al., 2018). Even if they show no symptoms, a person with HPV might still infect someone else. Cervical cancer can develop if certain kinds of human papillomavirus are acquired over an extended period of time (Zhang et al., 2016)

Cervical Cancer: One form of cancer that affects the cells of the cervix, the lower portion of the uterus that attaches to the vagina, is cervical cancer. Most cervical malignancies are caused by different HPV strains. The immune system of the body usually stops HPV from doing any harm when it is exposed. Since the virus endures for years, it helps certain cervical cells develop into cancerous cells.

HPV Vaccine: These are vaccinations that guard against contracting specific strains of the human papillomavirus. There are two, four, or nine different HPV vaccinations that are now available. The HPV types 16 and 18 that are most likely to cause cervical cancer are at least partially protected by all HPV vaccinations.

Adolescents: Adolescence is a time of transitional physical and psychological growth that typically occurs between puberty and adulthood (Ortiz *et al.*, 2017). Although adolescence is typically thought of as occurring during the teenage years, its physical, psychological, or cultural manifestations can start earlier and last longer (Susanne *et al.*, 2017). According to the World Health Organization (WHO), teenagers are individuals who are between the ages of 10 and 19 years old. As a result, the vast majority of teenagers fall within the age-based definition of "child" that was approved by the Convention on the Rights of the Child, which defines a "child" as a person under the age of 18 (Ortiz *et al.*, 2017).

Knowledge: A collection of experience, relevant information, and expert insight is referred to as knowledge, and it provides a framework for evaluating and integrating fresh experiences and information.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter is made up relevant literature related to the study. The literature is presented in line with the objectives of the study. In view of this, the objectives of the study are presented as themes and discussed. The focus of the literature is on reproductive health but emphasizing on Human Papillomavirus, its effects and preventive measures among adolescents. The main aim of this chapter is to understand what has been done so far on the subject matter under discussion and identify and fill gaps in the study.

2.2 Prevalence of HPV among adolescent

Infection with the human papillomavirus (HPV) is extremely common and results in a number of malignancies and other negative health effects (Ortiz *et al.*, 2017). Some studies have identified that HPV infection is more prone to certain population groups than others (Bunzen et al., 2006; Smits et al., 2014). The studies indicates that, such population groups have certain peculiar or unique characteristics that may be determined by environmental factors (Ferreira et al., 2006; P. Machado & Pereira, 2006). According to research on Black and Hispanic males, for example, Hispanic men are more likely than non-Hispanic men to get penile cancer linked to HPV, while Black men are more likely to develop anal cancer linked to the virus (Susanne *et al.*, 2017). The literature suggests that, HPV is responsible for roughly 70% of oropharyngeal cancers (Bettinger et al., 2013). The late identification or discovery of HPV among the male gender is as a result of long incubation period of the disease condition among men (Sakae & Imamura, 2006). For that matter, public health professionals are worried over this because of further and continues infection as by infected men who engages in continues sexual intercourse (Montovani et al., 2006).

According to Castro & Bussoloti (2006) one of the fundamental reasons accounting for an increase in HPV prevalence is the inability of infected men to identify their infection, treat and stop multiple sexual partners.

Cervical cancer, the most prevalent kind of cancer in women in Sub-Saharan Africa (SSA), is linked to one of 13 high-risk oncogenic genotypes of the human papillomavirus. This association is independent of men's incapacity to detect, treat, and manage HPV (Howell-jones et al., 2012; Tatar et al., 2017). According to estimates, East Africa has the highest age-standardized incidence of cervical cancer in the world, with around 30.0 cases per 100,000 people-years reported there (Auranen et al., 2014; Felix et al., 2006). Additionally, the HPV virus causes cervical cancer in around 15.0 out of every 100,000 women worldwide and 6.0 out of every 100,000 women in North America (Gauci et al., 2012). The literature indicates that, the highest global prevalence of HPV infection in East Africa is within the female population (Maier *et al.*, 2014; Duarte *et al.*, 2006). Additionally, studies on HPV reveal that younger women have the highest frequency of the virus, which is mostly curable in its early stages (Mesher et al., 2015). The literature also points to the fact that, the prevalence of HPV is dictated by the level of knowledge of the condition among people especially the adolescents. According to a research, most girls and women are HPV-naive before having their first sexual encounter in regions like North America and Europe, and HPV is swiftly acquired after having intercourse for the first time and when switching partners (Cornall *et al.*, 2017).

The most prevalent oncogenic viral infection in the world, HPV is linked to laryngeal, oropharyngeal, vaginal, vulvar, and oral malignancies (Montovani et al., 2006). Yet, the increasing numbers in HPV does not affect or inform adolescents prone to the condition to live a healthy life simply because of poor attitude towards the disease (Mccloskey *et al.*, 2017). For instance, 311,000

fatalities globally in 2018 were related to HPV, and there were predicted to be 569,000 new instances of cervical cancer (Hermansson et al., 2018; Satzke et al., 2014). One of the causes is that people are exposed to HPV infections during the beginning of sexual maturity and when they first meet new partners for sexual activity, albeit they may not be aware of the exposer (Gallagher *et al*., 2017). In accordance with it, statistics from throughout the world have showed that young women under the age of 25 have the greatest HPV prevalence (Howard *et al.,* 2017). Although HPV prevalence and type distribution differ by geographic location, the infection among teenage females often peaks between the ages of 15 and 16 and correlates with the start of sexual activity (Fukuchi et al., 2006). According to multiple studies, there are two peaks for older women's HPV, with the first peak occurring in those under 30 and the second peak occurring in those over 45 (Haeggblom et al., 2017; Imamura & Sennes, 2006). However, data shows that when compared to low- and middle-income regions, such as sub-Saharan Africa, industrialized nations like the United States and Australia have made significant strides in lowering HPV prevalence (Markowitz *et al.*, 2013). Therefore, HPV infection remains a significant public health issue, particularly in sub-Saharan Africa (SSA) where most countries are yet to implement nationwide measures to reduce its prevalence and enhance healthy reproductive life among the population (Dunne et al., 2006). Although the prevalence of HPV has already been evaluated in some specific groups and areas with the aim of identifying the causes and reducing its menace, its prevalence is still felt in some underdeveloped Communities of low and middle income nations (Garland et al., 2017; Kahle et al., 2012). Interestingly, some scholars have indicated that, most nations of the world have shown some decline in HPV prevalence according to age among female (Marcio et al., 2006). Other experts also argues that, the prevalence and type-specific HPV frequency can change according to race and gender than age (Erra et al., 2014; Salgado & Corrêa, 2006).

The prevalence of HPV in young people is crucial for assessing the efficiency of healthy sexual behaviour and HPV vaccination in various contexts under the influence of vaccination (Okada et al., 2006). The prevalence of HPV infection has been reported in some studies conducted in the developed world to be highest among young women and declines as majority dies out of the disease condition (Karron *et al.*, 2012). For instance, literatures has indicated an estimated 20 million Americans infected with HPV, with more than 5.5 million new cases diagnosed annually (Bruggink *et al.*, 2012). But the literature indicates that, out this figures, close to half of the victims died reducing the rate but not the condition (Morel et al., 2017). Yet, reduction in numbers, according to some scholars is as result of knowledge gained about the condition and positive attitude towards healthy reproductive lifestyle (Faria *et al*., 2006). Such poor knowledge affects the efforts to reduce the rate of prevalence of HPV (Rahman *et al*., 2017).

The cumulative prevalence rates of HPV could reach 82% in some groups, with teenage populations having the greatest rates (Bashaw et al., 2017). Less information is available about HPV infection prevalence rates in men, frequently because it is challenging to collect enough samples for HPV DNA testing (Almeida *et al.*, 2006). According to general estimates, 16% to 45% of males are infected with HPV, which is similar to the rates reported in women (Li *et al.*, 2017). The majority of HPV infections in men are asymptomatic, similar to those in women, but males are nevertheless susceptible to acquiring HPV-related illnesses such genital warts and invasive penile or anal cancer (Vinodhini et al., 2012). The majority of sexually transmitted diseases (STIs) worldwide and in Africa affect young individuals (Fávero & Sanchez, 2006). In women, the prevalence of HPV, one of the most prevalent STIs, rises around adolescence, shortly after the first sexual experience, and declines with age (Dunne et al., 2007).

Higher risk of HPV infection exists in females who had their first sexual experience before the age of 16 (Cardoso & Valera, 2006). In South African women, the average age of their first sexual encounter is between 16 and 18 years old (José et al., 2006). The prevalence and burden of HPV-related illnesses have been studied in the Korean population in recent years by a number of studies, although there are differences in the prevalence and type distribution (Neto, 2006; Soccol *et al.*, 2006). Consequently, the introduction of effective educational interventions among teenagers is one such preventative strategy that is desperately needed (Themis *et al.*, 2006).

2.3 Knowledge of Human papillomavirus among adolescents

Adolescents' knowledge on the human papillomavirus is very essential in healthy reproductive life and the prevention of other sexually transmitted infections (Lee et al., 2012). In view of that, Kruse et al. (2020) suggest effective awareness creation of the adolescents on sexual and reproductive health. Because such broad-based awareness of healthy reproductive life style can lead to avoidance and reduction in sexually transmitted infections among the adolescents (Sharomi & Malik, 2017). Reasoning with Kruse et al. (2020 and Hu *et al.*, (2021) established that, awareness or knowledge of the adolescents on healthy reproductive life style must be underpinned by positive attitude of the adolescents towards acquiring such knowledge. Kruse et al. (2020) describes the positive attitude here to mean, readiness to know what is been taught and to be taught and live it. But some analysts are of the view that, providers or educators of HPV and other sexually transmitted infections must equally be committed to the task (Xu et al., 2021). Because reluctance to provide or engage in active reproductive health education especially on HPV affects the level of knowledge adolescents would have gotten on HPV, thus, narrowing the knowledge-based of the adolescents and even families on the condition (Schiller et al., 2012).

Furthermore, critical sources of knowledge of HPV for the adolescent must be well noted and enhanced (Vielot *et al.*, 2017). So, school health program has been identified as one of the fundamental sources of information of the adolescent on sexually transmitted infections and particularly HPV which is less discussed (Maclaughlin *et al.*, 2020). According to Boyles et al. (2022) school health program is more effective means of providing health education to the adolescent because they are well defined and easily reachable. But some scholars argue that, adolescents in school are already having the privilege of getting information on sexual and reproductive health including education on HPV. Therefore, education or sensitization of the adolescents on HPV must be focused on the adolescents who are not in school. Reflecting on this, Thomas *et al.*,(2013) suggest community outrage programs as a means through which adolescents outside school can obtain information or know about HPV. Then again, Krzowska-Firych et al. (2019) contend that, community outrage programs might be limited in terms of scope and mentioned a wider coverage medium of sharing information on HPV among families, precisely adolescents.

Studies on HPV conducted in some parts of India indicated that, community outrage health education programs on reproductive health contributed to reduction in teenage pregnancies and adolescents' contraction of STI's (Jiaying et al., 2019). But analyst points to these studies as urban oriented studies because they are carried out within the urban areas and the context determines the level of understanding of issues (Bowyer et al., 2014; Vasudevan et al., 2022). Meanwhile evidence suggests most of the adolescents who lack adequate understanding of healthy reproductive life including the prevention of STI's are those living in deprived communities of low and middle income countries *(*Bardají *et al.*, 2018). Adding to this, Amboree *et al.*, (2022) opines that, policy makers and researchers on public health and reproductive in particular must

focus their attention on making issues of STI's and HPV in particular well-known to people or adolescents living in less endowed areas.

Agreeing with Brunelli *et al.,* (2021) proposition, Kim et al. (2019) indicated the use of radio as another medium through which information or knowledge can be obtained. Runge et al. (2019) buttressed radio as an affordable medium with wider coverage and audience. Contending, (Akanda et al., 2022; Giorgi et al., 2017; Massad et al., 2015) established that, the use of radio as a channel of sharing information with the adolescents' girls on HPV has many benefits besides the coverage, affordability and large audience. Its benefits include reduction in the cost of organizing health education on HPV and time spent by providers or professionals to carry out the education. From professional perspectives, Chaw et al. (2019) explains, invariably the cost involve in creating awareness or sharing knowledge on HPV with the adolescents it is still very essential because its effect on human health, especially the female is more pronounced. This is because it can generate into cervical cancer which is the fourth most common cancer among women worldwide after breast, colorectal and lung cancer (Tsai et al., 2019).

Other scholars within the field of public health in general and reproductive health in particular are equally of the opinion that, knowledge of HPV must extend beyond the adolescents who are dependents to include their parents (Walker *et al.*, 2022; Robles *et al.*, 2021). The literature indicates that, when parents have knowledge or are aware of HPV, its preventive measures and consequences, they would also educate their children against attitude and life style that has the potentials of endangering their health as they grow (Forster *et al.*, 2017). Adding to this, Chung et al. (2022) emphasized parental knowledge as very essential because parents are care-takers of these growing adolescents and as such controls and coordinates their activities. Therefore, their know-how on what is HPV, its effects and preventive measures will aid them in sharing the

information with their children. Additionally, parental knowledge on HPV is more critical and easy to share because most parents are faired by their children (Leung et al., 2019).

But it is also argued that, non-literate parents may not also have such adequate knowledge on HPV to educate their children (Zhang et al., 2020). The reason(s) is/are that these category of parents are limited to the variety of information pertaining to HPV (Odunyemi et al., 2018). Such limitation may include their inability to read existing literature on the subject, understand presentations and teachings of the condition on social media platforms such as You Tube and television networks (Abbas et al., 2020). The literature indicates that, most parents, though may be aware of the existence of sexually transmitted infections or disease, that of their knowledge on HPV, its effects and prevention is still not well known to them (Ruiz-sternberg *et al.,* 2018). Notwithstanding this opinion, Jenkins and Bosch, (2018) maintained that, the common knowledge that parents have on sexually transmitted infections if used appropriately for the adolescent can enhance adolescent knowledge against HPV. Implicitly, HPV comes through sexual intercourse and if sexual intercourse is avoided, HPV can also be avoided among the adolescent girl and boy (Efua et al., 2022). In view of this, Morales-campos *et al*., (2013) concludes that, the most effective medium of transferring knowledge on HPV to adolescent girls is the parents and parents' knowledge on the disease condition and sexually transmitted infections in general must be enhanced.

Some studies also revealed that, the lack/poor on knowledge on HPV has further been worsened by the attitude of some adolescents engaging in certain sexual activities that the larger human society frowns at (Rezqalla *et al.,* 2021; Goldfarb & Comber, 2022). Some cross-sectional studies conducted in some developed Countries and some low and middle income setting indicates an increased risk for HIV infection specifically among men who have sex with men, people who inject drugs, and heterosexually active adults (Ahmed et al., 2022; Wigle et al., 2013). Other

studied that, because of the knowledge gap in the disease condition, most of the infected persons are usually not aware of the symptoms and to respond quickly to treatment and management of the condition (Dodd et al., 2016; States et al., 2021). According to Horvath *et al*., (2018) and (Lonky et al., 2021) the inadequate knowledge of the adolescent boy and girl on the consequences of HPV including progression to cervical cancer, effects on newborn children and human health in general is a concern. Teenagers are generally unaware of the virus and are particularly ignorant of its potential to cause cancer (Dorji et al., 2021)

Adolescents' knowledge and awareness of HPV prevention can be increased by educational, school-based activities (Wang et al., 2020). Increase basic sexually transmitted illness prevention practices and decrease sexual risk-taking (Portnoy *et al.,* 2021). The perceptions of girls towards the HPV vaccine can be positively impacted by interventions (Wentzensen et al., 2021) With the goal of promoting primary HPV prevention, only a small number of randomised controlled studies have been carried out among teenagers (Simms et al., 2020). According to a study done on secondary school-aged adolescents, awareness of the need for a healthy reproductive life is largely influenced by education about sexual health and relationships, eating habits, sleep patterns, physical activity, use of tobacco, alcohol, and drugs, as well as psychosocial health (Daniels *et al.*, 2021).

2.4 Coverage of HPV vaccine uptake among adolescent

According to available data, boys and girls in the adolescent years in the United States (U.S.) are frequently advised to get the HPV vaccination (Birebent et al., 2021). Yet literature indicates that, the coverage of HPV vaccines among the adolescent population in the US is country still daunting. (Tsai et al., 2019). According to Wirtz *et al*., (2022), the rate of teenagers who receive the HPV vaccine is still below expectations for a healthy population and country (Morgan *et al.*, 2022).

Only 45% of teenagers in certain wealthy nations were vaccinated against HPV between 2013 and 2018, according to a national survey (Lott et al., 2020; Vinkenes et al., 2019). Additionally, some other surveys in first world countries still revealed that, an estimated 22% of nationals from these nations had their young adult population ages 18 to 26 completing the HPV vaccine series (Katsuta et al., 2019). Despite the complexity of the factors impacting vaccine uptake, HPV awareness and understanding are linked to vaccination intent and actual vaccination (Jradi & Bawazir, 2019). The two (2) HPV vaccinations that are now on the market, Gardasil (MSD) and Cervarix (GlaxoSmithKline Biologicals), protect against the two (2) most prevalent cancer-causing HPV genotypes, HPV 16 and 18 (Almazrou et al., 2020). Prior to contracting an infection with specific genotypes associated with the vaccine, HPV immunization is most effective (Ramesh et al., 2021).

Eighty industrialized nations have reportedly incorporated the HPV vaccination into their national immunization policy for teenage females, according to literature on HPV infection (Pu *et al.*, 2021). In addition to 2 phylogenetically related high-risk HPV types (HPV-31 and HPV-45) that benefited from cross protection by the quadrivalent vaccine, the quadrivalent vaccine has been shown to be highly effective at reducing the incidence of cervical and anogenital HPV infections and related diseases caused by vaccine types (HPV-6, HPV-11, HPV-16, and HPV-18) (Gomes *et al.*, 2019). Five more high-risk HPV types (HPV-31, HPV-45, HPV-33, HPV-52, and HPV-58) are now protected thanks to the launch of the 9-valent HPV vaccination in 2017 (Cinar et al., 2019). According to estimates of the pre-vaccine population, the presence of nine HPV strains would prevent over 90% of cervical and anal neoplasia, as well as anogenital warts (Marlow et al., 2013). Uptake of the HPV vaccine has been delayed in several areas of the world, compared to greater immunization rates other nations where national programmes were established earlier (Rositch *et al.*, 2022).

In addition, not all HPV varieties, including certain cancer-causing non-vaccine kinds, are protected against by the current vaccinations (Young et al., 2022). The non-vaccine high-risk HPV varieties (HPV-35, HPV-39, HPV-51, HPV-56, HPV-59, and HPV-68) are also included, and they account for fewer than 10% of all female cervical and anal malignancies (Smith & Perkins, 2022). However, longterm data on the efficacy of the HPV vaccination in populations of adolescents and young adults living in developed countries are scarce (Værnesbranden *et al.*, 2021). In a sizable group of teenage girls and young women living in a city, the temporal relationships in age-adjusted post-vaccine HPV rates were assessed (Daniels *et al.*, 2022). One of the leading causes of cancer worldwide connected to infection is human papillomavirus (HPV) infection (Wong *et al.*, 2018). There is a link between HPV and cancers of the cervix, uterus, penis, vulva, vagina, anus, and oropharynx (Westrick *et al*., 2017). In addition to routine screening, these cancers can be successfully avoided by prophylactic HPV vaccination, safe sex (condom usage), and safe pregnancy (Wang *et al*., 2020).

Many countries have implemented national HPV immunization programme (Sonawane *et al*., 2020). For instance, in Sweden, starting in 2012, school-based vaccination programmes administered by school nurses began offering the quadrivalent vaccine to girls aged 10 to 12 years, while catch-up vaccination programmes administered in primary care settings began offering the vaccine to older girls and young women (Grandahl et al., 2016). Young women's coverage in low- and middle-income nations is significantly lower than in advanced economies (Bitarafan *et al*., 2021). Due to increased sexual risk-taking, HPV infections and HPV-related illnesses have surged in recent decades (Hogea, 2017). Before developing HPV infection, girls in their adolescent years or females between the ages of 9 and 26 should ideally receive the immunizations (Anwari *et al*., 2020). Due to their immature cervix, which has a larger area of ectopy, and sexual exposure, which

predisposes them to various reproductive tract infections, including HPV infection, adolescent girls are a special and important group for research into the sociodemographic and sexual factors responsible for acquiring HPV infection (Bermedo-carrasco et al., 2015).

Nevertheless prepubescent females who are sexually inactive have also been shown to have HPV infection; this might be because of non-penetrative sexual behaviours, autoinoculation, fomites, and other non-sexual pathways (Engel *et al.*, 2022). Previous research demonstrated that HPV infection risk rises shortly after the start of sexual activity (Hviid & Laksafoss, 2021; Luiz *et al*., 2015). Furthermore, epidemiological research indicates that 75% of all sexually active individuals will get HPV at some point in their lifetime (Davies *et al*., 2021; Kaul *et al.*, 2019). The chance of contracting HPV and developing an HPV-related illness is almost universal among sexually active men and women (Tull et al., 2019). In a study of teenagers who were originally HPV negative, it was shown that by three years, 55% had developed HPV (Choi et al., 2018). In a study of women enrolling in college who were HPV negative and who said they had never engaged in sexual activity when they entered, over 30% got HPV within a year of engaging in sexual activity and more than 50% did so within four years (Kreimer *et al*., 2020; Villa *et al*., 2020). This statistics demonstrate how HPV is easily transmitted through sexual contact among teenage and young adult females, and they emphasise the significance of focusing vaccination programmes on this vulnerable populations (Markowitz et al., 2018).

2.5 Factors influencing HPV vaccine uptake among adolescents

The knowledge on HPV vaccines and its availability is very essential or a great determinant for its uptake especially among vulnerable groups (Kacou et al., 2021). For instance, the three types of HPV vaccines available in the market, Cervarix W, Gardasil W and Gardasil-9W must be known to the consumers of the vaccines, its effects either positive or negative (Rosberger et al., 2022).

According to Karafillakis et al. (2021) the lack of/poor knowledge of the HPV vaccines among the users of the vaccines creates or leads to low uptake of the vaccines. In the opinion of Nsugbe, (2022) and Grossi *et al.*, (2021), the incidence of HPV among the young girls of age 15 to 19 is as a result of poor knowledge or understanding of the vaccine. Therefore, the knowledge gap in HPV vaccines plays a critical role or is an essential factor influencing the uptake of the vaccine (Rosen et al., 2018). But some analyst also argue that, difficulty to accepting a change accounts for the low uptake of the vaccines especially among vulnerable population (Choi et al., 2016; Kreimer et al., 2020).

Notwithstanding such argument, the literature suggest parental consent as an important factor that can influence the adolescent acceptance and uptake of HPV vaccine (Hoshino *et al.*, 2006). It is established that, the fear of side effects of vaccines may make the adolescent entertain fear of taking the vaccines. This could be explained to these young ones by their parents if parents are really showing concern of their children healthy reproductive life (Haynes *et al.*, 2006). However, in some low and middle income areas, parents are skeptical in discussing matters related to sex with their children especially females (Kanj *et al.*, 2006). This affects their understanding and the courage to take the vaccine for safety (Geels *et al*., 2006). But some studies blames such attitude of some parents and attributes it to parents' poor understanding of the vaccines and reproductive health in general (Dulude et al., 2006). Additionally, the situation is also explained by others as the lack of exposure of parents to modern and technological means of healthy life style and reproductive health interventions (Gabet et al., 2006).

Adding to this, Kieback and Mu, (2006) reports that, the lack of or poor knowledge of changing global health environment and emerging diseases underpins the reasons for some parents or care-takers of adolescents not consenting to the uptake of the vaccines. The introduction of the national

HPV vaccination programme for instance in the United States have being successful because of the role of parents in seeking for a healthy reproductive life of their wards (Etherington et al., 2006). The introduction of school-based vaccinations in other nations including Australia, the UK, and Denmark informed teachers and students on the need and safety of the vaccines, thus enhancing its uptake (Cicala *et al.*, 2006). While in Malaysia, the goal of include HPV vaccine in the child immunization programme for 12-year-old females was to ensure that, the adolescent girl grows healthy (Coleman et al., 2006). But reproductive health policy analyst are equally of the view that, invariably the efforts to increase the uptake of this vaccine, some population group and countries are still struggling and grappling to accept and receive the vaccine as a protective measure of immunization against possible contraction of HPV (Ramanathan et al., 2006).

According to certain research from underdeveloped nations, young women between the ages of 19 and 26 have the lowest vaccination rates because they refuse to obtain at least one dose of the HPV vaccine (Munakata et al., 2006). Despite being included in the national vaccination programme in Malaysia since 2010, the HPV vaccine's uptake in the nation has been hampered by the fact that only a small percentage of the population is aware of it (Fang et al., 2006). Only 3.6% of the participants in a research among university students in Malaysia were immunised against cervical cancer, demonstrating the country's inadequate vaccination practices (Shivachandra *et al.*, 2006). The Pap smear screening programme was established in Malaysia in 1969; nevertheless, only 850,000 of the 5.2 million eligible women have had cervical cancer screening tests (Rajendran & Nagy, 2006). The fact that cervical cancer is the second most common malignancy among women between the ages of 15 and 44, and because PAP smear screening and HPV vaccination rates are low among Malaysian women, there is a significant likelihood that they may develop the disease (Bruni *et al.*, 2006).

The discrepancies are probably going to get worse among low-income, underprivileged communities that have historically been marginalized and have less access to preventative and necessary treatment (Howe *et al.*, 2015). The HPV virus can cause cervical cancer when it is contracted through a number of well-known risk factors, including early sexual activity, poor genital cleanliness, many sexual partners, multiple pregnancies, and high parity (Moriuchi et al., 2006). Additionally, HR-HPV types 16 and 18 are present in more than 80% of Indian women who have cervical cancer (Ros et al., 2006). Early initiation into sexual activity and the acceptance of polygamy are factors that contribute to numerous partners, early pregnancy, and multiple pregnancies (Machado et al., 2006). Childbirth takes place at home in unsanitary circumstances without nursing or medical assistance. Low-income individuals are more susceptible to a number of chronic and infectious illnesses, including HPV and cancer, due to common factors such hunger, poor hygiene, lack of education, low economic position, ignorance, and lack of contemporary medical facilities (Balakrishnan & Milavetz, 2006).

2.6 Gap in the Literature

Although there is colossal literature on HPV, its prevalence, effect, and prevention or management practices, most of those studies are confined in advance nations and urban centers rather peri-urban and deprived communities of low- and middle-income settings like Ghana. Due to this, information on the earliest age at which teenage females are HPV-positive and the precise age at which the initial peak of the infection is seen is rare. This study aims to fill, these gaps and expose the issues of HPV to the general public.

CHAPTER THREE

METHODOLOGY

3.1 Introduction

This part outlines the procedure through which the study was carried out. The chapter comprises of the study area which explains key indicators pertaining to the research and how it impacted on the HPV, cervical cancer and the uptake of vaccine against HPV. It also includes the study population, sampling design, and sampling size, sampling procedure, criteria for selecting participants, variables, data collection, and analysis technique and quality issues in data management.

3.1 Study Area

As one of Ghana's 261 Metropolitan, Municipal and District Assemblies (MMDAs), the Nkoranza South Municipal is a local government entity. It belongs to the Bono East Region's eleven (11) Municipalities and Districts, with Nkoranza serving as its capital (Municipal Planning Coordinating Unit, 2020). The Nkoranza South district was upgraded to Municipal Status in May, 2012 with LI 2089 provided in section 5 of the Local Government Act 1993 (Act 462). The Municipality lies within the wet semi-equatorial region with a mean annual rainfall from 800-1200mm (Ghana Statistical Service, 2010). In addition to the Nkoranza North District to the north, Techiman Municipal to the west, Offinso North and Ejura Sekyeredumase Municipal (both in Ashanti Region) to the south and south-east, the Municipality also has borders with these other Ashanti Region municipalities. There are around 126 towns there, each of which is traditionally led by a single supreme chief, over a total area of 913 km2. 114 642 people call the Municipality home, including 57 112 men and 57 530 women, according to the 2021 Population and Housing Census (Municipal Planning Coordinating Unit, 2020). The General Fertility Rate (GFR) for the

area is 121.1 births per 1000 women aged 15 to 49, which ranks second highest nationally. A little over half (42%) of people aged 12 and older are married, 37.3% have never been married, 10.0% are in consensual relationships, 4.4 percent are widowed, 3.9% are divorcing, and 2.2% are living apart. 72.5 percent of people over the age of 11 are literate, compared to 27.5 percent who are not. 20 782 homes, or 3.6% of the total number of residences in the Brong Ahafo Region, are in the Nkoranza Municipality. 5.8 people on average live in each home. However, for the four youngest age groups 0-4 years 15-19 years, the proportion of the male population each of these age groups is higher than that in the corresponding female age groups (Ghana Statistical Service, 2010).

3.2 Study Population

The population of this study comprised of in school and out of school female adolescents' age 12-19 years living within the Nkoranza South Municipality. The female adolescents were targeted for this study because HPV is mostly associated with cervical cancer which is a female prone health condition (Rosberger et al., 2022). Aside that, the adolescents are those within the sexually active age and a study like this to unravel the adolescent understanding or knowledge on the condition was critical.

3.3 Study Design

A cross-sectional design with quantitative approach was used for this study. The quantitative approach was used to obtain data for the study. Furthermore, the 'what' questions on the adolescent's knowledge on HPV, cervical cancer and vaccines for HPV was obtained through dual methodological approach or mode of data collection. This dual approach to data collection is the quantitative and qualitative research methods. The reason is that descriptive statistics and the lived experiences of the participants on HPV, cervical cancer and HPV vaccines is needed for this study.

It leads to clearer understanding of adolescents' knowledge level of the participants on the causes of HPV, its implication for cervical cancer and the possibility of HPV vaccines as a preventive measure.

3.4 Sample size determination

According to Sekeran (2000) a sample is "a subset of a population being studied." The sample size of the study is three hundred and forty-one (341) respondents based on the sample size determination table by Krejcie and Morgan (1970). This is because available statistics at the Nkoranza Municipal Assembly indicates an estimated adolescent population of 3000.

N	*S*	*N*	*S*	*N*	*S*
10	10	220	140	1200	291
15	14	230	144	1300	297
20	19	240	148	1400	302
25	24	250	152	1500	306
30	28	260	155	1600	310
35	32	270	159	1700	313
40	36	280	162	1800	317
45	40	290	165	1900	320
50	44	300	169	2000	322
55	48	320	175	2200	327
60	52	340	181	2400	331
65	56	360	186	2600	335
70	59	380	191	2800	338
75	63	400	196	3000	341
80	66	420	201	3500	346
85	70	440	205	4000	351
90	73	460	210	4500	354
95	76	480	214	5000	357
100	80	500	217	6000	361
110	86	550	226	7000	364
120	92	600	234	8000	367
130	97	650	242	9000	368
140	103	700	248	10000	370
150	108	750	254	15000	375
160	113	800	260	20000	377
170	118	850	265	30000	379
180	123	900	269	40000	380
190	127	950	274	50000	381
200	132	1000	278	75000	382
210	136	1100	285	1000000	384

Note.—*N* is population size. *S* is sample size.

Source: Krejcie & Morgan, 1970

Following the table above, the sample size of the study was 341. Including a 5% contingency to make room for fallout, 358 adolescents were sampled for the study. However, 331participated in the study which is about 97.1% response rate. Some individuals declined to participate in the study due to lack of interest, and time constraints. Response rate means the number of people who were able to fill or completed the questionnaire. This fallout could be attributed to the fact that schools were in session and the municipality being an agricultural zone, most of the adolescents follow their parents to farm.

3.5 Sampling Technique

Sampling techniques refer to the methods used to select a portion, or sample, from a larger population, as described by Boateng (2014). In this study, the multistage random sampling technique was applied to recruit participants. Multistage sampling is a probability sampling method, which involves selecting a sample from different groups or clusters within a population (Creswell & Creswell, 2018). This technique was chosen because of constraints related to limited resources and time, which made it necessary to streamline the process of selecting participants.

The study was conducted in the Nkoranza Municipality, which is naturally divided into six distinct clusters or zones. Out of these six clusters, four were randomly chosen to participate in the research. The random selection of these zones was essential to maintain the probability aspect of the sampling technique, ensuring that each cluster had a fair chance of being included in the study.

Once the four clusters were selected, further randomization was conducted within them. Schools and households were randomly chosen from each of these clusters to serve as the primary sources of participants. To ensure fairness and eliminate bias, the simple random sampling technique was

used to recruit individuals from these schools and households. This method ensured that every individual within the population had an equal chance of being selected for the study.

For the actual selection of participants, a straightforward and transparent process was employed. Pieces of paper labeled "YES" and "NO" were placed in a container and presented to the eligible participants. Those who drew a paper marked "YES" were invited to participate in the study after providing their consent. This approach not only guaranteed randomness but also maintained ethical standards by seeking informed consent before enrolling participants. The process continued until the required sample size was met, ensuring a fair and unbiased recruitment of participants.

3.5.1 Sampling Procedure

3.5.1.0 Criteria for selecting study participant

The criteria for selecting the study participants involves identification and selection of appropriate subjects.

3.5.1.1 Study inclusion criteria

The study inclusion criteria involved those who were included in the study. Therefore, those included in this study were girls within ages 12-19 who have stayed in the Nkoranza Municipality for at least one year.

3.5.1.1 Study exclusion criteria

Adolescents who have not resided in the municipality for at least one year would be excluded, as they may not have sufficient exposure to the local conditions relevant to the study.

3.6 Study variables

The dependent variable for this study was HPV vaccine uptake. The independent variable were the socio-demographic characteristics (age, educational level, religion, residence, sexual experiences and parent educational level), knowledge, prevalence, coverage, and factors that influence the HPV vaccine uptake among the adolescents.

3.7 Data collection Procedure/Technique

Data collection is the act of acquiring and analysing information on relevant variables in a predetermined, methodical way so that one may respond to specified research questions, test hypotheses, and assess results. Before the start of data collection, the semi-structured questionnaire was first pre-tested with fifteen (15) female adolescents in Bono East Region. This was to identify errors and streamlined the instrument for data collection. After the pretesting and finalization of the tool, the principal investigator conducted training for the research assistance on the ethical issues during data collection, adherence to the study protocol, and appropriate presentation of questions to participants. This ensured that quality information was obtained for the study.

The questionnaire was printed in sufficient quantities to cover the sample size. The data collection process began by distributing these printed questionnaires to the selected participants. Distribution occurred in the following manner:

Schools: For girls attending school, questionnaires were handed out during a scheduled class session or at a meeting organized with the school authorities. This ensured efficient and systematic distribution within an environment where the participants were easily accessible.

Households: For girls who were not in school, the questionnaires were delivered to their households. This involved the use of field assistants who went door-to-door in the selected clusters to ensure every eligible respondent received the questionnaire.

Before participants completed the questionnaire, they were provided with a brief explanation about the study's objectives, their role, and how to answer the questions. If needed, field assistants provided further clarifications on certain items in the questionnaire. Importantly, informed consent was obtained from the respondents or their guardians before they proceeded.

Respondents completed the questionnaire in their own time, or in some cases, immediately after receiving it. Field assistants remained available to assist those who needed help with understanding certain questions, ensuring that participants could provide accurate responses.Once the participants had completed the questionnaires, they were collected either on the same day. Field assistants ensured that all completed questionnaires were collected promptly.

3.8 Data Collection tools

A semi-structured questionnaire was used to gather data for the study. The semi-structured questionnaire was made up of close and open-ended questions that are designed in line with the study objectives and questions. The close ended questions allowed participants to select from a list of options that may apply to them. This strategy makes analysis simple because the replies are concise and to the point. Whiles the open-ended questions allow the participants to shared more experiences regarding the topic. This gave an opportunity for investigator discover the participants' knowledge level on the subject under investigation through the reasons and feelings they expressed especially pertaining to their knowledge on HPV, causes and effects as well as rationale for taken or not taken the vaccines. One critical merit of using the semi-structured

questionnaires is that, the quantitative defects will be complemented by the qualitative and visa-visa. This addresses the lapses in each method or tool of data collection.

The questionnaire was structured into five sections. The first section was collected data on the respondents' socio-demographic characteristics. The section covers the prevalence of HPV among the female adolescent, the third section comprised of knowledge on HPV among the respondents, the fourth section included the coverage of HPV vaccine uptake among female adolescents, and last the fifth section which dealt with the factors influencing HPV vaccine uptake among female adolescents.

3.9 Data analysis technique

The data was analyzed through univariate analysis to investigate if the independent and dependent variables have a connection. Firstly, bivariate relationship using Pearson's chi-square test or Fisher's exact test for categorical variables was tested, and Students' t-test for continuous variables with the normal distribution and Kruskal Wallis test for continuous variables with non-normal distribution were also tested. Furthermore, the binary logistics model was tested with all factors which demonstrated a connection to a p-value of 0.05 or less in the bivariable analysis. A p-value of 0.05 was taken as statistically significant and the uptake of HPV vaccine was compared among the respondents.

3.9.1 Assessment of knowledge of respondents on HPV infection

The study used 20 items to assess the respondents' knowledge level on HPV infection. Each item was positively awarded. The maximum knowledge score was 20 points. A respondent who got a question correct, received one (1) point. However, a respondent who got a question wrong, received zero (0) point. The knowledge level was categorized into two levels. The first level was

'Poor knowledge' thus if a respondent scored 50% and blow (≤ 10 points). Nonetheless, the second level was 'Good Knowledge' thus if a respondent scored 51% and above (11 – 20 points).

3.10 Data handling and quality control

Before distributing the questionnaire, it underwent a pilot test with a small sample of respondents outside the study's target population. This helped identify any issues in clarity, wording, or design that needed to be refined to ensure the questionnaire effectively gathered the intended data. In doing so, common errors identified during the pre-testing was corrected and the instrument finalized before data collection. At the end of each day, the data gathered from the completed questionnaires was carefully vetted or reviewed by the principal researcher to ensure that the responses aligned with the questions asked. This process involved cross-checking the answers for completeness, consistency, and clarity. Any ambiguous or incomplete responses were noted, and efforts were made to follow up with the respondents where possible to clarify their answers. This daily review ensured that any errors or discrepancies were addressed promptly, maintaining the integrity and accuracy of the data collection process. This was to avoid daily errors in data collection and that data respond to appropriate research questions and purpose of the research.

3.11 Ethical Consideration

Ethical approval with reference number CHRPE/AP/367/22 was obtained from Kwame Nkrumah University of Science and Technology, Kumasi, ethics review committee. This approval letter was submitted to the Nkoranza South Municipal for permission or authorization letter to conduct the interviews. The letter together with the informed consent was presented to each participant of the study for approval before an interview was conducted. As part of the consent processes, the opinions, rights, and values of the participants was respected, and the information shared quite confidential just for academic purpose. Beyond this, the personal particulars or identifiers and

names of the participants were not collected. Therefore, it was made known to participants that their participation is voluntary, thus they could stop the interview at any time.

CHAPTER FOUR

FINDINGS

4.1 Chapter Overview

This chapter presents findings of the study. The findings are presented under key thematic areas including the socio-demographic features of the respondents of the study, the respondent's knowledge on HPV, prevalence of HPV vaccines uptake among adolescent and the factors influencing HPV vaccine uptake among adolescents.

4.2 Socio-demographic characteristics of the respondents

A sample size of 341 female adolescents were selected for the study. However, about 331 (97.1%) of the sample participated in the study. The result of the study revealed that 131 (39.6%) of the respondents were within age 15 to 17 and 18-19 years and constituted 113 (34.1%) of the study population. It was revealed that 138 (41.7%) of the respondents had Senior High School education with those without any form of formal education constituting 14 (4.2%) of the study participants. Also, approximately 130 (39.3%) of the respondents attend Pentecostal Churches, 86 (26.0%), Catholic 86 (26.0%). On tribal lines, the majority of the respondents, 239 (72.2%) were Akan. Furthermore, 123 (37.2%) of the respondents stay in urban area. The results have also showed that approximately 99 (29.9%), and 82 (24.8%) of the respondents' mothers and fathers had Junior High School education. The table 4.1a below presents more information on the socio-demographics features of the respondents.

Table 4. 1a: Socio-demographic characteristics of respondents

Variable	Frequency (n)	Percentage (%)
Age (years)		
13 – 14	87	26.3
15 – 17	131	39.6
18 – 19	113	34.1
Total	331	100.0
Level of education		
No education	14	4.2
Primary	22	6.6
Junior High School (JHS)	152	45.6
Senior High School (SHS)	138	41.7
Tertiary	5	1.5
Total	331	100.0
Religion		
Catholic	86	26.0
Pentecostal churches	130	39.3
Muslim	38	11.5
Traditionalist	9	2.7
Charismatic churches	33	10.0
Adventists	16	4.8
Orthodox churches	18	5.4
None	1	0.3
Total	331	100.0
Ethnic group		
Akan	239	72.2
Dagare	39	11.8
Hausa	4	1.2
Sesala	3	0.9
Komkomba	7	2.1
Ga-adangbe	1	0.3
Ewe	4	1.2
Mole Dagbani	9	2.7
Mossi	2	0.6
Frafra	12	3.6
Others (Kasem, Bimoba, Gruse, Gruma)	11	3.3
Total	331	100.0
Area of residence		
Rural area	118	35.6
Peri-urban area	90	27.2
Urban area	123	37.2
Total	331	100.0

Table 4. 2b: Socio-demographic characteristics of respondents continued

Mother's education level		
No formal education	79	23.9
Primary	51	15.4
JHS	99	29.9
SHS	64	19.3
Tertiary	38	11.5
Total	331	100.0
Father's education level		
No formal education	75	22.7
Primary	24	7.3
JHS	92	27.8
SHS	58	17.5
Tertiary	82	24.8
Total	331	100.0

Source: Field survey 2022.

Table 4.1b shows the sexual experiences of respondents. More than half of the respondents 182 (55.0%) and 157 (47.4%) were in relationship with the opposite sex and have had sexual intercourse respectively. Among those who have had sexual intercourse at the time of this study, 79 (50.3%) of them initiated sex at the age of 16 years and above. Majority of these had 1 to 5 times of sexual intercourses. The result indicated that 112 (71.3%) of those in relationship had 1 partner. It was also revealed that approximately 117 (74.5%) of the respondents who had sexual intercourse at the time of this study, their boyfriends do not use condom during the sexual intercourse.

Table 4. 2: Sexual experiences of respondents

Variable	Frequency (n)	Percentage (%)
Relationship status		
Yes	182	55.0
No	149	45.0
Total	331	100.0
Have you had sexual intercourse before?		
Yes	157	47.4
No	174	52.6
Total	331	100.0
Age at first sexual intercourse		
≤ 10	3	1.9
11 – 15	75	47.8
≥ 16	79	50.3
Total	157	100.0
Number of sexual intercourses		
1 – 5 times	87	55.4
5 – 10 times	46	29.3
≥ 11	16	10.2
Don't know	8	5.1
Total	157	100.0
How many sexual partners do you have?		
1	112	71.3
≥ 2	45	28.7
Total	157	100.0
Do your boyfriend use condom during sexual intercourse?		
Yes	40	25.5
No	117	74.5
Total	157	100.0

Source: Field survey 2022.

4.3 Responses of adolescents about Human *Papillomavirus* (HPV)

The result of the study has showed that, 88(26.6%) of the respondents were aware of human papillomavirus, 53(60.2%) of the respondents stated that their source of information on HPV was from health workers whilst 62(70.5%) of the respondents indicated that they know the mode of transmission of HPV. It was stated by 59(95.2%) of the respondents that sexual intercourse is one of the modes of transmission of HPV and 38(43.2%) of the respondents indicated that females are

more prone to HPV infection. It was stated by 46(52.3%) of the respondents that they know the symptoms of HPV infection and 34(38.6%) mentioned that, everyone infected with HPV exhibits the symptoms. Furthermore, 33(38.4%) of the respondents indicated vaginal itching as one of the signs of a person infected person with HPV. Sexual promiscuity was also stated by 35(40.7%) of the respondents as means of contracting HPV. The results further showed that, the majority of the respondents, 223(67.4%) have ever heard about cervical cancer. It was also indicated by 52(48.1%) that, HPV is the cause of cervical cancer. However, less than half of the respondents, 53(49.1%) of the respondents indicated that cervical cancer can be prevented. The table 4.3 below shows details.

Table 4. 3a: Responses of the adolescents on HPV

Variable	Frequency (n)	Percentage (%)
Awareness of HPV		
Yes	88	26.6
No	243	73.4
Total	331	100.0
Source of information		
Health workers	53	60.2
Teachers	3	3.4
Parents	2	2.3
Friends	5	5.7
TV	7	8.0
Radio	7	8.0
Internet	11	12.5
Total	88	100.0
Awareness of mode of transmission		
Yes	62	70.5
No	26	29.5
Total	88	100.0
Known mode of transmission of HPV (Multiple response)		
Physical contact	9	14.5
Air droplet	1	1.6
Sexual intercourse	59	95.2
Persons at risk of HPV		
Male	3	3.4
Female	38	43.2

Both	36	40.9
I don't know	11	12.5
Total	88	100.0
Awareness of HPV infection		
Yes	46	52.3
No	42	47.7
Total	88	100.0
All persons with HPV exhibit the symptoms		
True	32	36.4
False	22	25.0
I don't know	34	38.6
Total	88	100.0
Known symptoms of HPV (Multiple response)		
Vaginal itching	33	38.4
Warts	31	36.0
Bleeding per vaginum	24	27.9
Weight loss	3	3.5
I don't know	32	37.2

Table 4. 4b: Responses of the adolescents on HPV continued

Means of contracting HPV (Multiple response)		
Sexual promiscuity	35	40.7
Early age onset of sexual intercourse	43	50.0
History of STIs	9	10.5
Genital herpes	8	9.3
I don't know	24	27.9
Awareness of Cervical Cancer		
Yes	108	32.6
No	223	67.4
Total	331	100.0
Causes of cervical cancer?		
HPV	52	48.1
HIV	11	10.2
Malaria	3	2.8
I don't know	42	38.9
Total	108	100.0
Can cervical cancer be prevented		
Yes	53	49.1
No	21	19.4
I don't know	34	31.5
Total	108	100.0

4.3.1 Knowledge level of respondents about HPV infection

The finding of the study revealed that 304(91.8%) of the respondents had poor knowledge about HPV infection. Nevertheless, 27(8.2%) of the respondents had good knowledge about HPV infection (Table 4.4).

Table 4. 5: Knowledge level of respondents about HPV

Scores (Points)	Rating	Frequency (n)	Percentage (%)
0 – 10	Poor knowledge	304	91.8
11 – 20	Good knowledge	27	8.2
Total		331	100.0

4.3.2 Distribution of knowledge level HPV infection according respondents' characteristics

The study discovered that adolescents aged 12 to 14, (100.0%) reported a higher proportion of poor knowledge as compared to their counterparts. However, adolescents aged 18 to 19, (15.9%) reported a higher proportion of good knowledge as compared to their counterparts. The result has showed a statistically significant association between age and knowledge level about HPV infection. Moreover, respondents with Junior High School (98.0%) reported a higher proportion of poor knowledge as compared to their counterparts. However, respondents with tertiary education (40.0%) reported a higher proportion of good knowledge. The result showed a statistically significant association between respondents' educational level and knowledge level about HPV infection. The result of the study indicated that respondents who were not in relationship (98.0%) reported a higher proportion of poor knowledge as compared to respondents in relationship. Nonetheless, respondents in relationship reported (13.4%) a higher proportion of good knowledge as compared to respondents who are not in relationship. The result found a statistically significant association between relationship status of respondents and knowledge level

about HPV infection. It was discovered that respondents who have not had sexual intercourse before (96.6%) reported poor knowledge level as compared to those who have had sexual intercourse before. However, respondents who have had sexual intercourse before (13.4%) reported a higher percentage of good knowledge as compared to those who have not had sexual intercourse before. The result showed a statistically significant association between the status of sexual intercourse among respondents and knowledge level about HPV infection (Table 4.5).

Table 4. 6a: Distribution of knowledge level according respondents' characteristics

Variable	Knowledge level		
	Poor n (%)	Good n (%)	Chi-square (P-value)
Age (years)			
12 – 14	87(100.0)	0(0.0)	
15 – 17	122(93.1)	9(6.9)	
18 – 19	95(84.1)	18(15.9)	
Level of education			
No education	12(85.7)	2(14.3)	**24.575**
Primary	22(100.0)	0(0.0)	**(< 0.001)**
Junior High School (JHS)	149(98.0)	3(2.0)	
Senior High School (SHS)	118(85.5)	20(14.5)	
Tertiary	3(60.0)	2(40.0)	
Religion			
Catholic	81(94.2)	5(5.8)	7.964
Pentecostal churches	114(87.7)	16(12.3)	(0.336)
Muslim	34(89.5)	4(10.5)	
Traditionalist	9(100.0)	0(0.0)	
Charismatic churches	33(100.0)	0(0.0)	
Adventists	15(93.8)	1(6.3)	
Orthodox churches	17(94.4)	1(5.6)	
None	1(100.0)	0(0.0)	
Area of residence			
Rural area	108(91.5)	10(8.5)	
Peri-urban area	81(90.0)	9(10.0)	
Urban area	115(93.5)	8(6.5)	
Mother's education level			
No formal education	73(92.4)	6(7.6)	8.459
Primary	46(90.2)	5(9.8)	(0.076)
JHS	96(97.0)	3(3.0)	
SHS	54(84.4)	10(15.6)	
Tertiary	35(92.1)	3(7.9)	

Father's education level			
No formal education	67(89.3)	8(10.7)	3.313
Primary	23(95.8)	1(4.2)	(0.507)
JHS	87(94.6)	5(5.4)	
SHS	51(87.9)	7(12.1)	
Tertiary	76(92.7)	6(7.3)	

Table 4. 6b: Distribution of knowledge level according respondents' characteristics

Variable	**Knowledge level**		
	Poor	**Good**	**Chi-square**
	n (%)	**n (%)**	**(P-value)**
Relationship status			
Yes	158(86.8)	24(13.4)	**13.653**
No	146(98.0)	3(2.0)	**(< 0.001)**
Have you had sexual intercourse before?			
Yes	136(86.6)	21(13.4)	**10.857**
No	168(96.6)	6(3.4)	**(0.001)**

4.4 Prevalence of HPV among adolescent

The study found 8.5% (95% CI: 5.2% to 11.8%) prevalence rate of HPV infection among the respondents (Figure4.1). However, 91.5% (95% CI: 88.2% to 94.8%) of the respondents have never been diagnosed of HPV infection before. Among those who have ever been infected with HPV infection before, 12 (42.9%) of them indicated they were diagnosed 6 months ago. Moreover, 295 (89.1%) of the respondents stated that they do not know of anybody who have been diagnosed of HPV infection before. Among respondents who know of a person diagnosed of HPV infection, it was indicated by 15 (41.7%) of such people who were diagnosed 3 months ago (Table 4.6).

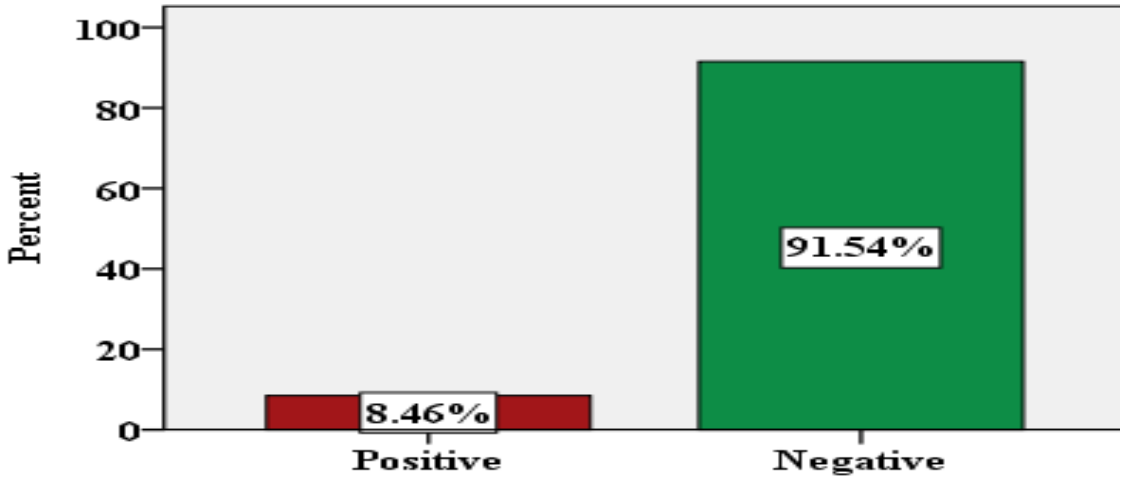

Figure 4.1: The prevalence of HPV among the respondents

Table 4. 6: The prevalence of HPV among the respondents

Variable	Frequency (n)	Percentage (%)
Ever been diagnosed of HPV infection		
Yes	28	8.5
No	303	91.5
Total	331	100.0
Period of HPV diagnosis		
3 months ago,	10	35.7
6 months ago,	12	42.9
More than 1 year	6	21.4
Total	28	100.0
Awareness of person diagnosed of HPV infection		
Yes	36	10.9
No	295	89.1
Total	331	100.0
Period of awareness of HPV diagnosis		
>3 months	15	41.7
>6 months	13	36.1
More than 1 year	8	22.2
Total	36	100.0

4.4.1 Distribution of prevalence of HPV according to respondents' characteristics

The result of the study found that respondents aged 18 to 19 (16.8%) reported a higher percentage of HPV infection as compared to their counterparts. However, respondents aged 12 to 14 (100.0%) reported a higher percentage of no HPV infection. The result found a statistically significant association between age of respondents and prevalence of HPV infection. Furthermore, it was discovered that respondents with no education (35.7%) reported a higher proportion of HPV infection as compared to their counterparts. However, respondents with JHS education (96.7%) reported a higher proportion of no HPV infection as compared to their counterparts. The result found a statistically significant association between respondents' educational level and prevalence of HPV infection. The result showed that respondents who stay in rural areas (1.6%) reported a higher proportion of HPV infection as compared to their counterparts. Nonetheless, respondents who stay in urban areas (95.1%) reported a higher proportion of no HPV infection as compared to their counterparts. The result found a statistically significant association between respondents' area of residence and prevalence of HPV infection.

The result showed that respondents who are in relationship (13.7%) reported a higher proportion of HPV infection as compared to their counterparts. However, respondents who are not in relationship (98.0%) reported a higher proportion of no HPV infection as compared to those who are not in relationship. The result found a statistically significant association between relationship status and prevalence of HPV infection. Again, respondents who have had sexual intercourse before (4.6%) reported a higher proportion of HPV infection as compared to those who have not. However, respondents who have not have sexual intercourse before (97.1%) reported a higher proportion of no HPV infection as compared to those who have had before. The result found a statistically significant association between status of sexual intercourse among respondents and

prevalence of HPV infection. It was also indicated that respondents whose father had no education reported a higher proportion of HPV infection as compared to their counterparts. However, respondents whose fathers had tertiary education reported a higher proportion of no HPV infection as compared to their counterparts. The result found a statistically significant association between respondents' father's education level and prevalence of HPV infection (Table 4. 7).

Table 4. 7: Distribution of prevalence of HPV according to respondents' characteristics

Variable	Prevalence of HPV infection		
	Positive n (%)	Negative n (%)	Chi-square (P-value)
Age (years)			
12 – 14	0(0.0)	87(100.0)	**18.653**
15 – 17	9(6.9)	122(93.1)	**(< 0.001)**
18 – 19	19(16.8)	94(83.2)	
Level of education			
No education	5(35.7)	9(64.3)	**22.228**
Primary	1(4.5)	21(95.5)	**(< 0.001)**
Junior High School (JHS)	5(3.3)	147(96.7)	
Senior High School (SHS)	17(12.3)	121(87.7)	
Tertiary	0(0.0)	5(100.0)	
Religion			
Catholic	6(7.0)	80(93.0)	7.366
Pentecostal churches	13(10.0)	117(90.0)	(0.392)
Muslim	5(13.2)	33(86.8)	
Traditionalist	0(0.0)	9(100.0)	
Charismatic churches	0(0.0)	33(100.0)	
Adventists	1(6.3)	15(93.8)	
Orthodox churches	3(16.7)	15(83.3)	
None	0(0.0)	1(100.0)	
Area of residence			
Rural area	16(13.6)	102(86.4)	**6.374**
Peri-urban area	6(6.7)	84(93.3)	**(0.041)**
Urban area	6(4.9)	117(95.1)	
Relationship status			
Yes	25(13.7)	157(86.3)	**14.540**
No	3(2.0)	146(98.0)	**(< 0.001)**
Have you had sexual intercourse before?			
Yes	23(14.6)	134(85.4)	**14.780**
No	5(2.9)	169(97.1)	**(< 0.001)**
Mother's education level			
No formal education	10(12.7)	69(87.3)	4.843
Primary	4(7.8)	47(92.2)	(0.304)
JHS	4(4.0)	95(96.0)	
SHS	7(10.9)	57(89.1)	

Tertiary	3(7.9)	35(92.1)	
Father's education level			
No formal education	12(16.0)	63(84.0)	**12.581**
Primary	3(12.5)	21(87.5)	**(0.014)**
JHS	9(9.8)	83(90.2)	
SHS	3(5.2)	55(94.8)	
Tertiary	1(1.2)	81(98.8)	

4.5 Coverage of HPV vaccine uptake among adolescent

The result found that 57(17.2%) of the respondents know of a vaccine that can prevent HPV infection. Out of these 40(70.2%) of the respondents indicated they heard about the vaccine from health workers. The coverage of HPV vaccine uptake among the respondents was 2.4% (at 95% CI: 0.9% to 4.1%) (Figure 4). However, 97.6% (at 95% CI: 95.9% to 99.1%) of the respondents have not been vaccinated. It was revealed that 5(62.5%) of the respondents who have been vaccinated before were vaccinated 6 months ago. Moreover, 7(87.5%) of respondents reported that they completed the full course of the vaccination. It was also revealed that 182(56.3%) of the respondents who have not been vaccinated indicated that they are willing to be vaccinated (Table 4.8).

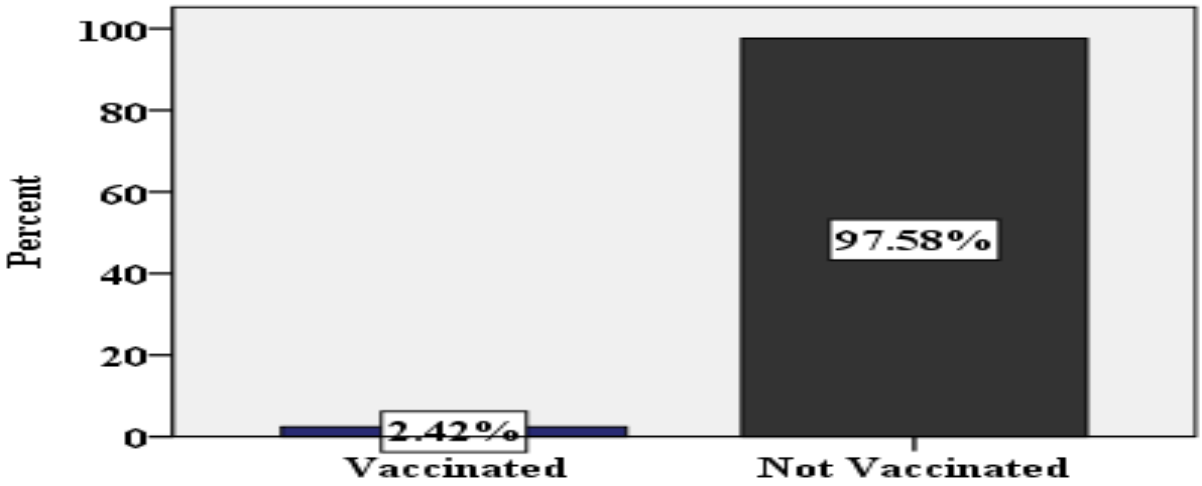

Figure 4. 1: Coverage of HPV vaccine uptake among adolescent

Table 4. 8: Coverage of HPV vaccine uptake among adolescent

Variable	Frequency (n)	Percentage (%)
Awareness of vaccine for prevention of HPV infection		
Yes	57	17.2
No	274	82.8
Total	331	100.0
Sources of information about HPV vaccines		
Health workers	40	70.2
Friends	3	5.3
Teachers	3	5.3
Parents	3	5.3
Radio	4	7.0
TV	2	3.5
Internet	2	3.5
Total	57	100.0
Ever received HPV vaccine		
Yes	8	2.4
No	323	97.6
Total	331	100.0
Period vaccinated with HP V vaccines		
6 months ago	5	62.5
Last five months	1	12.5
Last month	1	12.5
Last three years	1	12.5
Total	8	100.0
Completed HPV vaccinations?		
Yes	7	87.5
No	1	12.5
Total	8	100.0
Willingness to complete HPV vaccination		
Yes	182	56.3
No	141	43.7
Total	323	100.0

Source: Field survey 2022

4.5.1 Distribution of vaccine coverage according to respondents' characteristics

The result of the study revealed that respondents aged 18 to 19 years (7.1%) reported a higher proportion of HPV vaccine uptake as compared to their counterparts. However, respondents aged 12 to 14 years and 15 to 17 years (100.0%) equally reported higher proportion of not been vaccinated as compared to their counterparts. The result of the study discovered a statistically significant association between age of respondents and HPV vaccine uptake. Moreover, respondents who live rural area (5.1%) reported a higher proportion of HPV vaccine uptake as compared to their counterparts. However, respondents who live in peri-urban areas (1.6%) reported a higher proportion of not been vaccinated as compared to their counterparts. The result showed a statistically significant association between respondents' area of residence and HPV vaccine uptake. The result showed that respondents who have had sexual intercourse before (4.5%) reported a higher proportion of HPV vaccine uptake as compared to their counterpart. However, respondents who have not had sexual intercourse before (99.4%) reported a higher proportion of not been vaccinated. The result discovered a statistically significant association between respondents' status of sexual intercourse before and HPV vaccine uptake (Table 4.9).

Table 4.9: Distribution of vaccine coverage according to respondents' characteristics

Variable	Vaccinated n (%)	Not vaccinated n (%)	Chi-square (P-value)
Age (years)			
12 – 14	0(0.0)	87(100.0)	**15.816**
15 – 17	0(0.0)	131(100.0)	**(< 0.001)**
18 – 19	8(7.1)	105(92.9)	
Level of education			
No education	0(0.0)	14(100.0)	7.136
Primary	0(0.0)	22(100.0)	(0.129)
Junior High School (JHS)	1(0.7)	151(99.3)	
Senior High School (SHS)	7(5.1)	131(94.9)	
Tertiary	0(0.0)	5(100.0)	
Religion			
Catholic	1(1.2)	85(98.8)	4.332
Pentecostal churches	4(3.1)	126(96.9)	(0.741)
Muslim	2(5.3)	36(94.7)	
Traditionalist	0(0.0)	9(100.0)	
Charismatic churches	0(0.0)	33(100.0)	
Adventists	0(0.0)	16(100.0)	
Orthodox churches	1(5.6)	17(94.4)	
None	0(0.0)	1(100.0)	
Area of residence			
Rural area	6(5.1)	112(94.9)	**6.116**
Peri-urban area	0(0.0)	90(100.0)	**(0.047)**
Urban area	2(1.6)	121(98.4)	
Relationship status			
Yes	7(3.8)	175(96.2)	3.502
No	1(0.7)	148(99.3)	(0.061)
Ever had sexual intercourse			
Yes	7(4.5)	150(95.5)	**5.279**
No	1(0.6)	173(99.4)	**(0.022)**
Mother's education level			
No formal education	2(2.5)	77(97.5)	5.808
Primary	1(2.0)	50(98.0)	(0.214)
JHS	1(2.0)	98(99.0)	
SHS	4(6.3)	60(93.8)	
Tertiary	0(0.0)	38(100.0)	
Father's education level			
No formal education	1(1.3)	74(98.7)	4.718
Primary	2(8.3)	22(91.7)	(0.317)
JHS	2(2.2)	90(97.8)	
SHS	2(3.4)	56(96.6)	
Tertiary	1(1.2)	81(98.8)	

4.6 Factors influencing HPV vaccine uptake among adolescents

The result of the study discovered that 239(72.2%) of the respondents stated that they will need their parents' approval before taking the HPV vaccine. Out of these, 98(41.0%) of the respondents stated that their parents are their care taker. Among respondents who do not seek approval from their parents, 23(25.0%) of them indicated that they are mature to make their own decision. Furthermore, 130(39.3%) of the respondents indicated that apart from parental consent, there are other reasons that may prevent them from taking HPV vaccine. Out these, 33(25.4%) of them stated that they do not know where to get the HPV vaccine. The result found that the majority of the respondents 287(86.7%) have never searched for information on HPV/cervical cancer on their own before. Out of these, 196(68.3%) of them said they have never heard about at least one or both before. It was stated by 94(28.4%) of the respondents that they do not know where to get vaccinated with HPV vaccine. Table 4.10 contains more information.

Table 4. 10: Factors influencing HPV vaccine uptake among adolescents

Variable	Frequency (n)	Percentage (%)
Parental consent before HPV Vaccination		
Yes	239	72.2
No	92	27.8
Total	331	100.0
Reasons for parental consent		
I need their consent/permission in decision making	82	34.3
For more information and understanding	20	8.4
They are my caretakers	98	41.0
Also, for their safety	1	0.4
To avoid transmission	2	0.8
Fear and side effects of the vaccine issues	20	8.4
To avoid trouble from them	5	2.1
For them to know the reason why I want to be vaccinated/ the kind of vaccine I am about to take	7	2.9
They would pay the bills	4	1.7
Total	239	100.0
Reasons for no parental consent		
I am mature to make my own decision	23	25.0

I have no parents	14	15.2
I don't stay with my parents	14	15.2
My parents do not know that I am dating	5	5.4
No reason	11	12.0
I don't have the disease	2	2.2
Haven't had sex before	7	7.6
It is my life and I am responsible for it.	6	6.5
They know nothing about health education	7	7.6
They would resist me from taking the vaccine	3	3.3
Total	92	100.0
Other reasons for non-uptake of HPV?		
Yes	130	39.3
No	201	60.7
Total	331	100.0
Other reasons		
Not sexually active	16	12.3
Too expensive	13	10.0
Already infected with HPV	2	1.5
Don't know where to get the vaccine	33	25.4
Not sure about the safety of the vaccine	15	11.5
Need more information about the vaccine	47	36.2
My culture/religion is against it	4	3.1
Total	130	100.0

Self-seeking for information on HPV/Cervical cancer		
Yes	44	13.3
No	287	86.7
Total	331	100.0
Reasons for not seeking for information on HPV/Cervical cancer		
never heard about at least one or both before until today	196	68.3
Don't have phone	37	12.9
Lack of ladies talk	4	1.4
Never taken it seriously	33	11.5
Can't read	7	2.4
I don't want to have sexual intercourse with anyone	1	0.3
Just got to know after diagnosis	5	1.7
Don't need it	2	0.7
Don't know where to get it	2	0.7
Total	287	100.0
Awareness of where to get HPV Vaccinations?		
Yes	94	28.4
No	237	71.6
Total	331	100.0
Known Vaccination centres		

Hospital	94	100.0

4.7 Binary logistics regression analysis of coverage of HPV among respondents' characteristics

Binary logistic regression analysis was employed to further examine the relationship between participants' characteristics and the coverage of HPV vaccine. The result of the study showed that respondents aged 12 to 14 years were 17.6 times more likely to be vaccinated with HPV as compared to respondents aged 18 to 19 years. However, there was no statistically significant association between respondent aged 12 to 14 years and uptake of HPV vaccines. Furthermore, adolescents who live in rural areas were -0.8 times less to uptake the HPV vaccines as compared to adolescents who live in urban areas. The result showed no statistically significant association between adolescents who live in rural areas and uptake of HPV vaccine. It was discovered that adolescents who live in peri-urban areas were 17.3 times more likely to uptake the HPV vaccines as compared to adolescents who live urban areas. There was no statistically significant relationship between adolescents who live in peri-urban areas and HPV vaccine uptake. Lastly, the result showed that adolescents who have had sexual intercourse before were -1.1 times less likely to uptake HPV vaccine as compared to adolescents who have not had sexual intercourse before. The result showed no statistically significant association between adolescents who have had sexual intercourse before and the uptake of HPV vaccines. Table 4.11 contains more information.

Table 4. 11: Binary logistics regression analysis of coverage of HPV among respondents' characteristics

Variable	B	P-value
Age (years)		
12 – 14	17.627	0.996
15 – 17	18.371	0.996
18 – 19	Reference	
Residence		
Rural area	-0.803	0.348
Peri-urban area	17.326	0.996
Urban area	Reference	
Ever had sexual intercourse		
Yes	-1.054	0.339
No	Reference	

CHAPTER FIVE

DISCUSSION

5.1 Introduction

This chapter discusses the key findings of the study. The discussions are presented on socio-demographic factors of the respondents including their knowledge on HPV, prevalence of HPV vaccines uptake among adolescent. Factors influencing HPV vaccine uptake among adolescents. Recommendations are made to address the problem of the knowledge on HPV infection and HPV vaccine.

5.2 Socio-demographic characteristics of the respondents

The age group of 10-19 is the adolescent stage of life course which is among the most critical for human development, yet the most poorly understood (WHO, 2023). It is therefore not surprising that the dominant HPV infected rate (8.46%) in this study was among the respondents who were in the age group of 14-19. Baslow et al, (2017) affirmed that HPV infection rates are highest in adolescent population with cumulative prevalent rate as high as 82%. This trend indicates that early sexual activity among the adolescents can be very detrimental to their development as they stand a higher risk for being HPV infected (Cardoso & Valera, 2006, Favero & Sanchez, 2006, Jose, et al. 2006). This is because their reproductive organs and health can easily be affected either by disease condition or slow down their rate of healthy growth (WHO, 2023). Therefore, having more than half of the respondents 174 (52.6%) having early sexual intercourse can be worrisome. Because most of these adolescents are senior high school students with limited knowledge on healthy sexual activities and protective measures against STI's and pregnancy. Durowade, et al, (2017) affirmed the seriousness of early sex life of adolescents and their limited knowledge in

HPV by stating that “the high prevalence of early sexual exposure among the students is a worrisome trend.

This limitation in knowledge can lead to some of these adolescents have increase chance of HPV infection with its possible ripple effects as school dropout and the inability to give birth in the future. The early sexual exposure among the adolescents needs to be curtailed. This necessitates that secondary school curricula include a successful sex education programme (Boyles et al, 2022). This study is timely to help educate the adolescent prevent harmful impacts on their health and remind parents of their moral obligation to teach their kids about the risks of early sex and to be watchful of the friends their kids hang out with. The tendency must be stopped by conducting several cross- and intra-sectoral actions (Durowade, et al, 2017).

5.3 Knowledge level of respondents about HPV infection

Only 26% of the respondents in this survey reported having heard of the HPV infection. Only 17% were aware of the HPV vaccine, indicating that the adolescent females in Ghana had little understanding about HPV and HPV immunizations. The poor knowledge of the female adolescents about HPV infection and HPV vaccinations can affect their vaccine uptake and may increase the tendency of engaging in unhealthy and unprotected sexual activities, thus exposing them to the risk of sex related diseases (Kruse et al., 2020). This is in line with the results of the 14 investigations done by Zurales et al., in 10 Sub-Saharan African nations in 2023, which revealed that only 26% of the respondents were aware of the HPV infection and 15% were aware of the HPV vaccination (Zurales et al., 2023). Despite the rising knowledge of HPV infection and vaccination throughout the years, the incidence of cervical cancer prevention has not dramatically risen (Zurales et al., 2023). This is an indication that the spread of knowledge about HPV is still low among the adolescent females. This also implies that much more effort must be put in place

to increase awareness and education about HPV infection and HPV vaccinations. As results indicated, 53 (60.2%) of the respondents got the information on HPV from health care workers. This implies that programme such as community outrage, establishment of many more health training schools, and the provision of logistics to health professionals will eventually enhance community sensitization of adolescent health programs including that of HPV (Schiller et al., 2012). This suggests that HPV infection and HPV vaccine awareness may stem from healthcare sensitization programs and resourced health professionals (Boyles et al., 2022). In view of this, Boyles et al, 2022) further affirms that healthcare professionals embarking on effective school health education is among the greatest means of sharing information on healthy sexual debut. Again, results show that 59 (95.2%) of the respondents that has been infected with HPV has been one way or the other engaged in sexual intercourse. This implies that unprotected sexual activities can be one of the major causes of HPV infection rising rate. This suggests that if efforts are directed to educating the adolescents about protected sex, the goal of reducing or preventing HPV can be achieved (Jiaying et al, 2019). Access to effective sex education among the adolescents can have a long-term effect which may bring a drastic reduction in the HPV infection and a healthy reproductive life style to the youth (Boyles et al., 2022 & Jiaying et al., 2019).

Respondents with Junior High School (98.0%) reported a higher proportion of poor knowledge as compared to their counterparts in the Senior and tertiary educational levels. Implicitly, the more one can have access to higher education, the likelihood of the person having adequate knowledge on sexually transmitted infections including HPV. This study is consistent with the findings of Forster *et al.,* (2017) on the level of education and knowledge in sexually healthy lifestyle. It was discovered that respondents who have not had sexual intercourse before (96.6%) reported poor knowledge levels as compared to those who have had sexual intercourse before. The results imply

that those who have had sexual experience before are better informed about HPV infections and can be infective in awareness creation to those who have not had any sexual experience. In view of this, Zhang et al., (2020) discovered that narration on live experiences especially regarding human behavior is more effective in teaching and learning than theoretical explanations. Knowledge about the human papillomavirus seems not to be well-known among the adolescents as only 26% of the respondents indicated in this study were aware of human papillomavirus. Knowledge informs attitude and since their knowledge on the condition is limited, there is the tendency that these adolescents will engage in unhealthy sexual activities that could be very detrimental to their growth and development, hence affirming the findings of Kruse et al., (2020) that knowledge informs behavioral change. This may affect their understanding and belief of contracting or getting the diseases condition, thus completing the theoretical model of Health Belief that, perceived susceptibility refers to an individual's beliefs about the chances of getting a disease (Abraham & Sheeran, 2016). In addition to that, the results indicate that about 53 (60.2%) of the respondents got the information on HPV from health workers. This means that programs such as community outrage, establishment of many more health training schools and the provision of logistics to health professionals will eventually enhance community sensitization of adolescent health programs including that of HPV (Schiller et al., 2012). Implicitly, the availability of adequate health professionals well-equipped with working tools can lead to wider coverage of health education programs including that of schools for the young growing population thus affirming the findings of Boyles et al., (2022) that effective school health education is among the greatest means of sharing information on healthy sexual debut. It was stated by 59 (95.2%) of the respondents that sexual intercourse is one of the modes of transmission of HPV. Based on this study, it can be asserted that efforts aiming at reducing or preventing HPV can possibly be achieved

since the majority of the study population are aware of the mode and means of transmission of HPV. The long-term effect will be a drastic reduction in the HPV infection and a healthy reproductive life style (Jiaying et al., 2019).

5.4 Coverage of HPV vaccine uptake among adolescents

The results of the study showed that the overall coverage of HPV vaccine uptake among the respondents was 2.4% (at 95% CI: 0.9 to 4.1%). However, 97.6% (at 95% CI: 95.9% to 99.1%) of the respondents have not been vaccinated. These results indicate a remarkable low HPV vaccination uptake as it is in line with 2.7% vaccine uptake in a study conducted in Ethiopia among adolescent girls in a less developed region (Bruni L et al., 2016). The reasons being lack of sufficient awareness about HPV infection and the HPV vaccine, the negative socio-cultural beliefs about the vaccine in the general population, and low income (Zurales et al., 2023; Hoque et al., 2015; Osei et al., 2021; & Vermandere et al, 2016). It therefore suggests that low coverage of HPV vaccination uptake in adolescent girls can imply the spread of cervical cancer in most low- and middle-income countries. In a study conducted by Brisson et al, 2020 and funded by WHO, UNDP, UNICEF, & UN, WHO Director General affirmed the above assertion and issued a call for action to eliminate cervical cancer as a public health problem through vaccination. The study results provided the information for WHO for the implementation of HPV vaccinations and life time cervical cancer screening scenarios as a global effort to prevent the spread of HPV infection (Brisson et al, 2020, WHO, 2018).

Additionally, the result found that 182 (56%) of the respondents who have not been vaccinated and have been infected with HPV believe that the vaccine could have prevented them from HPV infection. Though this finding is low as compared to similar studies conducted in Tanzania, 95% (Cunningham et al., 2015), Mali, 100% (Poole et al., 2013), Bangladesh 94% (Islam et al., 2010,

and Kenya, 95% (Becker-Dreps et al., (2010), which might be due to the variations in education levels, rural-urban settings, acceptability levels, vaccine accessibility, routine vaccinations for young girls etc., there is some appreciable level of understanding. This suggests that they believe in the efficacy of the vaccine uptake and are willing to be vaccinated and recommend the vaccine to others and the community members. This can create an opportunity for them to be educators of HPV vaccination in their communities based on their experience to influence the spread of HPV vaccine uptake. These adolescents can be deployed in the future in the cervical cancer campaign to promote HPV vaccine uptake. This is also an indication that the future of the young girls on reproductive health is gradually gaining prominence (Værnesbranden et al., 2021).

Moreover, respondents who lived in rural area (5.1%) reported a higher proportion of HPV vaccine uptake as compared to their counterparts. The rural-urban drift plays a significant role in the adolescent knowledge and uptake of HPV vaccine. This is because, exposure to information on healthy reproductive lifestyle including HPV infections is essential and determinant the availability of technology which seem to be missing or limited of a kind in the rural settings (Davies *et al*., 2021; Kaul et al., 2019). This further reflects in the findings of the study that respondents who live in peri-urban areas (1.6%) reported a higher proportion of not been vaccinated as compared to their counterparts. HPV infection as compared to their counterparts in the peri-urban and rural communities. By implication, urban dwellers are more exposed to technology that enhances their understanding of sexually transmitted infection to the extent that they are able to guard against getting infected. This has been expressed by some communication experts in the area of education and sensitization on public health that, the use of modern technology to educate a population can help to improve population health (Themis *et al.*, 2006).

One significant findings of the study also dwelled on respondents whose fathers had no formal education getting infected more than their counterparts whose fathers had some form of formal education. Following this assertion, it can be deduced that, parents with formal and better formal educational background play a lot of role or activities to ensure the health of their adolescents than those without such opportunities in life. This assertion can be associated with the exposer of the parents to technology and social order (Okada et al, 2006).

5.6 Factors influencing HPV vaccine uptake among adolescents

This study suggests that a high uptake of the HPV vaccination among adolescent girls may have a significant impact on lowering the incidence of HPV infections and cervical cancer. It has taken longer than anticipated for adoption, though. However, little study has been done on the levels and variables involved with the vaccination's uptake. Following that, the study attempted to look at variables linked to vaccination uptake. Pre-information and vaccination uptake were shown to be significantly correlated. This study showed that only 17% of the respondents were aware of the HPV vaccine and 36% needed more information about the vaccine which determined only 2.7% uptake. This suggests that because the percentage of the respondents showing awareness of the vaccine was low, it reflected in a low uptake. Low pre-information is possible to create a negative attitude and low motivation towards the vaccine. Pre-information shows as a very important factor to create a positive attitude which may determine higher HPV vaccine uptake (National Library of Medicine, 2020; Kisaakye et al., 2018; & Turiho et al., 2014). This study opens the discussion on the awareness of the HPV vaccination creation in schools, families, and communities to help the adolescents' girls learn more about the benefits of the vaccine uptake.

Additionally, results showed that 33 (25%) of the respondents did not know where to get HPV vaccine. The lack of knowledge on where to obtain the vaccine also affects the vaccines coverage

and can eventually and potentially affect a healthy lifestyle of the adolescents (Larson, 2021). This implies that poor knowledge about accessibility to the HPV vaccines might cause low uptake. Thus, providing information about who can get free the HPV vaccine, its availability, where they can get it and how much it costs to get vaccinated can provide a motivation for the adolescent girls to improve the vaccine uptake (Canadian Partnership Against Cancer, 2022; Nabirye, 2020).

The findings of this study also discovered that 239 (72.2%) of the respondents stated that they would need their parents' approval before taking the HPV vaccine. Out of these, 98 (41.0%) of the respondents stated that their parents are their care takers who affect their decisions on HPV vaccine uptake. The study indicates that parental decisions on HPV vaccination are positively associated with their daughters HPV uptake. This is due to the fact that parental perceptions of their daughters' willingness to receive the HPV vaccine and their perceptions of the risks of cervical cancer have a significant effect in this decision (Degarege et al., 2018; Yoon et al., 2023). This could be due socio-cultural factor where parents become the sole decision-making authority of their dependent families. Parents must be fully aware of the significance and advantages of the HPV vaccination in order to increase the uptake of the vaccine among adolescent girls.

5.7 Strength and Limitations

The quantitative approach allowed for precise and objective measurement of variables, reducing biases that could affect results. Data was collected from the perspectives of both the adolescent girls who were in school and those outside of school. On the other hand, Nkoranza North Municipality is divided into six districts, however the study only covered four which could limit the coverage. Finally, the study only focused on the adolescent girls in the Municipality. It failed to address the knowledge levels of HPV infection and HPV vaccine among the adolescents' boys

in the Municipality. It will be helpful if the attention of future researchers is directed to the knowledge levels of the adolescent boys in HPV infection.

CHAPTER SIX

SUMMARY OF KEY FINDINGS, CONCLUSION AND RECOMMENDATION

6.1 Summary

The study found a low prevalence of HPV infection among the adolescent population. A small percentage of participants had been diagnosed with HPV, and the majority had no history of the infection. Adolescents aged 18 to 19 reported a higher percentage of HPV infection compared to younger counterparts. Those living in rural areas, as well as those who had been sexually active, were more likely to report having HPV.

The majority of female adolescents in the study had poor knowledge about HPV. Only a small fraction of participants were aware of the virus, with health workers being the main source of information. Older adolescents and those who had engaged in sexual activity demonstrated better knowledge about HPV, while younger adolescents and those who had not engaged in sexual activity reported poorer understanding.

HPV vaccine uptake was notably low among the participants. Most adolescents were unaware of the vaccine, although a small number who had heard of it attributed their knowledge to health workers. Among those vaccinated, the majority had completed the required dosage. A significant proportion of unvaccinated respondents expressed a willingness to be vaccinated, particularly older adolescents and those who had been sexually active.

Parental approval played a major role in vaccine uptake, with many respondents indicating the need for consent before getting vaccinated. Younger adolescents were more likely to receive the vaccine compared to older ones. Additionally, location influenced vaccine uptake, with

adolescents in peri-urban areas being more likely to get vaccinated than those in rural or urban settings.

6.2 Conclusions

In conclusion, the study determined the knowledge and uptake of the HPV vaccine among the adolescent girls in the Nkoranza South Municipality. The study findings revealed low awareness of HPV and a prevalence of 8.5% among adolescent girls. Also, the study found low uptake of the HPV vaccine with parental consent to be a major factor in the vaccine's uptake. However, age, residence, and sexual intercourse were found not to significantly influence the vaccine uptake among the adolescent girls.

Based on the key findings of the study, inferences can be drawn from the fact that most of the participants are very young, and obtaining knowledge about healthy reproductive life and healthy sexual activity is very essential for their growth and development. However, having an appreciable level of formal education, both the adolescents and their parents equally play a significant role in their knowledge concerning healthy sexual life. The HPV vaccine uptake is, to a large extent, also determined by some socio-cultural factors, including parental consent. Apart from that, where the adolescent lives equally have an impact on their knowledge or understanding of healthy reproductive life, including HPV, its uptake, coverage, and challenging factors.

6.3 Recommendation

1. Public education efforts on HPV and vaccines are necessary. Health personnel should be required to participate in such education or sensitization, and the Ghana Health Service and Ministry of Health should support it. Durbars and community outrage programmes can be effective tools for explaining the problems to the adolescents.

2. The Ghana Health Service should ensure that the HPV vaccine is available at a reasonable cost or for no cost through the Ministry of Health and other non-governmental organizations. This will increase the number of adolescents who receive the HPV vaccine, lowering the HPV prevalence and preventing cervical cancer.
3. Parents must be well educated about the significance and advantages of the HPV vaccination in order to increase the uptake of the vaccine among teenage girls.
4. Future studies might benefit from paying attention to how much knowledge teenage males have about HPV infection.

REFERENCES

Abbas, K. M., van Zandvoort, K., Brisson, M., & Jit, M. (2020). Effects of updated demography, disability weights, and cervical cancer burden on estimates of human papillomavirus vaccination impact at the global, regional, and national levels: a PRIME modelling study. *The Lancet Global Health*, *8*(4), e536–e544.

Abraham, C., & Sheeran, P. (2016). *The Health Belief Model*. *June 2015*.

Agyei-Baffour, P., Asare, M., Lanning, B., Koranteng, A., Millan, C., Commeh, M. E., Montealegre, J. R., & Mamudu, H. M. (2020). Human papillomavirus vaccination practices and perceptions among Ghanaian Healthcare Providers: A qualitative study based on multi-theory model. *PLoS One*, *15*(10), e0240657.

Ahmed, D., VanderEnde, K., Harvey, P., Bhatnagar, P., Kaur, N., Roy, S., Singh, N., Denzongpa, P., Haldar, P., & Loharikar, A. (2022). Human papillomavirus (HPV) vaccine introduction in Sikkim state: Best practices from the first statewide multiple-age cohort HPV vaccine introduction in India–2018–2019. *Vaccine*, *40*, A17–A25.

Akanda, R., Kawale, P., & Moucheraud, C. (2022). Cervical cancer prevention in Africa: A policy analysis. *Journal of Cancer Policy*, *32*, 100321.

Alagarsamy, S., Mehrolia, S., Pushparaj, U., & Jeevananda, S. (2022). Explaining the intention to uptake COVID-19 vaccination using the behavioral and social drivers of vaccination (BeSD) model. *Vaccine: X*, *10*, 100140.

Ali, I. (2022). COVID-19 and cancelled vaccination programs: Forecasting outbreaks of vaccine preventable diseases (VPDs) in Pakistan. *Vaccine: X*, *10*, 100151.

Almazrou, S., Saddik, B., & Jradi, H. (2020). Knowledge, attitudes, and practices of Saudi physicians regarding cervical cancer and the human papilloma virus vaccine. *Journal of Infection and Public Health*, *13*(4), 584–590.

Almeida, F. S. De, Roberto, P., Eduardo, L., Paiva, F., Aparecida, M., Almeida, O., & Silva, A. (2006). Auditory Middle Latency Evoked Responses: A Standardizing Study. *Brazilian Journal of Otorhinolaryngology*, *72*(2), 227–234. https://doi.org/10.1016/S1808-8694(15)30060-4

Amboree, T. L., Montealegre, J. R., Wermuth, P. P., Mgbere, O., Fujimoto, K., & Darkoh, C. (2022). Awareness of human papillomavirus and reported human papillomavirus vaccine uptake in a high-risk population. *Preventive Medicine Reports*, *28*, 101853.

Angkasekwinai, N., Sewatanon, J., Niyomnaitham, S., Phumiamorn, S., Sukapirom, K., Sapsutthipas, S., Sirijatuphat, R., Wittawatmongkol, O., Senawong, S., & Mahasirimongkol, S. (2021). Safety and immunogenicity of CoronaVac and ChAdOx1 against the SARS-CoV-2 circulating variants of concern (Alpha, Delta, Beta) in Thai healthcare workers. *MedRxiv*, 2010–2021.

Anwari, P., Debellut, F., Vodicka, E., Clark, A., Farewar, F., Zhwak, Z. A., Nazary, D., Pecenka, C., LaMontagne, D. S., & Safi, N. (2020). Potential health impact and cost-effectiveness of bivalent human papillomavirus (HPV) vaccination in Afghanistan. *Vaccine*, *38*(6), 1352–1362.

Auranen, K., Rinta-kokko, H., Goldblatt, D., Nohynek, H., Brien, K. L. O., Satzke, C., Simell, B., Tanskanen, A., & Käyhty, H. (2014). Design questions for Streptococcus pneumoniae vaccine trials with a colonisation endpoint. *Vaccine*, *32*(1), 159–164.

https://doi.org/10.1016/j.vaccine.2013.06.105

Balakrishnan, L., & Milavetz, B. (2006). *Reorganization of RNA polymerase II on the SV40 genome occurs coordinately with the early to late transcriptional switch*. *345*, 31–43. https://doi.org/10.1016/j.virol.2005.09.039

Bardají, A., Mindu, C., Augusto, O. J., Casellas, A., Cambaco, O., Simbine, E., Matsinhe, G., Macete, E., Menéndez, C., & Sevene, E. (2018). Awareness of cervical cancer and willingness to be vaccinated against human papillomavirus in Mozambican adolescent girls. *Papillomavirus Research*, *5*, 156–162.

Bashaw, A. A., Leggatt, G. R., Chandra, J., Tuong, Z. K., & Frazer, I. H. (2017). Modulation of antigen presenting cell functions during chronic HPV infection. *Papillomavirus Research*, *4*, 58–65.

Bermedo-carrasco, S., Xin, C., & Pe, J. N. (2015). *Predictors of having heard about human papillomavirus vaccination : Critical aspects for cervical cancer prevention among Colombian women*. *29*(2), 112–117. https://doi.org/10.1016/j.gaceta.2014.09.005

Bettinger, J. A., Scheifele, D. W., Halperin, S. A., Vaudry, W., Findlow, J., Borrow, R., Medini, D., Tsang, R., the members of the Canadian, F., & Program, I. M. (2013). Diversity of Canadian meningococcal serogroup B isolates and estimated coverage by an investigational meningococcal serogroup B vaccine (4CMenB). *Vaccine*, *32*(1), 124–130.

Birebent, J., Palmaro, A., Tanios-Dulot, C., Driot, D., Dupouy, J., & Rougé-Bugat, M.-E. (2021). Impact of the notice of the high council of public health amending the age of human papillomavirus vaccination on teen vaccination rates. *La Presse Médicale Open*, *2*, 100014.

Bitarafan, F., Hekmat, M. R., Khodaeian, M., Razmara, E., Ashrafganjoei, T., Gilani, M. M., Mohit, M., Aminimoghaddam, S., Cheraghi, F., & Khalesi, R. (2021). Prevalence and genotype distribution of human papillomavirus infection among 12 076 Iranian women. *International Journal of Infectious Diseases*, *111*, 295–302.

Blose, N., Amponsah-Dacosta, E., Kagina, B. M., & Muloiwa, R. (2022). Descriptive analysis of routine childhood immunisation timeliness in the Western Cape, South Africa. *Vaccine: X*, *10*, 100130.

Bowyer, H. L., Dodd, R. H., Marlow, L. A. V, & Waller, J. (2014). Association between human papillomavirus vaccine status and other cervical cancer risk factors. *Vaccine*, *32*(34), 4310–4316.

Boyles, G. P., Baek, J., Pandit, R., Cosgrove, C. M., & Bixel, K. L. (2022). Gynecologic Oncology Reports An investigation into human papillomavirus (HPV) vaccination for patients undergoing surgery for high-grade cervical or vulvar dysplasia. *Gynecologic Oncology Reports*, *41*(April), 101001. https://doi.org/10.1016/j.gore.2022.101001

Bruggink, S. C., de Koning, M. N. C., Gussekloo, J., Egberts, P. F., Ter Schegget, J., Feltkamp, M. C. W., Bavinck, J. N. B., Quint, W. G. V, Assendelft, W. J. J., & Eekhof, J. A. H. (2012). Cutaneous wart-associated HPV types: prevalence and relation with patient characteristics. *Journal of Clinical Virology*, *55*(3), 250–255.

Brunelli, L., Bravo, G., Romanese, F., Righini, M., Lesa, L., De Odorico, A., Bastiani, E., Pascut, S., Miceli, S., & Brusaferro, S. (2021). Beliefs about HPV vaccination and awareness of vaccination status: Gender differences among Northern Italy adolescents. *Preventive Medicine Reports*, *24*, 101570.

Bruni, R., Conti, I., Villano, U., Giuseppetti, R., Palmieri, G., & Rapicetta, M. (2006). Lack of WHV integration nearby N-myc2 and in the downstream b3n and win loci in a considerable fraction of liver tumors with activated N-myc2 from naturally infected wild woodchucks. *Virology*, *345*(1), 258–269.

Bunzen, D. L., Campos, A., & Neto, S. C. (2006). Efficacy of functional endoscopic sinus surgery for symptoms in chronic rhinosinusitis with or without polyposis. *Brazilian Journal of Otorhinolaryngology*, *72*(2), 242–246. https://doi.org/10.1016/S1808-8694(15)30062-8

Caldas Neto, S. (2006). Postgraduate pariah. In *Revista Brasileira de Otorrinolaringologia* (Vol. 72, p. 146). SciELO Brasil.

Cardoso, F., & Valera, P. (2006). Orbital endoscopic decompression in Graves Ophthalmopathy. *Brazilian Journal of Otorhinolaryngology*, *72*(2), 283–287. https://doi.org/10.1016/S1808-8694(15)30069-0

Carpenter, C. J., & Carpenter, C. J. (2010). *A Meta-Analysis of the Effectiveness of Health Belief Model Variables in Predicting Behavior A Meta-Analysis of the Effectiveness of Health Belief Model Variables in Predicting Behavior*. *0236*. https://doi.org/10.1080/10410236.2010.521906

Castro, T. P. P. G., & Bussoloti Filho, I. (2006). Prevalence of human papillomavirus (HPV) in oral cavity and oropharynx. *Brazilian Journal of Otorhinolaryngology*, *72*(2), 272–281.

Cattaruzza, E., Radillo, L., Ronchese, F., Negro, C., Rui, F., De Michieli, P., & Filon, F. L. (2022). COVID-19 susceptibility and vaccination coverage for measles, rubella and mumps in students and healthcare workers in Trieste hospitals (NE Italy). *Vaccine: X*, *10*, 100147.

Chakraborty, S., Das, R., Mishra, V., Sharma, N., & Khurana, N. (2018). *Human papillomavirus and its nature of infection : An overview HUMAN PAPILLOMAVIRUS AND ITS NATURE OF INFECTION : AN OVERVIEW*. *June*, 11–16. https://doi.org/10.22159/ajpcr.2018.v11i6.24233

Chaw, L. L., Lim, S. T. W., & Yussof, S. R. M. (2019). Human Papillomavirus vaccine coverage among female students in Brunei Darussalam: results from the first 4 years of the national school-based vaccination programme. *Heliyon*, *5*(10), e02588.

Choi, H. C. W., Jit, M., Leung, G. M., Tsui, K.-L., & Wu, J. T. (2018). Simultaneously characterizing the comparative economics of routine female adolescent nonavalent human papillomavirus (HPV) vaccination and assortativity of sexual mixing in Hong Kong Chinese: a modeling analysis. *BMC Medicine*, *16*(1), 1–13.

Choi, Y., Eworuke, E., & Segal, R. (2016). What explains the different rates of human papillomavirus vaccination among adolescent males and females in the United States? *Papillomavirus Research*, *2*, 46–51.

Chung, J. E., Mustapha, I. Z., Li, J., & Gu, X. (2022). Discourse about human papillomavirus (HPV)-associated oropharyngeal cancer (OPC) on Twitter: Lessons for public health education about OPC and dental care. *Public Health in Practice*, *3*, 100239.

Cicala, C., Arthos, J., Censoplano, N., Cruz, C., Chung, E., Martinelli, E., Lempicki, R. A., Natarajan, V., VanRyk, D., & Daucher, M. (2006). HIV-1 gp120 induces NFAT nuclear translocation in resting CD4+ T-cells. *Virology*, *345*(1), 105–114.

Cinar, İ. O., Ozkan, S., Aslan, G. K., & Alatas, E. (2019). Knowledge and behavior of university

students toward human papillomavirus and vaccination. *Asia-Pacific Journal of Oncology Nursing*, *6*(3), 300–307.

Coleman, S. H., Hitchin, D., Noviello, C. M., & Guatelli, J. C. (2006). HIV-1 Nef stabilizes AP-1 on membranes without inducing ARF1-independent de novo attachment. *Virology*, *345*(1), 148–155.

Cornall, A. M., Poljak, M., Garland, S. M., Phillips, S., Machalek, D. A., Tan, J. H., Quinn, M. A., & Tabrizi, S. N. (2017). HPV genotype-specific concordance between EuroArray HPV, Anyplex II HPV28 and Linear Array HPV Genotyping test in Australian cervical samples. *Papillomavirus Research*, *4*, 79–84.

Cragg, L., Davis, M., & Macdowall, W. (2013). Health Promotion Theory Second Edition. *Books.Google.Com*, 1–213. http://books.google.com/books?hl=en&lr=&id=gN6SKgXf1t4C&oi=fnd&pg=PP1&dq=health+promotion+theory&ots=t-MzGT1wtp&sig=ldmbtOCSHHGiSV_yDezFVFyQ2V0%5Cnpapers2://publication/uuid/E05A01B1-7F43-4C1E-910E-68FE571DCF57

Creswell, J.W. & Creswell, J. . (2018). Research Design,Qualitative,Quantitative and Mixed Method Approaches. In Acquisitions Editor: Helen Salmon, E. A. M. O. Neve, Content Development Editor: Chelsea Nerve, & P. E. D. C. F. Copy (Eds.), *United States of America: SAGE Publication.* (Fifth Edit, Vol. 5). SAGE Publications India Pvt. Ltd.

Daniels, V., Saxena, K., Patterson-Lomba, O., Gomez-Lievano, A., Saah, A., Luxembourg, A., Velicer, C., Chen, Y.-T., & Elbasha, E. (2022). Modeling the health and economic implications of adopting a 1-dose 9-valent human papillomavirus vaccination regimen in a

high-income country setting: An analysis in the United Kingdom. *Vaccine*, *40*(14), 2173–2183.

Daniels, V., Saxena, K., Roberts, C., Kothari, S., Corman, S., Yao, L., & Niccolai, L. (2021). Impact of reduced human papillomavirus vaccination coverage rates due to COVID-19 in the United States: A model based analysis. *Vaccine*, *39*(20), 2731–2735.

Dantas, P., & Takiuti, A. D. (2018). *Knowledge and acceptance of HPV vaccine among adolescents , parents and health professionals : construct development for collection and database composition*. *28*(March), 58–68.

Davies, C., Stoney, T., Hutton, H., Parrella, A., Kang, M., Macartney, K., Leask, J., McCaffery, K., Zimet, G., & Brotherton, J. M. L. (2021). School-based HPV vaccination positively impacts parents' attitudes toward adolescent vaccination. *Vaccine*, *39*(30), 4190–4198.

Dodd, R. H., Waller, J., Marlow, L. A. V, Medline, W., & Plus, C. (2016). Human Papillomavirus and Head and Neck Cancer : Psychosocial Impact in Patients and Knowledge of the Link e A Systematic Review Statement of Search Strategies Used and Sources of Information. *Clinical Oncology*, *28*(7), 421–439. https://doi.org/10.1016/j.clon.2016.02.012

Dorji, T., Nopsopon, T., Tenzin, S., & Pongpirul, K. (2021). EClinicalMedicine Human papillomavirus vaccination uptake in low-and middle-income countries : a meta-analysis. *EClinicalMedicine*, *34*, 100836. https://doi.org/10.1016/j.eclinm.2021.100836

Duarte, J. L., Cardoso, F. A., Faria, D., Ceolin, D. S., Mary, T., & Assis, G. F. De. (2006). rats. *Brazilian Journal of Otorhinolaryngology*, *72*(2), 210–216. https://doi.org/10.1016/S1808-

8694(15)30057-4

Dulude, D., Berchiche, Y. A., & Gendron, K. (2006). *Decreasing the frameshift efficiency translates into an equivalent reduction of the replication of the human immunodeficiency virus type 1*. *345*, 127–136. https://doi.org/10.1016/j.virol.2005.08.048

Dunne, E. F., Nielson, C. M., Stone, K. M., Markowitz, L. E., & Giuliano, A. R. (2006). Prevalence of HPV infection among men: a systematic review of the literature. *The Journal of Infectious Diseases*, *194*(8), 1044–1057.

Dunne, E. F., Unger, E. R., Sternberg, M., McQuillan, G., Swan, D. C., Patel, S. S., & Markowitz, L. E. (2007). Prevalence of HPV infection among females in the United States. *Jama*, *297*(8), 813–819.

Efua, M., Markey, K., & Grealish, A. (2022). Healthcare professional ' s promotional strategies in improving Human papillomavirus (HPV) vaccination uptake in adolescents : A systematic review. *Vaccine*, *40*(19), 2656–2666. https://doi.org/10.1016/j.vaccine.2022.03.054

Engel, D., Afeli, A. D. J., Morgan, C., Zeck, W., Ross, D. A., Vyankandondera, J., Bloem, P., & Adjeoda, K. R. (2022). Promoting adolescent health through integrated human papillomavirus vaccination programs: The experience of Togo. *Vaccine*, *40*, A100–A106.

Erra, E. O., Askling, H. H., Yoksan, S., Rombo, L., Riutta, J., Vene, S., Lindquist, L., Vapalahti, O., & Kantele, A. (2013). Cross-protection elicited by primary and booster vaccinations against Japanese encephalitis: a two-year follow-up study. *Vaccine*, *32*(1), 119–123.

Etherington, G. J., Dicks, J., & Roberts, I. N. (2006). High throughput sequence analysis reveals

hitherto unreported recombination in the genus Norovirus. *Virology*, *345*(1), 88–95.

Ezeanochie, M., Olasimbo, P., & Ezeanochie, M. (2020). *Awareness and uptake of human papilloma virus vaccines among female secondary school students in Benin City , Nigeria*. *20*(1), 45–50.

Fang, M., Cheng, H., Dai, Z., Bu, Z., & Sigal, L. J. (2006). *Immunization with a single extracellular enveloped virus protein produced in bacteria provides partial protection from a lethal orthopoxvirus infection in a natural host*. *345*, 231–243. https://doi.org/10.1016/j.virol.2005.09.056

Faria, J., Nigro, D. A., Eduardo, C., Nigro, N., Antonio, S., Marone, M., & Voegels, R. L. (2006). Microbiology of the Maxillary and Ethmoid Sinuses in Patients with Chronic Rhinosinusitis Submitted to Functional Endoscopic Sinus Surgery. *Brazilian Journal of Otorhinolaryngology*, *72*(2), 217–221. https://doi.org/10.1016/S1808-8694(15)30058-6

Fávero, M. L., & Sanchez, T. G. (2006). Contralateral suppression of otoacoustic emission in patients with tinnitus. *Brazilian Journal of Otorhinolaryngology*, *72*(2), 223–226. https://doi.org/10.1016/S1808-8694(15)30059-8

Felix, F., Gomes, G. A., Souza, B. P. de, Cardoso, G. A., & Tomita, S. (2006). Evaluation of the utility of histopathologic exam as a routine in tonsillectomies. *Revista Brasileira de Otorrinolaringologia*, *72*, 252–255.

Ferreira, L. M. de B. M., do Nascimento Rios, A. S., Gomes, É. F., Azevedo, J. F., de Paula Araújo, R., & Moraes, R. B. (2006). Midfacial degloving-acess to nasal cavity and paranasal sinuses lesions. *Brazilian Journal of Otorhinolaryngology*, *72*(2), 158–162.

Forster, A. S., Mcbride, K. A., Davies, C., Stoney, T., Marshall, H., Mcgeechan, K., Cooper, S. C., & Skinner, S. R. (2017). Development and validation of measures to evaluate adolescents ' knowledge about human papillomavirus (HPV), involvement in HPV vaccine decision-making , self-efficacy to receive the vaccine and fear and anxiety. *Public Health*, *147*, 77–83. https://doi.org/10.1016/j.puhe.2017.02.006

Fukuchi, I., Cerchiari, D. P., Garcia, E., & Borges, C. E. (2006). Tympanoplasty: Surgical results and a comparison of the factors that may interfere in their success. *Brazilian Journal of Otorhinolaryngology*, *72*(2), 267–271. https://doi.org/10.1016/S1808-8694(15)30067-7

Gabet, A., Moule, V., Sibon, D., Nass, C. C., Mortreux, F., Maucle, P., Gessain, A., Murphy, E. L., & Wattel, E. (2006). *Endemic versus epidemic viral spreads display distinct patterns of HTLV-2b replication*. *345*, 13–21. https://doi.org/10.1016/j.virol.2005.08.026

Gallagher, K. E., Howard, N., Kabakama, S., Mounier-jack, S., Burchett, H. E. D., Lamontagne, D. S., & Watson-jones, D. (2017). Human papillomavirus (HPV) vaccine coverage achievements in low and middle-income countries 2007 – 2016. *Papillomavirus Research*, *4*(October), 72–78. https://doi.org/10.1016/j.pvr.2017.09.001

Garland, S. M., Brotherton, J. M. L., Moscicki, A.-B., Kaufmann, A. M., Stanley, M., Bhatla, N., Sankaranarayanan, R., de Sanjosé, S., & Palefsky, J. M. (2017). HPV vaccination of immunocompromised hosts. *Papillomavirus Research*, *4*, 35–38.

Gauci, C. G., Jayashi, C. M., Gonzalez, A. E., Lackenby, J., & Lightowlers, M. W. (2012). Protection of pigs against Taenia solium cysticercosis by immunization with novel recombinant antigens. *Vaccine*, *30*(26), 3824–3828. https://doi.org/10.1016/j.vaccine.2012.04.019

Geels, M. J., Jansen, C. A., Baan, E., Cuyper, I. M. De, Miedema, F., Paxton, W. A., & Baarle, D. Van. (2006). *CTL escape and increased viremia irrespective of HIV-specific CD4 + T-helper responses in two HIV-infected individuals*. *345*, 209–219. https://doi.org/10.1016/j.virol.2005.09.023

Giorgi, P., Carozzi, F., Federici, A., Ronco, G., & Zappa, M. (2017). Cervical cancer screening in women vaccinated against human papillomavirus infection : Recommendations from a consensus conference. *Preventive Medicine*, *98*, 21–30. https://doi.org/10.1016/j.ypmed.2016.11.020

Goldfarb, J. A., & Comber, J. D. (2022). Vaccine : X Human papillomavirus (HPV) infection and vaccination : A cross-sectional study of college students ' knowledge , awareness , and attitudes in Villanova , PA. *Vaccine: X*, *10*, 100141. https://doi.org/10.1016/j.jvacx.2022.100141

Goldie, S., Llobregat, L. H. De, Goldenthal, K., & Harper, D. M. (2007). *Human papillomavirus and HPV vaccines : a review*. *May 2014*. https://doi.org/10.2471/BLT.

Gomes, M., Annielson, I. I., Costa, D. S., Eduardo, J., Pereira, G., Je, I., Winter, F., Adami, I. I. I. F., Edige, I. I. I., & Sousa, F. De. (2019). Knowledge and acceptability of the human papillo- mavirus vaccine among health professionals in Acre state , western Amazon. *CLINSP*, *74*(8), e1166. https://doi.org/10.6061/clinics/2019/e1166

Grandahl, M., Rosenblad, A., Stenhammar, C., Tydén, T., Westerling, R., Larsson, M., Oscarsson, M., Andrae, B., Dalianis, T., & Nevéus, T. (2016). School-based intervention for the prevention of HPV among adolescents: a cluster randomised controlled study. *BMJ Open*, *6*(1), e009875.

Grossi, M., Magalhães, G. M., Campos, L., Cristina, É., Lourdes, M. De, & Carvalho-leite, R. De. (2021). *Dermatologia - Part II : 96*. https://doi.org/10.1016/j.abd.2020.11.005

Haeggblom, L., Ramqvist, T., Tommasino, M., & Dalianis, T. (2017). Time to change perspectives on HPV in oropharyngeal cancer . A systematic review of HPV prevalence per oropharyngeal sub-site the last 3 years. *Papillomavirus Research*, *4*(March), 1–11. https://doi.org/10.1016/j.pvr.2017.05.002

Haynes, B. F., Ma, B., Montefiori, D. C., Wrin, T., Petropoulos, C. J., Sutherland, L. L., Scearce, R. M., Denton, C., Xia, S., Korber, B. T., & Liao, H. (2006). *Analysis of HIV-1 subtype B third variable region peptide motifs for induction of neutralizing antibodies against HIV-1 primary isolates*. *345*, 44–55. https://doi.org/10.1016/j.virol.2005.08.042

Heidari, M., Zhang, H., Hearn, C., & Sunkara, L. (2022). Vaccine : X B cells do not play a role in vaccine-mediated immunity against Marek ' s disease. *Vaccine: X*, *10*, 100128. https://doi.org/10.1016/j.jvacx.2021.100128

Hermansson, R. S., Olovsson, M., Hoxell, E., & Lindstro, A. K. (2018). *HPV prevalence and HPV-related dysplasia in elderly women*. 1–9.

Hogea, C. (2017). S239. *Value in Health*, *21*, S238–S239. https://doi.org/10.1016/j.jval.2018.09.1426

Horvath, J. D. C., Kops, N. L., Caierão, J., Bessel, M., Hohenberger, G., & Wendland, E. M. (2018). European Journal of Obstetrics & Gynecology and Reproductive Biology Human papillomavirus knowledge , beliefs , and behaviors : A questionnaire adaptation. *European Journal of Obstetrics and Gynecology*, *230*, 103–108.

https://doi.org/10.1016/j.ejogrb.2018.09.023

Hoshino, Y., Honma, S., Jones, R. W., Santos, N., Nakagomi, O., Nakagomi, T., Kapikian, A. Z., & Thouless, M. E. (2006). *A rotavirus strain isolated from pig-tailed macaque (Macaca nemestrina) with diarrhea bears a P6 [1]: G8 specificity*. *345*, 1–12. https://doi.org/10.1016/j.virol.2005.09.003

Howard, N., Gallagher, K. E., Mounier-jack, S., Burchett, H. E. D., Kabakama, S., Lamontagne, D. S., & Watson-jones, D. (2017). What works for human papillomavirus vaccine introduction in low and middle-income countries ? *Papillomavirus Research*, *4*(March), 22–25. https://doi.org/10.1016/j.pvr.2017.06.003

Howe, J. A., Pelka, P., Antelman, D., Wilson, C., Cornell, D., Hancock, W., Ramachandra, M., Avanzini, J., Horn, M., Wills, K., Sutjipto, S., & Ralston, R. (2015). *Matching complementing functions of transformed cells with stable expression of selected viral genes for production of E1-deleted adenovirus vectors*. *345*(2006), 220–230. https://doi.org/10.1016/j.virol.2005.09.029

Howell-jones, R., Silva, N. De, Akpan, M., Oakeshott, P., Carder, C., Coupland, L., Sillis, M., Mallinson, H., Ellis, V., Frodsham, D., Robinson, T. I., Gill, O. N., Beddows, S., & Soldan, K. (2012). Prevalence of human papillomavirus (HPV) infections in sexually active adolescents and young women in England , prior to widespread HPV immunisation. *Vaccine*, *30*(26), 3867–3875. https://doi.org/10.1016/j.vaccine.2012.04.006

Hu, S., Xu, X., Zhang, Y., Liu, Y., Yang, C., Wang, Y., Wang, Y., Yu, Y., Hong, Y., Zhang, X., Bian, R., Cao, X., Xu, L., & Zhao, F. (2021). A nationwide post-marketing survey of knowledge , attitude and practice toward human papillomavirus vaccine in general

population : Implications for vaccine roll-out in mainland China. *Vaccine*, *39*(1), 35–44. https://doi.org/10.1016/j.vaccine.2020.11.029

Huang, P. C., Goru, R., Huffman, A., Yu, A., Cooke, M. F., & He, Y. (2022). Vaccine : X Cov19VaxKB : A web-based integrative COVID-19 vaccine knowledge base. *Vaccine: X*, *10*, 100139. https://doi.org/10.1016/j.jvacx.2021.100139

Hviid, A., & Laksafoss, A. (2021). *The Lancet Regional Health - Europe Quadrivalent human papillomavirus vaccination and non-targeted infectious disease hospitalisation : Population-based self-controlled case series analysis*. *10*. https://doi.org/10.1016/j.lanepe.2021.100189

Imamura, R., & Sennes, L. U. (2006). Impact in Vocal Quality. *Brazilian Journal of Otorhinolaryngology*, *72*(2), 261–266. https://doi.org/10.1016/S1808-8694(15)30066-5

Isara, A. R., & Osayi, N. (2021). Knowledge of Human Papillomavirus and Uptake of its Vaccine among Female Undergraduate Students of Ambrose Alli University, Ekpoma, Nigeria. *Journal of Community Medicine and Primary Health Care*, *33*(1), 64–75.

Janz, N. K., & Becker, M. H. (1984). *The Health Belief Model : A Decade Later Author (s): Nancy K . Janz and Marshall H . Becker Published by : Sage Publications , Inc . Stable URL : https://www.jstor.org/stable/45049071 The Health Belief Model : A Decade Later*. *11*(1), 1–47.

Jenkins, D., & Bosch, F. X. (2018). General Introduction — The Background to Human Papillomavirus and Cancer Research. In *Human Papillomavirus*. INC. https://doi.org/10.1016/B978-0-12-814457-2.00028-3

Jiaying, L., Mohammad, A., Keshavarzi, F., & Bheemavarapu, H. (2019). Assessment of knowledge , attitude and barriers towards cervical cancer vaccination among Malaysian women. *Le Pharmacien Hospitalier et Clinicien*, *54*(3), 279–287. https://doi.org/10.1016/j.phclin.2018.12.001

Jones, C. J., Smith, H., Llewellyn, C., Jane, C., Smith, H., Llewellyn, C., Jones, C. J., Smith, H., & Llewellyn, C. (2014). *Evaluating the effectiveness of health belief model interventions in improving adherence : a systematic review in improving adherence : a systematic review*. *7199*. https://doi.org/10.1080/17437199.2013.802623

Jones, C. L., Jensen, J. D., Scherr, C. L., Brown, N. R., Christy, K., & Weaver, J. (2015). The Health Belief Model as an Explanatory Framework in Communication Research: Exploring Parallel, Serial, and Moderated Mediation. *Health Communication*, *30*(6), 566–576. https://doi.org/10.1080/10410236.2013.873363

José, A., Júnior, M., & Crespo, A. N. (2006). Cephalometric study of alterations induced by maxillary slow expansion in adults. *Brazilian Journal of Otorhinolaryngology*, *72*(2), 166–172. https://doi.org/10.1016/S1808-8694(15)30051-3

Jradi, H., & Bawazir, A. (2019). Knowledge , attitudes , and practices among Saudi women regarding cervical cancer , human papillomavirus (HPV) and corresponding vaccine. *Vaccine*, *37*(3), 530–537. https://doi.org/10.1016/j.vaccine.2018.11.065

Kacou, E., Horo, A., Fanny, M., & Kof, A. (2021). *Gynecology and Obstetrics Clinical Medicine The delay , symptoms , and survival of Ivorian adolescent girls and young adults with uterine cervical cancer*. *1*. https://doi.org/10.1016/j.gocm.2021.04.001

Kahle, L., Graubard, B. I., & Chaturvedi, A. K. (2012). *Prevalence of Oral HPV Infection in the United States , 2009-2010*. *307*(7), 2009–2010. https://doi.org/10.1001/jama.2012.101

Kanj, S. S., Dandashi, N., El-hed, A., Harik, H., Maalouf, M., Kozhaya, L., Mousallem, T., Tollefson, A. E., Wold, W. S., Chalfant, C. E., & Dbaibo, G. S. (2006). *Ceramide regulates SR protein phosphorylation during adenoviral infection*. *345*, 280–289. https://doi.org/10.1016/j.virol.2005.09.060

Karafillakis, E., Peretti-watel, P., Verger, P., Chantler, T., & Larson, H. J. (2021). The role of maturity in adolescent decision-making around HPV vaccination in France. *Vaccine*, *39*(40), 5741–5747. https://doi.org/10.1016/j.vaccine.2021.08.096

Karanja-chege, C. M. (2022). *HPV Vaccination in Kenya : The Challenges Faced and Strategies to Increase Uptake*. *10*(March), 1–5. https://doi.org/10.3389/fpubh.2022.802947

Karron, R. A., Thumar, B., Schappell, E., Surman, S., Murphy, B. R., Collins, P. L., & Schmidt, A. C. (2012). Evaluation of two chimeric bovine-human parainfluenza virus type 3 vaccines in infants and young children. *Vaccine*, *30*(26), 3975–3981. https://doi.org/10.1016/j.vaccine.2011.12.022

Katsuta, T., Moser, C. A., Offit, P. A., & Feemster, K. A. (2019). Japanese physicians ' attitudes and intentions regarding human papillomavirus vaccine compared with other adolescent vaccines. *Papillomavirus Research*, *7*(April), 193–200. https://doi.org/10.1016/j.pvr.2019.04.013

Kaul, S., Quynh, T., Do, N., Hsu, E., Schmeler, K. M., Montealegre, J. R., & Rodriguez, A. M. (2019). School-based human papillomavirus vaccination program for increasing vaccine

uptake in an underserved area in Texas. *Papillomavirus Research*, *8*(January), 100189. https://doi.org/10.1016/j.pvr.2019.100189

Khakimova, A., Abdollahi, L., Zolotarev, O., & Rahim, F. (2022). Vaccine : X Global interest in vaccines during the COVID-19 pandemic : Evidence from Google Trends. *Vaccine: X*, *10*, 100152. https://doi.org/10.1016/j.jvacx.2022.100152

Kieback, E., & Mu, M. (2006). *Factors influencing subcellular localization of the human papillomavirus L2 minor structural protein*. *345*, 199–208. https://doi.org/10.1016/j.virol.2005.09.047

Kim, Y., Serrano, B., Lee, J., Lee, H., & Lee, S. (2019). Burden of Human papillomavirus (HPV) -related disease and potential impact of HPV vaccines in the Republic of Korea. *Papillomavirus Research*, *7*(April 2018), 26–42. https://doi.org/10.1016/j.pvr.2018.12.002

Korle Bu Teaching Hospital. (2021). *Facility-Based records on Human papiloma virus*.

Kreimer, A. R., Chaturvedi, A. K., Alemany, L., Anantharaman, D., Bray, F., Carrington, M., Doorbar, J., Souza, G. D., Fakhry, C., Ferris, R. L., Gillison, M., Hayes, D. N., Hildesheim, A., Hui, S., Kowalski, L. P., Lang, K. A., Lewis, J., Lowy, D. R., Mehanna, H., … Brennan, P. (2020). Summary from an international cancer seminar focused on human papillomavirus (HPV) -positive oropharynx cancer , convened by scientists at IARC and NCI. *Oral Oncology*, *108*(March), 104736. https://doi.org/10.1016/j.oraloncology.2020.104736

Kruse, M. H., Bednarczyk, R. A., & Evans, D. P. (2020). A human rights approach to understanding provider knowledge and attitudes toward the human papillomavirus vaccine in São Paulo , Brazil. *Papillomavirus Research*, *9*(June 2019), 100197.

https://doi.org/10.1016/j.pvr.2020.100197

Krzowska-Firych, J., Lucas, G., Lucas, C., Lucas, N., & Pietrzyk, Ł. (2019). An overview of Human Papillomavirus (HPV) as an etiological factor of the anal cancer. *Journal of Infection and Public Health*, *12*(1), 1–6.

Lee, C., Chen, T., Wu, T., & Huang, L. (2012). REVIEW ARTICLE A human papillomavirus public vaccination program in Taiwan : The Kinmen County experience. *Journal of the Formosan Medical Association*, *111*(12), 682–685. https://doi.org/10.1016/j.jfma.2012.10.004

Lessard, D., Ortiz-paredes, D., Park, H., Varsaneux, O., Worthington, J., Basta, N. E., Macdonald, S. E., Lebouché, B., Cox, J., Ismail, S. J., & Kronfli, N. (2022). Vaccine : X Barriers and facilitators to COVID-19 vaccine acceptability among people incarcerated in Canadian federal prisons : A qualitative study. *Vaccine: X*, *10*(February), 100150. https://doi.org/10.1016/j.jvacx.2022.100150

Leung, A., On, S., Akinwunmi, B., Elias, K. M., & Feldman, S. (2019). Vaccine : X Educating healthcare providers to increase Human Papillomavirus (HPV) vaccination rates : A Qualitative Systematic Review. *Vaccine: X*, *3*, 100037. https://doi.org/10.1016/j.jvacx.2019.100037

Li, M., Nyabigambo, A., Navvuga, P., Nuwamanya, E., Nuwasiima, A., Kaganda, P., Asiimwe, F. T., Vodicka, E., Mugisha, N. M., Mukose, A., Kwesiga, D. K., Lubinga, S. J., Jr, L. P. G., & Babigumira, B. (2017). Acceptability of cervical cancer screening using visual inspection among women attending a childhood immunization clinic in Uganda. *Papillomavirus Research*, *4*(June), 17–21. https://doi.org/10.1016/j.pvr.2017.06.004

Loke, A. Y., Kwan, M. L., Wong, Y., Kar, A., & Wong, Y. (2017). *The Uptake of Human Papillomavirus Vaccination and Its Associated Factors Among Adolescents : A Systematic Review*. https://doi.org/10.1177/2150131917742299

Lonky, N. M., Ms, L. X., Silva, D. M. Da, Felix, J. C., & Chao, C. (2021). lesions among a cohort of women who underwent. *The American Journal of Obstetrics & Gynecology*, *225*(6), 656.e1-656.e11. https://doi.org/10.1016/j.ajog.2021.07.006

Lott, B. E., Okusanya, B. O., Anderson, E. J., Kram, N. A., Rodriguez, M., Thomson, C. A., Rosales, C., & Ehiri, J. E. (2020). Interventions to increase uptake of Human Papillomavirus (HPV) vaccination in minority populations : A systematic review. *Preventive Medicine Reports*, *19*(July), 101163. https://doi.org/10.1016/j.pmedr.2020.101163

Luiz, P., Coelho, S., Lacerda, G., Salgueiro, F., Michel, J., Freitas, D. M., Marcela, P., Castro, V., & Konstantyner, T. (2015). REVISTA PAULISTA (recombinant): systematic review and meta-analysis. *Revista Paulista de Pediatria (English Edition)*, *33*(4), 474–482. https://doi.org/10.1016/j.rppede.2015.08.017

Machado, A. V., Naffakh, N., Gerbaud, S., Werf, S. Van Der, & Escriou, N. (2006). *Recombinant influenza A viruses harboring optimized dicistronic NA segment with an extended native 5 V terminal sequence : Induction of heterospecific B and T cell responses in mice*. *345*, 73–87. https://doi.org/10.1016/j.virol.2005.09.050

Machado, P., & Pereira, S. A. (2006). Effects of Physical Exercise in Nasal Volume. *Brazilian Journal of Otorhinolaryngology*, *72*(2), 256–260. https://doi.org/10.1016/S1808-8694(15)30065-3

Maclaughlin, K. L., Jacobson, R. M., St, J. L., Jacobson, D. J., Fan, C., Wi, C., & Finney, L. J. (2020). An innovative housing-related measure for individual socioeconomic status and human papillomavirus vaccination coverage : A population-based cross-sectional study q. *Vaccine*, *38*(39), 6112–6119. https://doi.org/10.1016/j.vaccine.2020.07.026

Maier, E. A., Weage, K. J., Guedes, M. M., Denson, L. A., Mcneal, M. M., Bernstein, D. I., & Moore, S. R. (2014). Protein-energy malnutrition alters IgA responses to rotavirus vaccination and infection but does not impair vaccine efficacy in mice ☆☆. *Vaccine*, *32*(1), 48–53. https://doi.org/10.1016/j.vaccine.2013.10.072

Marcio, C., Ikino, Y., Saraiva, R., Bittar, M., & Sato, K. M. (2006). Experimental endolymphatic hydrops under action of a type II nitric oxide synthase inhibitor: otoacoustic emissions evaluation and electrocochleography. *Brazilian Journal of Otorhinolaryngology*, *72*(2), 151–157. https://doi.org/10.1016/S1808-8694(15)30049-5

Markowitz, L. E., Gee, J., Chesson, H., & Stokley, S. (2018). O VERVIEW / Commentaries Ten Years of Human Papillomavirus Vaccination in the United States. *Academic Pediatrics*, *18*(2), S3–S10. https://doi.org/10.1016/j.acap.2017.09.014

Markowitz, L. E., Hariri, S., Lin, C., Dunne, E. F., Steinau, M., Mcquillan, G., & Unger, E. R. (2013). *Reduction in Human Papillomavirus (HPV) Prevalence Among Young Women Following HPV Vaccine Introduction in the United States , National Health and Nutrition Examination Surveys , 2003 – 2010*. *208*, 385–393. https://doi.org/10.1093/infdis/jit192

Marlow, L. A. V, Zimet, G. D., Mccaffery, K. J., Ostini, R., & Waller, J. (2013). Knowledge of human papillomavirus (HPV) and HPV vaccination : An international comparison. *Vaccine*, *31*(5), 763–769. https://doi.org/10.1016/j.vaccine.2012.11.083

Massad, L. S., Evans, C. T., Weber, K. M., Souza, G. D., Hessol, N. A., Wright, R. L., Colie, C., Strickler, H. D., & Wilson, T. E. (2015). Gynecologic Oncology Reports Changes in knowledge of cervical cancer following introduction of human papillomavirus vaccine among women at high risk for cervical cancer. *GORE*, *12*, 37–40. https://doi.org/10.1016/j.gore.2015.02.007

Mburu, A., Itsura, P., Mabeya, H., Kaaria, A., & Brown, D. R. (2019). *Knowledge of Cervical Cancer and Acceptability of Prevention Strategies Among Human Papillomavirus-Vaccinated and Human Papillomavirus-Unvaccinated Adolescent Women in Eldoret , Kenya*. *8*, 139–145. https://doi.org/10.1089/biores.2019.0007

Mccloskey, J. C., Kast, W. M., Flexman, J. P., Mccallum, D., French, M. A., & Phillips, M. (2017). Syndemic synergy of HPV and other sexually transmitted pathogens in the development of high-grade anal squamous intraepithelial lesions. *Papillomavirus Research*, *4*(October), 90–98. https://doi.org/10.1016/j.pvr.2017.10.004

Mesher, D., Soldan, K., Howell-jones, R., Panwar, K., & Manyenga, P. (2015). Reduction in HPV 16 / 18 prevalence in sexually active young women following the introduction of HPV immunisation in England. *Vaccine*, *32*(1), 26–32. https://doi.org/10.1016/j.vaccine.2013.10.085

Montovani, J. C., Maria, L., Campos, P. De, Gomes, M. A., Rodrigues, V., Moraes, S. De, Ferreira, F. D., & Nogueira, E. A. (2006). Etiology and incidence facial fractures in children and adults. *Brazilian Journal of Otorhinolaryngology*, *72*(2), 235–241. https://doi.org/10.1016/S1808-8694(15)30061-6

Montovani, J. C., Nogueira, E. A., Ferreira, F. D., Cardoso, A., Neto, L., & Nakajima, V. (2006).

Surgery of frontal sinus fractures. Epidemiologic study and evaluation of techniques. *Brazilian Journal of Otorhinolaryngology*, *72*(2), 204–209. https://doi.org/10.1016/S1808-8694(15)30056-2

Morales-campos, D. Y., Ph, D., Markham, C. M., Ph, D., Peskin, M. F., Ph, D., Fernandez, M. E., & Ph, D. (2013). Hispanic Mothers ' and High School Girls ' Perceptions of Cervical Cancer , Human Papilloma Virus , and the Human Papilloma Virus Vaccine. *Journal of Adolescent Health*, *52*(5), S69–S75. https://doi.org/10.1016/j.jadohealth.2012.09.020

Morel, M. E., Mcbride, S. E., & Gomez, M. P. (2017). Comparative study of a novel application of automated HR HPV assay and stability in a previously untested Preservative media. *Papillomavirus Research*, *4*(June), 12–16. https://doi.org/10.1016/j.pvr.2017.06.001

Morgan, C., Rose, M., Holroyd, T., Pfitzer, A., Engel, D., Sidibe, A., Holloway, M., Bloem, P., Fields, R., Shimp, L., & Kumar, S. (2022). Integration of other services with human papillomavirus vaccination ; lessons from earlier in the life course highlight the need for new policy and implementation evidence q. *Vaccine*, *40*, A94–A99. https://doi.org/10.1016/j.vaccine.2021.12.066

Moriuchi, M., Yoshimine, H., Oishi, K., & Moriuchi, H. (2006). *Norepinephrine inhibits human immunodeficiency virus type-1 infection through the NF- n B inactivation*. *345*, 167–173. https://doi.org/10.1016/j.virol.2005.10.002

Munakata, Y., Kato, I., Saito, T., & Kodera, T. (2006). *Human parvovirus B19 infection of monocytic cell line U937 and antibody-dependent enhancement*. *345*, 251–257. https://doi.org/10.1016/j.virol.2005.09.040

Municipal Planning Coordinating Unit. (2020). *Annual progress report on development projects/ programmes for the year ending 31st December, 2020*.

Ndikom, C. M., & Oboh, P. I. (2017). Perception, acceptance and uptake of human papillomavirus vaccine among female adolescents in selected secondary schools in Ibadan, Nigeria. *African Journal of Biomedical Research*, *20*(3), 237–244.

Nkoranza Municipal Hoaspital. (2021). *Facility-Based records on Human papiloma virus*.

Nkoranza Municipal Hospital. (2018). *Facility-Based records on Human papiloma virus*.

Nsugbe, E. (2022). Towards the use of cybernetics for an enhanced cervical cancer care strategy. *Intelligent Medicine*. https://doi.org/10.1016/j.imed.2022.02.001

Odunyemi, F. T., Ndikom, C. M., & Oluwatosin, O. A. (2018). Effect of Nursing Intervention on Mothers ' Knowledge of Cervical Cancer and Acceptance of Human Papillomavirus Vaccination for their Adolescent Daughters in Abuja – Nigeria. *Asia-Pacific Journal of Oncology Nursing*, *5*(2), 223–230. https://doi.org/10.4103/apjon.apjon

Okada, D. M., Onishi, E. T., Chami, F. I., Borin, A., & Guerreiro, V. M. (2006). immediate relief. *Brazilian Journal of Otorhinolaryngology*, *72*(2), 182–186. https://doi.org/10.1016/S1808-8694(15)30053-7

Ortiz, A. P., Tamayo, V., Scorsone, A., Soto-salgado, M., Febo, I., Piovanetti, P., Venegas-ríos, H. L., Yamamura, Y., & Zorrilla, C. (2017). Prevalence and correlates of cervical HPV infection in a clinic-based sample of HIV-positive Hispanic women. *Papillomavirus Research*, *4*(June), 39–44. https://doi.org/10.1016/j.pvr.2017.06.006

Portela, M., & Pires, S. (2022). *Knowledge , attitudes , and practices of adolescents regarding*

human papillomavirus. 1–9.

Portnoy, A., Pedersen, K., Trogstad, L., Hansen, B. T., Feiring, B., Laake, I., Smith, M. A., Sy, S., Nygård, M., Kim, J. J., & Burger, E. A. (2021). Impact and cost-effectiveness of strategies to accelerate cervical cancer elimination : A model-based analysis. *Preventive Medicine*, *144*(March), 106276. https://doi.org/10.1016/j.ypmed.2020.106276

Pu, J., He, M., Pu, Y., Liu, Z., Le, L., Wang, H., & Du, X. (2021). *Knowledge about Human Papillomavirus and Cervical Cancer Prevention among Intern Nurses*. 46–50. https://doi.org/10.4103/apjon.apjon

Rahman, S., Giuliano, A. R., Rollison, D. E., Pawlita, M., Waterboer, T., Villa, L. L., & Lazcano, E. (2017). Cutaneous HPV and alpha-mucosal 9-valent HPV sero-status associations. *Papillomavirus Research*, *4*(March), 54–57. https://doi.org/10.1016/j.pvr.2017.08.001

Rajendran, K. S., & Nagy, P. D. (2006). *Kinetics and functional studies on interaction between the replicase proteins of Tomato Bushy Stunt Virus : Requirement of p33 : p92 interaction for replicase assembly*. *345*, 270–279. https://doi.org/10.1016/j.virol.2005.09.038

Ramanathan, M. P., Chambers, J. A., Pankhong, P., Chattergoon, M., Attatippaholkun, W., Dang, K., Shah, N., & Weiner, D. B. (2006). *Host cell killing by the West Nile Virus NS2B – NS3 proteolytic complex : NS3 alone is sufficient to recruit caspase-8-based apoptotic pathway*. *345*, 56–72. https://doi.org/10.1016/j.virol.2005.08.043

Ramesh, P. S., Krishnamurthy, S., Shrestha, S., Nataraj, S. M., & Devegowda, D. (2021). Knowledge, awareness and prevalence of Human Papillomavirus among local University

students and Healthcare workers in South India: A cross-sectional study. *Clinical Epidemiology and Global Health*, *12*, 100839.

Rezqalla, J., Alshatti, M., Ibraheem, A., Omar, D., Al-failakawi, H., Alhaqqan, S., Alghurair, S., & Akhtar, S. (2021). Journal of Infection and Public Health Human Papillomavirus (HPV): unawareness of the causal role of HPV infection in cervical cancer , HPV vaccine availability , and HPV vaccine uptake among female schoolteachers in a Middle Eastern country. *Journal of Infection and Public Health*, *14*(5), 661–667. https://doi.org/10.1016/j.jiph.2021.01.015

Rijkers, G. T., & Braas, O. (2022). *Vaccine : X ‘‘ Get a shot of rhythm and blues ”: Songs on corona and COVID-19 vaccination*. *10*, 19–21. https://doi.org/10.1016/j.jvacx.2022.100155

Robles, C., Bruni, L., Acera, A., Riera, J. C., Prats, L., Poljak, M., Mlakar, J., Anja, O., Dillner, J., Faber, M. T., Munk, C., & Kjaer, S. K. (2021). *Determinants of Human Papillomavirus Vaccine Uptake by Adult Women Attending Cervical Cancer Screening in 9 European Countries*. *60*(4), 478–487. https://doi.org/10.1016/j.amepre.2020.08.032

Ros, C., Baltzer, C., Mani, B., & Kempf, C. (2006). *Parvovirus uncoating in vitro reveals a mechanism of DNA release without capsid disassembly and striking differences in encapsidated DNA stability*. *345*, 137–147. https://doi.org/10.1016/j.virol.2005.09.030

Rosberger, Z., Shapiro, G. K., Tatar, O., & Hospital, J. G. (2022). *Articles The impact of publicly funded immunization programs on human papillomavirus vaccination in boys and girls : An observational study*. *8*. https://doi.org/10.1016/j.lana.2021.100128

Rosen, B. L., Shepard, A., & Kahn, J. A. (2018). US Health Care Clinicians ’ Knowledge ,

Attitudes , and Practices Regarding Human Papillomavirus Vaccination : A Qualitative Systematic Review. *Academic Pediatrics*, *18*(2), S53–S65. https://doi.org/10.1016/j.acap.2017.10.007

Rositch, A. F., Ph, D., H, M. S. P., Liu, T., S, M. H., Chao, C., S, M., Moran, M., Ph, D., Beavis, A. L., & H, M. P. (2022). Levels of Parental Human Papillomavirus Vaccine Hesitancy and Their Reasons for Not Intending to Vaccinate : Insights From the 2019 National Immunization Survey-Teen. *Journal of Adolescent Health*, 1–8. https://doi.org/10.1016/j.jadohealth.2022.01.223

Ruiz-sternberg, Á. M., Moreira, E. D., Restrepo, J. A., Lazcano-ponce, E., Cabello, R., Silva, A., Andrade, R., Revollo, F., Uscanga, S., Victoria, A., María, A., Luna, J., Plata, M., Nossa, C., Fedrizzi, E., Suarez, E., Reina, J. C., Ellison, M. C., Moeller, E., … Perez, G. (2018). E ffi cacy , immunogenicity , and safety of a 9-valent human papillomavirus vaccine in Latin American girls , boys , and young women ☆. *Papillomavirus Research*, *5*(December 2017), 63–74. https://doi.org/10.1016/j.pvr.2017.12.004

Runge, A. S., Bernstein, M. E., Lucas, A. N., & Tewari, K. S. (2019). Cervical cancer in Tanzania: A systematic review of current challenges in six domains. *Gynecologic Oncology Reports*, *29*, 40–47.

Sakae, F. A., & Imamura, R. (2006). Microbiology of Peritonsillar. *Brazilian Journal of Otorhinolaryngology*, *72*(2), 247–250. https://doi.org/10.1016/S1808-8694(15)30063-X

Salgado, C., & Corrêa, J. P. (2006). tertiary hospital. *Brazilian Journal of Otorhinolaryngology*, *72*(2), 177–181. https://doi.org/10.1016/S1808-8694(15)30052-5

Satzke, C., Turner, P., Virolainen-julkunen, A., Adrian, P. V, Antonio, M., Hare, K. M., Henao-restrepo, A. M., Leach, A. J., Klugman, K. P., Porter, B. D., Sá-leão, R., Scott, J. A., Nohynek, H., Brien, K. L. O., & Pneumococcal, W. H. O. (2014). *Standard method for detecting upper respiratory carriage of Streptococcus pneumoniae : Updated recommendations from the World Health Organization Pneumococcal Carriage Working Group*. *32*, 165–179. https://doi.org/10.1016/j.vaccine.2013.08.062

Schiller, J. T., Castellsagué, X., & Garland, S. M. (2012). A Review of Clinical Trials of Human Papillomavirus Prophylactic Vaccines. *Vaccine*, *30*, F123–F138. https://doi.org/10.1016/j.vaccine.2012.04.108

Schwendener, C. L., Kiener, L. M., Jafflin, K., Rouached, S., Juillerat, A., Meier, V., Maurer, S. S., Muggli, F., Gültekin, N., Baumann, A., Debergh, M., Gruillot, C., Huber, B., Merten, S., Buhl, A., Deml, M. J., & Tarr, P. E. (2022). *HPV vaccine awareness , knowledge and information sources among youth in Switzerland : a mixed methods study*. 1–11. https://doi.org/10.1136/bmjopen-2021-054419

Sharomi, O., & Malik, T. (2017). A model to assess the effect of vaccine compliance on Human Papillomavirus infection and cervical cancer. *Applied Mathematical Modelling*, *47*, 528–550. https://doi.org/10.1016/j.apm.2017.03.025

Shivachandra, S. B., Rao, M., Janosi, L., Sathaliyawala, T., Matyas, G. R., Alving, C. R., Leppla, S. H., & Rao, V. B. (2006). *In vitro binding of anthrax protective antigen on bacteriophage T4 capsid surface through Hoc – capsid interactions : A strategy for efficient display of large full-length proteins*. *345*, 190–198. https://doi.org/10.1016/j.virol.2005.10.037

Simms, K. T., Hanley, S. J. B., Smith, M. A., Keane, A., & Canfell, K. (2020). Impact of HPV

vaccine hesitancy on cervical cancer in Japan: a modelling study. *The Lancet Public Health*, *5*(4), e223–e234.

Smith, D. L., & Perkins, R. B. (2022). Low rates of HPV vaccination and cervical cancer screening : Challenges and opportunities in the context of the COVID-19 pandemic. *Preventive Medicine*, *159*(April), 107070. https://doi.org/10.1016/j.ypmed.2022.107070

Smits, K., Pottier, G., Smet, J., Dirix, V., Schutter, I. De, Carollo, M., Locht, C., & Maria, C. (2014). *Different T cell memory in preadolescents after whole-cell or acellular pertussis vaccination*. *32*, 111–118. https://doi.org/10.1016/j.vaccine.2013.10.056

Soccol, A. T., Bettega, S., Sass, S., Soccol, V. T., Scholz, R., & Mocellin, M. (2006). Defect repair in rat mandible with hydroxyapatite cement comparad to small intestine submucosa. *Brazilian Journal of Otorhinolaryngology*, *72*(2), 195–199. https://doi.org/10.1016/S1808-8694(15)30055-0

Sonawane, K., Zhu, Y., Montealegre, J. R., Lairson, D. R., Bauer, C., Mcgee, L. U., Giuliano, A. R., & Deshmukh, A. A. (2020). Articles Parental intent to initiate and complete the human papillomavirus vaccine series in the USA : a nationwide , cross-sectional survey. *The Lancet Public Health*, *5*(9), e484–e492. https://doi.org/10.1016/S2468-2667(20)30139-0

States, U., Escobar, B., Amboree, T. L., Sonawane, K., Deshmukh, A. A., Mcgee, L. U., Rodriguez, A. M., Jibaja-weiss, M. L., & Montealegre, J. R. (2021). Human papillomavirus awareness among foreign- and US-born Hispanics ,. *Preventive Medicine Reports*, *22*, 101379. https://doi.org/10.1016/j.pmedr.2021.101379

Susanne, E., Merz, I., Görögh, T., Hedderich, J., Haag, J., Röcken, C., Ambrosch, P., & Ho, M.

(2017). *miRNA-expression in tonsillar squamous cell carcinomas in relation to HPV infection and expression of the antileukoproteinase SLPI*. *4*(June), 26–34. https://doi.org/10.1016/j.pvr.2017.06.005

Tatar, O., Perez, S., Naz, A., Shapiro, G. K., & Rosberger, Z. (2017). Psychosocial correlates of HPV vaccine acceptability in college males : A cross-sectional exploratory study. *Papillomavirus Research*, *4*(October), 99–107. https://doi.org/10.1016/j.pvr.2017.11.001

Themis, M., Gonçalves, M., Avelino, M. A. G., Pizarro, G. U., Moreira, G. A., Hallinan, M. P., Fujita, R. R., Louis, L., & Weckx, M. (2006). Polisomnographic findings on children with laryngopathies. *Brazilian Journal of Otorhinolaryngology*, *72*(2), 187–192. https://doi.org/10.1016/S1808-8694(15)30054-9

Thomas, T. L., Ph, D., Strickland, O., Ph, D., Diclemente, R., Ph, D., Higgins, M., & Ph, D. (2013). An Opportunity for Cancer Prevention During Preadolescence and Adolescence : Stopping Human Papillomavirus (HPV) -Related Cancer Through HPV Vaccination. *Journal of Adolescent Health*, *52*(5), S60–S68. https://doi.org/10.1016/j.jadohealth.2012.08.011

Tsai, Y., Lindley, M. C., Zhou, F., & Stokley, S. (2019). Insurance reimbursements for human papillomavirus vaccination in the private sector , 2007 – 2014 ☆. *Preventive Medicine Reports*, *15*(January), 100917. https://doi.org/10.1016/j.pmedr.2019.100917

Tull, F., Borg, K., Knott, C., Beasley, M., Halliday, J., Faulkner, N., Ph, D., Sutton, K., H, M. P., Bragge, P., & Ph, D. (2019). Short Message Service Reminders to Parents for Increasing Adolescent Human Papillomavirus Vaccination Rates in a Secondary School Vaccine Program : A Randomized Control Trial. *Journal of Adolescent Health*, *65*(1), 116–123.

https://doi.org/10.1016/j.jadohealth.2018.12.026

Værnesbranden, M. R., Wiik, J., Sjøborg, K., Cathrine, A., Lødrup, K. C., Haugen, G., Hedlin, G., Hilde, K., Nordlund, B., Nystrand, C. F., Rangberg, A., Maria, E., Rudi, K., Silvia, C., Sandberg, Y., Sjelmo, S., Skjerven, H. O., Söderhäll, C., Vettukattil, R., & Jonassen, C. M. (2021). International Journal of Infectious Diseases Maternal human papillomavirus infections at mid-pregnancy and delivery in a Scandinavian mother – child cohort study. *International Journal of Infectious Diseases*, *108*, 574–581. https://doi.org/10.1016/j.ijid.2021.05.064

Vasudevan, L., Ostermann, J., Wang, Y., Harrison, S. E., Yelverton, V., Fish, L. J., Williams, C., & Walter, E. B. (2022). Association of caregiver attitudes with adolescent HPV vaccination in 13 southern US states. *VACCINE: X*, 100181. https://doi.org/10.1016/j.jvacx.2022.100181

Vielot, N. A., Goldberg, S. K., Zimet, G., Smith, S. B., Anne, M., Ramos, S., Morgan, K., Joo, C., Richter, K. L., Peris, M., Whaley, K. J., & Smith, J. S. (2017). Acceptability of multipurpose human papillomavirus vaccines among providers and mothers of adolescent girls : A mixed-methods study in fi ve countries. *Papillomavirus Research*, *3*(November 2016), 126–133. https://doi.org/10.1016/j.pvr.2017.04.001

Villa, A., Patton, L. L., Giuliano, A. R., Estrich, C. G., Pahlke, S. C., Brien, K. K. O., Lipman, R. D., & Araujo, M. W. B. (2020). Umbrella review of systematic reviews. *The Journal of the American Dental Association*, *151*(4), 245-254.e24. https://doi.org/10.1016/j.adaj.2019.10.010

Vinkenes, E., Nielsen, M. A., & Blaakaer, J. (2019). European Journal of Obstetrics &

Gynecology and Reproductive Biology : X Is there evidence for ef fi cacy of human papillomavirus vaccination in solid organ transplant recipients ? *European Journal of Obstetrics & Gynecology and Reproductive Biology: X*, *4*, 100015. https://doi.org/10.1016/j.eurox.2019.100015

Vinodhini, K., Shanmughapriya, S., Das, B. C., & Natarajaseenivasan, K. (2012). *Prevalence and risk factors of HPV infection among women from various provinces of the world*. 771–777. https://doi.org/10.1007/s00404-011-2155-8

Walker, B., Anderson, A., Stoecker, C., Shao, Y., Laveist, T. A., & Callison, K. (2022). COVID-19 and Routine Childhood and Adolescent Immunizations : Evidence from Louisiana Medicaid. *Vaccine*, *40*(6), 837–840. https://doi.org/10.1016/j.vaccine.2021.12.022

Wang, Renjie, Pan, W., Jin, L., Huang, W., Li, Y., Wu, D., Gao, C., Ma, D., & Liao, S. (2020). *Human papillomavirus vaccine against cervical cancer : Opportunity and challenge*. *471*(November 2019), 88–102. https://doi.org/10.1016/j.canlet.2019.11.039

Wang, Runzhi, Lee, K., Gaydos, C. A., Anderson, J., Keller, J., & Coleman, J. (2020). International Journal of Infectious Diseases Performance and acceptability of self-collected human papillomavirus testing among women living with HIV. *International Journal of Infectious Diseases*, *99*, 452–457. https://doi.org/10.1016/j.ijid.2020.07.047

Wentzensen, N., Clarke, M. A., & Perkins, R. B. (2021). Impact of COVID-19 on cervical cancer screening : Challenges and opportunities to improving resilience and reduce disparities. *Preventive Medicine*, *151*(April), 106596. https://doi.org/10.1016/j.ypmed.2021.106596

Westrick, S. C., Hohmann, L. A., Mcfarland, S. J., Teeter, B. S., White, K., & Hastings, T. J. (2017). Parental acceptance of human papillomavirus vaccinations and community pharmacies as vaccination settings : A qualitative study in Alabama. *Papillomavirus Research*, *3*(August 2016), 24–29. https://doi.org/10.1016/j.pvr.2016.12.003

Wigle, J., Coast, E., & Watson-jones, D. (2013). Human papillomavirus (HPV) vaccine implementation in low and middle-income countries (LMICs): Health system experiences and prospects. *Vaccine*, *31*(37), 3811–3817. https://doi.org/10.1016/j.vaccine.2013.06.016

Wirtz, C., Mohamed, Y., Engel, D., Sidibe, A., Holloway, M., Bloem, P., Kumar, S., Brotherton, J., Reis, V., & Morgan, C. (2022). Integrating HPV vaccination programs with enhanced cervical cancer screening and treatment , a systematic review q. *Vaccine*, *40*, A116–A123. https://doi.org/10.1016/j.vaccine.2021.11.013

Wong, C. K. H., Man, K. K. C., Ip, P., Paed, F., Paed, F., Kwan, M., Paed, F., Paed, F., & Mcghee, S. M. (2018). Mothers ' Preferences and Willingness to Pay for Human Papillomavirus Vaccination for Their Daughters : A Discrete Choice Experiment in Hong Kong. *Value in Health*, *21*(5), 622–629. https://doi.org/10.1016/j.jval.2017.10.012

Xu, X., Wang, Y., Liu, Y., Yu, Y., Yang, C., Zhang, Y., & Zhao, F. (2021). A nationwide post-marketing survey of knowledge , attitudes and recommendations towards human papillomavirus vaccines among healthcare providers in China. *Preventive Medicine*, *146*, 106484. https://doi.org/10.1016/j.ypmed.2021.106484

Young, G., Inthasorn, P., Laowahutanont, P., & Lawpoolsri, S. (2022). Long-term effectiveness of human papillomavirus vaccines among adult women : A real-world scenario q. *Vaccine*, *40*(13), 1968–1976. https://doi.org/10.1016/j.vaccine.2022.02.042

Zaman, K., Aziz, A. B., Feser, J., Mooney, J., Tang, Y., Ellison, D. W., Thaisomboonsuk, B., Zhang, L., Neuzil, K. M., Marfin, A. A., & Letson, G. W. (2022). Vaccine : X Antibody persistence and immune memory response following primary vaccination and boosting with live attenuated SA 14-14-2 Japanese encephalitis vaccine (CD-JEV) in Bangladesh : A phase 4 open-label clinical trial. *Vaccine: X*, *10*, 100143. https://doi.org/10.1016/j.jvacx.2022.100143

Zhang, X., Liu, C., Wang, Z., Ren, Z., Feng, X., Ma, W., Gao, X., Zhang, R., Brown, M. D., Qiao, Y., Geng, Q., & Li, J. (2020). Effect of a school-based educational intervention on HPV and HPV vaccine knowledge and willingness to be vaccinated among Chinese adolescents : a multi-center intervention follow-up study. *Vaccine*, *38*(20), 3665–3670. https://doi.org/10.1016/j.vaccine.2020.03.032

Zhang, Y., Wang, Y., Liu, L., Fan, Y., Liu, Z., Wang, Y., & Nie, S. (2016). Awareness and knowledge about human papillomavirus vaccination and its acceptance in China : a meta-analysis of 58 observational studies. *BMC Public Health*, 1–15. https://doi.org/10.1186/s12889-016-2873-8

APPENDICES

Appendix A : Consent

Information Leaflet for Participants

NB: All potential respondents will be given this form to familiarize themselves with the research before deciding whether or not to participate.

PROJECT TITLE: Knowledge on Human Papillomavirus (HPV) and the uptake of the HPV vaccine among adolescent in the Nkoranza South Municipal.

Names and affiliation of researchers:

This research is conducted by Gyamfuah Mary of the University for Development Studies.

BACKGROUND

Human papillomavirus (HPV) is among the major sexually transmitted infection among women and men of active reproductive age. It is the high predisposing risk factor for cervical cancer in low- and middle-income settings. Though the condition can be detrimental to the health of both women and men, it is treatable with few others progressing to cervical cancer if the condition is not identified early and treatment delays. In Ghana, cervical cancer is the second most common female cancer especially for those within the active sexual age bracket and second leading cause of mortality among women. In 2018, 92 women were screened in Nkoranza and 11 tested positive and in December 2021, 100 females were screened and 12 tested positive. In March, 2022, 881 women screened in the Bono East Region, 51 tested positive. Hence this study seeks to examine "Knowledge on Human Papillomavirus and the uptake of HPV vaccines among the Adolescents in Nkoranza South Municipality

PURPOSE OF RESEARCH:

To assess the Knowledge of the adolescents on Human Papillomavirus and the uptake of HPV vaccine in Nkoranza South Municipal

PROCEDURES

This study is a onetime event where each participant will encounter the researcher only once. They will be required to answer both open and closed ended question based on the research topic. The study will be recruiting a total of 341 respondents based on the sample size determination table by Krejcie and Morgan (1970).

Moreover, each respondent will be given a structured questionnaire or assisted by a research assistant to fill or taken through an interview session that will last about 10 to 15 minutes respectively.

RISK:

By participating in this study, you will forfeit some few minutes of your valuable time.

BENEFITS: The goal of this study is to assess the Knowledge of the adolescents on Human Papillomavirus and the uptake of HPV vaccine. The responses from the adolescents will enable us to plan effective health educational programs, and also informed decisions about adolescent's health activities in the municipality. Also, it will also educate the adolescents on the condition and ways it can be prevented.

CONFIDENTIALITY:

The questionnaire is completely anonymous and no information will be linked directly/indirectly to your personal identity. All data will be kept anonymous and you will not be identifiable in any part of the report. Hence participant's identity numbers will be used instead of names.

Voluntary participation:

You are not to be coerced to take part in this study, but should do so out of your own free will. Participation is entirely voluntary.

Withdrawal from the research:

You are not under any obligation to complete the study once you have opted to participate. You may choose to withdraw from the research at any time with or without having to explain yourself.

Consequence of Withdrawal:

If you decide not to participate in this study, you will not be held responsible in any manner. As a result, there will be no negative consequences if you choose not to participate in the study.

Please be aware, however, that before you choose to withdraw, some of the information acquired from you without identifiers (name, age, etc.) may have been amended or utilized in analysis reports and publications. These can no longer be removed. We vow to make every reasonable attempt to carry out your preferences as much as possible.

Compensation:

A piece of nose mask will be given to each respondent before she starts answering the questionnaire. As a token of our appreciation for your time and inconvenience, you will be given a pen for participating in this study.

For further clarification or enquiries about the research, kindly contact Gyamfuah Mary on 0243718402 or my supervisor Dr. Martin N Adokiya on 0509044041 of the School of Public Health at the University for Development Studies.

APPENDIX B: QUESTIONNAIRE

QUESTIONNAIRE ON ADOLESCENT KNOWLEDGE ON HPV

Introduction

I am Mary Gyamfuah, a final year student of University for Development Studies, Tamale. I am offering Master of Philosophy (MPhil) in Community Health and Development. As part of my final year assessment for the award of Master of Philosophy, I am embarking on a study titled *"Knowledge on Human Papillomavirus and the uptake of HPV vaccines among the Adolescents in Nkoranza South Municipal."* I am pleading with you to endeavor to assist me obtain data on this subject. The data to be obtained will go long way to assist in decision making on reproductive health of the adolescent and maternal health in general.

Socio-demographic characteristics of respondents (*Instructions: Please tick a box where appropriate)*

1. Age ☐ 12-14 ☐ 15-17 ☐ 18-19	2. Level of Education ☐ No formal education ☐ Primary ☐ JHS ☐ SHS ☐ Tertiary
3. Religion ☐ Catholic ☐ Pentecostal churches ☐ Muslim ☐ Traditionalist ☐ Others (specify)_____	4. Which ethnic group do you belong? _____ 5. Area of residency? ☐ Rural ☐ Peri-urban Area ☐ Urban

6. May I know if you are in a relationship with a boy? ☐ Yes ☐ No 7. May I know if you ever had sexual intercourse? ☐ Yes ☐ No If yes, answer questions 8 to 10	8. Age at first sexual intercourse_____ 9. Number of times you had sexual intercourse_____ 10. How many sexual partners do you have? _____ 11. Does your boyfriend use condom during sexual intercourse? ☐ Yes ☐ No
12. Mother's Education level ☐ No formal education ☐ Primary ☐ JHS ☐ SHS ☐ Tertiary	13. Father's educational level ☐ No formal education ☐ Primary ☐ JHS ☐ SHS ☐ Tertiary
Knowledge on HPV among adolescents 14. Have you heard about HPV? ☐ Yes ☐ No 15. If yes, source of information? ☐ Health workers ☐ Teachers ☐ Parents ☐ Friends ☐ TV ☐ Radio ☐ Internet	16. Do you know the mode transmission of HPV? ☐ Yes ☐ No 17. If yes, which of the following describes the mode of transmission of HPV? **Tick all that apply** ☐ Physical contact ☐ Air droplet ☐ Sexual intercourse ☐ Other (specify)

18. Which of the following persons can be infected with PHV? ☐ Male ☐ Female ☐ Both ☐ I don't know 19. Do you know the symptoms of HPV? ☐ Yes ☐ No	20. Everyone infected with HPV exhibits the symptoms. ☐ True ☐ False ☐ I don't know 21. Which of the following best describes a person infected with HPV? **Tick all that apply** ☐ Vaginal itching ☐ Warts ☐ Bleeding per vaginum ☐ Weight loss ☐ I don't know
22. Which of the following do you think is a means contracting HPV? ☐ Sexual promiscuity ☐ Early age onset of sexual intercourse ☐ History of STIs ☐ Genital Herpes ☐ I don't know 23. Have you ever heard of cervical cancer? ☐ Yes ☐ No	24. If yes, which of the following best describes the cause of cervical cancer? ☐ HPV ☐ HIV ☐ Malaria ☐ I don't know 25. Can cervical cancer be prevented? ☐ Yes ☐ No ☐ I don't know
Prevalence of HPV among adolescent 26. Have you ever been diagnosed of HPV? ☐ Yes ☐ No 27. If yes, when? ☐ 3 months ago ☐ 6 months ago ☐ More than 1 year ago	28. Do you know of anyone who has been diagnosed of HPV infection? ☐ Yes ☐ No 29. If yes, when? ☐ 3 months ago ☐ 6 months ago ☐ More than 1 year ago

Coverage of HPV vaccine uptake among adolescent 30. Do you know of vaccine that can prevent HPV infection? ☐ Yes ☐ No 31. If yes, how did you get know about the HPV vaccine? ☐ Health worker ☐ Teachers ☐ Parents ☐ Friends ☐ TV ☐ Radio ☐ Internet ☐ workshops	32. Have you ever received HPV vaccine? ☐ Yes ☐ No 33. If yes, when? _____ 34. Did you complete the required dosage? ☐ Yes ☐ No 35. If no to Q32, are you willing to be vaccinated? ☐ Yes ☐ No
Factors influencing HPV vaccine uptake among adolescents 36. Will you need approval from parent /guardians before taking the HPV vaccine? ☐ Yes ☐ No 37. If yes, why?..... 38. If no, why?..... 39. Aside parental consent, are there other reasons that may prevent you from taking the HPV vaccine? ☐ Yes ☐ No	40. If yes, which of the following is associated with your reason ☐ Not sexually active ☐ Too expensive ☐ Already infected with HPV ☐ Don't know where to get the vaccine ☐ Not sure about the safety of the vaccine ☐ Need more information about the vaccine ☐ My culture/religion is against it ☐ Others (specify)……..

41. Have you ever searched for information on HPV/Cervical cancer on your own? ☐ Yes ☐ No 42. If no, why?..... 43. Do you know where to go and get vaccinated? ☐ Yes ☐ No 44. If yes, where?.....	**THANK YOU FOR PARTICIPATION**

Appendix C: Ethical Approval letters

UNIVERSITY FOR DEVELOPMENT STUDIES
SCHOOL OF PUBLIC HEALTH

Tel: 0509044041

Our Ref:
Your Ref:

P.O. Box 1883
Tamale, Ghana

Date: 6.20.2022

DEPARTMENT OF EPIDEMIOLOGY, BIOSTATISTICS & DISEASE CONTROL

The Chairman
Committee on Human Research and Publication Ethics
School of Medical Sciences,
KNUST, Kumasi, Ghana

Dear Chairman,

SUPPORT LETTER FOR ETHICAL APPROVAL TO CONDUCT A RESEARCH

This letter is to confirm my willingness and availability to serve as a supervisor for **Rev. Sis. Mary Gyamfuah** who is planning to undertake his MPhil thesis research in Nkoranza South Municipal, Ghana. The applicant is a second-year student with the School of Public Health. She is pursuing a master's program in Community Health and Development. As part of the requirements of the program, she plans to conduct field research on "***Knowledge on Human Papillomavirus and uptake of vaccination among adolescents in Nkoranza South Municipal, Ghana***".

I am a faculty member with the Department of Epidemiology, Biostatistics and Disease Control, University for Development Studies, Tamale, Ghana. As her supervisor, I would help with planning of the research and assist with the data collection and interpretation.

I look forward to working with the applicant. The research will contribute to knowledge on human papillomavirus and coverage of vaccination.

Your sincerely,

Martin Nyaaba Adokiya, MPH, Ph.D.

OUR CORE VALUES:
1. People – Centered
2. Professionalism
3. Team work
4. Innovation
5. Discipline
6. Integrity

Ghana Health Service
Municipal Health Directorate
P. O. Box 31
Nkoranza South, B/E

Date: 21st June, 2022

Tel: +.....

My Ref No: GHS/NKZ/BE/2022
Your Ref:.....

GYAMFUA MARY
ST. THERESA'S HOSPITAL
BOX 30
NKORANZA SOUTH -BONO EAST

RE: REQUEST FOR PERMISSION TO CONDUCT RESEARCH

With reference to your letter dated 21st March, 2022, requesting for permission to conduct research on "Knowledge on Human Papillomavirus (HPV) and uptake of HPV vaccine among adolescents in Nkoranza South Municipality.

I officially write to inform you that approval is given to undertake such research in the municipality, and we believe this will go a long way to promote health delivery in our communities.

We hope that confidentiality will be assured during this important activity.

Thank you.

DR. EMMANUEL A. TEVIU
MUNICIPAL DIRECTOR OF HEALTH SERVICES
MUNICIPAL HEALTH DIRECTORATE
NKORANZA SOUTH

Kwame Nkrumah
University of Science
and Technology, Kumasi

College of Health Sciences
SCHOOL OF MEDICINE AND DENTISTRY

COMMITTEE ON HUMAN RESEARCH, PUBLICATION AND ETHICS

Our Ref: CHRPE/AP/367/22

19th July 2022

Miss Mary Gyamfuah
Department of Social and Behavioural Change
University for Development Studies
TAMALE.

Dear Madam,

LETTER OF APPROVAL

Protocol Title: ***"Knowledge on Human Papillomavirus and the Uptake of the HPV Vaccine among the Adolescent in the Nkoranza South Municipal."***

Proposed Site: ***Nkoranza South Municipal.***

Sponsor: ***Principal Investigator.***

Your submission to the Committee on Human Research, Publications, and Ethics on the above-named protocol refer.

The Committee reviewed the following documents:

- A notification letter of 21ST June 2022 from the Nkoranza South Municipal Health Directorate (study site) indicating approval for the conduct of the study at the Municipality.
- A Completed CHRPE Application Form.
- Participant Information Leaflet and Consent Form.
- Research Protocol.
- Questionnaire.

The Committee has considered the ethical merit of your submission and approved the protocol. The approval is for a fixed period of one year, beginning **19th July 2022** to **18th July 2023** renewable thereafter. The Committee may, however, suspend or withdraw ethical approval at any time if your study is found to contravene the approved protocol.

Data gathered for the study should be used for the approved purposes only. Permission should be sought from the Committee if any amendment to the protocol or use, other than submitted, is made of your research data.

The Committee should be notified of the actual start date of the project and would expect a report on your study, annually or at the close of the project, whichever one comes first. It should also be informed of any publication arising from the study.

Thank you for your application.

Yours faithfully,

Rev. Prof. John Appiah-Poku.
Honorary Secretary
FOR: CHAIRMAN

Room 7, Block L, School of Medicine and Dentistry, KNUST, University Post Office, Kumasi, Ghana
Tel: +233 (0) 3220 63248 **Mobile:** +233 (0) 20 5453785 **Email:** chrpe.knust.kath@gmail.com/chrpe@knust.edu.gh