KNOWLEDGE OF CERVICAL CANCER AND ACCEPTABILITY OF PREVENTION STRATEGIES AMONG HPV-VACCINATED AND NON-VACCINATED ADOLESCENTS IN UASIN GISHU COUNTY, KENYA.

BY

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A RESEARCH THESIS PRESENTED IN PARTIAL FULFILLMENT FOR THE AWARD OF THE DEGREE OF MASTERS OF MEDICINE IN REPRODUCTIVE HEALTH OF MOI UNIVERSITY

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DECLARATION

Student's Declaration

I declare that this thesis is my original work and has not been presented in any other university or institution for the award of the degree or any academic credit. Views expressed herein are my own unless otherwise stated and in such a case, the reference has been cited. No part of this thesis may be reproduced without prior written permission of the author and/or Moi University.

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DEDICATION

I dedicate this work to all people living with cancer and those who have survived to tell the tale. And to the people caring for them, keep the candle burning.

DISCLOSURE

The investigator was the recipient of the U54 Cervical Cancer Prevention Mentoring Core Research Grant (Grant No. 233) from the National Institutes of Health (NIH) that seeks to promote global health research in Africa in the field of HIV related cancers. The grant has been in effect since 2015 and is offered annually to junior researchers in the U54 Consortium that includes Kenya, Uganda, Tanzania, Malawi, Rwanda and Botswana as part of the USAID/AMPATH collaboration.

ACKNOWLEDGEMENT

I bear sincere appreciation to my supervisors, Dr Mabeya and Dr Itsura for their zeal and zest in guiding me and sharing their knowledge with me.

I would also like to thank my colleagues in the Reproductive Health Department for their input and constructive criticism, the U54 Consortium and certainly, my family for their love and support.

ABBREVIATIONS

ACS	American Cancer Society
ASCCP	American Society for Colposcopy and Cervical Pathology
CDC	Center for Disease Control and Prevention
DCAH	Department of Child and Adolescent Health
DNA	Deoxyribonucleic Acid
DRH	Department of Reproductive Health
DVI	Division of Vaccines and Immunization
FDA	Food and Drug Administration
GAP	Gardasil Access Program
GAVI	Global Alliance for Vaccines and Immunization
HIV	Human Immunodeficiency Virus
HPV	Human Papilloma Virus
IREC	Institutional Research and Ethics Committee
LEEP	Loop Electrosurgical Excision Procedure
LMIC	Low and Middle Income Countries
MMWR	Morbidity and Mortality Weekly Report
STD	Sexually Transmitted Disease
WHO	World Health Organization
VIA	Visual Inspection with Acetic acid

OPERATIONAL DEFINITION OF TERMS

Acceptability	To be satisfactory and able to be agreed to or approved of
Adolescent	Young person between 10 and 19 years
Cervix	Cylinder-shaped neck of tissue that connects the vagina and uterus
Knowledge	Familiarity, awareness or understanding acquired through experience or education
Prevention	The act of stopping something from happening or of stopping someone from doing something
Vaccination	The administration of antigenic material (*vaccine*) to stimulate an individual's immune system to develop adaptive immunity to a pathogen.
Vaccination initiative	The undertaking of a program for vaccination by not-for-profit organizations

ABSTRACT

Background: Cervical cancer is a critical public health concern in sub-Saharan Africa. Contemporary approach seeks to actively include primary prevention in the global cervical cancer elimination challenge. Adolescents are key targets in this facet of care as they are in the age group for successful vaccination and can benefit from fostering early behavioral modification in avoidance of Human Papilloma Virus, HPV, infection. An HPV vaccination initiative in Uasin Gishu County, Kenya, immunized over 3000 girls aged 9-14 in 2013. Despite this, there is a dearth of information on the knowledge of cervical cancer amongst adolescents and their acceptance of cervical cancer prevention strategies.

Objective: To compare the knowledge and source of information of cervical cancer and acceptability of prevention strategies among vaccinated and unvaccinated adolescents after an HPV vaccination initiative in Uasin Gishu County.

Method: A cross sectional comparative study carried out in six randomly selected public schools that had participated in the vaccination initiative. By proportionate allocation, a total of 60 vaccinated and 120 unvaccinated adolescents were enrolled into the study.
Ethical approval was obtained from the Institutional Research and Ethics Committee and written consent from the parents. Data collection was done using interviewer-administered questionnaires derived from factual statements based on information from print material used for community sensitization on cervical cancer.

Results: The median age of the participants was 14.0 (IQR: 13.0-15.0). Of the vaccinated adolescents, 96.7% (58/60) had heard of cervical cancer as compared to 50.8% (61/120) of the unvaccinated adolescents (P<0.001). Most of the vaccinated adolescents (93.3%, 56/60) had heard of the HPV vaccine while only 5% (6/120) of the unvaccinated adolescents had heard of it (P>0.001). Both cohorts identified the school as the main source of information for cervical cancer. The two groups also showed similarity in their selection of cervical cancer prevention strategies acceptable to them like delaying sexual debut and frequency of using condoms for protection against sexually transmitted infections. Similar proportions of participants from both cohorts showed high acceptance of screening modalities for cervical cancer (85% vs 86.7%, p=0.940). Out of 120 unvaccinated participants, 63.7% expressed willingness to be vaccinated.

Conclusions: Exposure to the HPV vaccine was associated with a higher knowledge of cervical cancer. The adolescents predominantly rely on the school for health information. Adolescents, both vaccinated and unvaccinated, show high acceptance of cervical cancer prevention strategies.

Recommendations: Education on cervical cancer must be comprehensive and elaborate to ensure adolescents are sufficiently informed. Empowerment of the teachers by health care workers to ensure information dissemination. The high acceptance of cervical cancer prevention strategies should further encourage provision of these services such as rolling out the nationwide HPV vaccination.

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CHAPTER ONE: INTRODUCTION

1.1 Background

Cancer of the cervix is rapidly ascending the oncological ladder to be the primary fatal gynecological cancer in developing countries. There were 570, 000 new cases and 311,000 deaths worldwide in 2018 with 85% of mortality coming from low- and middle-income countries. (Bray et al., 2018) The five-year survival rate in women in whom invasive carcinoma was diagnosed early is 91%. It drops to 57% in women with metastasis to regional lymph nodes and/or surrounding tissues/organs and even lower in distant spread, 19%. (Bruni et al., 2015)

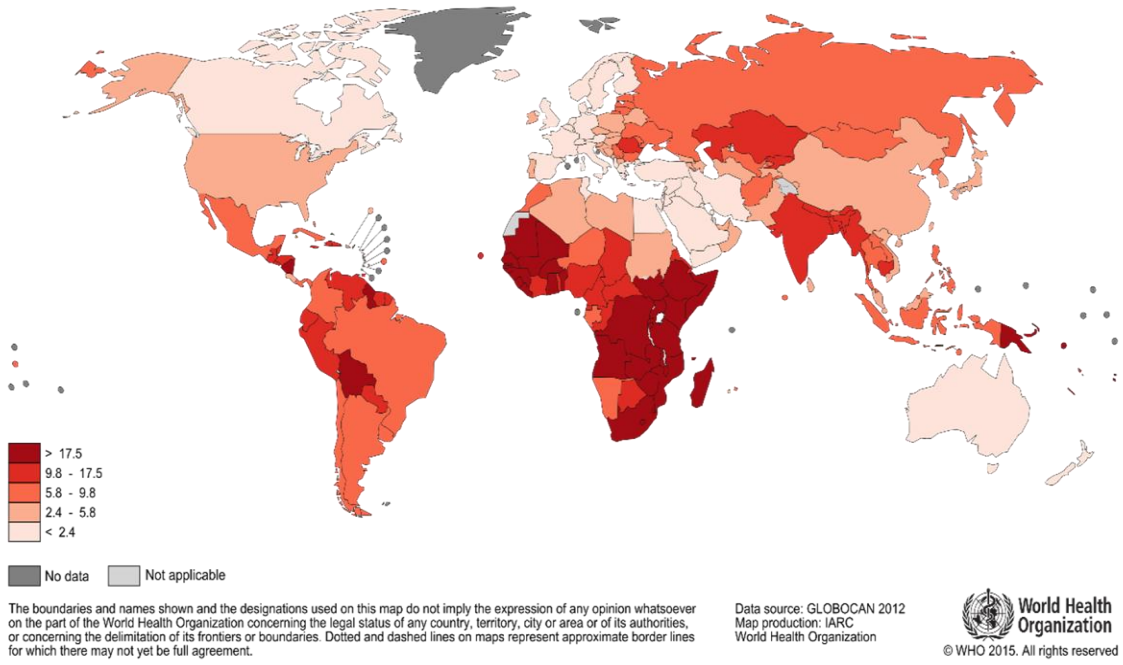


Figure 1: Estimated Cervical Cancer Mortality Worldwide in 2012

Cancer of the cervix is increasingly becoming a public health concern in Sub-Saharan Africa (Black et al., 2018), for example, cervical cancer ranks as the second cause of female cancers in Kenya, and is the leading cause of cancer deaths/mortality amongst all cancers in women. Annually, the estimated number of cervical cancer cases is 5, 250 while the mortality from cervical cancer is 3, 286 in Kenya. (Bray et al., 2018)

Between 1981 and 1990, cervical cancer accounted for 70-80% of all cancers of the genital tract and 8-20% of all cancer cases. (Rogo et al, 1990) The peak age of cancer of the cervix is 35-45 years, a time when the women are at their prime and should be raising children, caring for their families and contributing to the socioeconomic development of their community. (WHO 2006, 2010)

Human papillomavirus (HPV) is the causative agent of cervical cancer of the cervix (WHO, 2006). HPV types 16 and 18 are highly oncogenic and together cause 70% of all cervical cancers; the remainder are caused by other oncogenic HPV types. (Faridi et al., 2011)

Prevention strategies have focused on secondary methods with attention on sexually active women in the 20 to 45 years demographic. (Wardle, Robb, Vernon & Waller, 2015) These methods include screening using cytological testing (Pap smears), HPV DNA detection and visual inspection with acetic acid (VIA) with a screen-and-treat option of loop electrosurgical excision procedure (LEEP), cryotherapy or thermocoagulation. Despite measures to increase cervical cancer awareness and screening programs, there remains a deficiency that calls for a new additional approach.

It follows that contemporary approach is shifting towards primary prevention strategies with principal emphasis on adolescents to foster early behavioral modification including

but not limited to delaying sexual debut, restricting number of sexual partners, consistent correct condom use and not engaging in smoking. (Peirson, Fitzpatrick-Lewis, Ciliska & Warren, 2013) Recent scientific advances also evidenced the inception of HPV vaccines that have proved effective in the prevention of HPV infection with many nations incorporating it in their national adolescent vaccination schedule.

Kenya participated in this endeavor in 2012 to 2013 by carrying out pilot projects in selected regions under GAVI and GAP Initiative. The latter took place in Eldoret the principal town in Uasin Gishu County, Kenya and saw the vaccination of 3200 girls of ages 9 – 14 years.

The success of cervical cancer prevention strategies is related to the level of awareness and knowledge regarding various aspects of the disease and vaccine. (Rashid, Labani & Das, 2016) However, there is a dearth of data on the level of awareness of cervical cancer among Kenyan adolescents and their acceptance of cervical cancer prevention strategies. It is also difficult to ascertain where health workers stand with regards to the approach to adolescent-centered cervical cancer prevention program planning. Therefore, a study was conducted to compare the knowledge and source of information of cervical cancer and acceptability of prevention strategies among vaccinated and unvaccinated adolescents after an HPV vaccination initiative in Eldoret, Kenya.

1.2 Problem Statement

There is a rising incidence of cervical cancer despite a decade of secondary prevention strategies. There is therefore need to incorporate primary prevention strategies by involvement of adolescents.

The increasing incidence of cervical cancer, can be attributed to the high prevalence (29.5-36.4%) of HPV infection among adolescents aged 13-19 years associated with concomitant HIV infection. (Dunne et al., 2007 and Markowitz et al., 2013) Sexually active adolescents have the highest rates of prevalent and incident HPV infection rates with over 50–80% having infections within 12 months of initiating intercourse. (Moscicki, 2007) Over the last decade, the mean age of sexual debut has declined from approximately 17 years to 12 years among females in Kenya (Kenya HPV Factsheet, 2017). Annually, it is estimated 21 million girls aged 15 to 19 years, and 2 million girls aged under 15 years become pregnant in developing regions leading to grand multi-parity by age 30. (WHO, 2014) During the HPV vaccination effort in Uasin Gishu, cervical cancer education was done pre and post vaccination to the parents and adolescents, however there has been no pre or post testing to confirm or assess the level of knowledge and understanding among these adolescents. There remains a paucity of data on the state of cervical cancer awareness among adolescents.

1.3 Justification

Most HPV infections clear due to the natural cell-mediated immunity hence the majority of women who get infected with high risk oncogenic HPV (hrHPV) types do not develop cervical cancer. Even in those with persistent hrHPV infection, not all of them progress to cervical cancer. This implies that the presence of additional cofactors is necessary for the HPV infection to progress to invasive cervical cancer which for adolescents are often affected due to anatomical and physiological predispositions. (Mati et al, 1984) One such factor is early sexual debut. Increasing adolescents' awareness of the contribution of

modifiable lifestyle factors to cervical cancer may influence lifelong patterns of healthy behavior. (Kyle, Nicoll, Forbat & Hubbard, 2013)

Adolescents are within the age group of successful vaccination outcome hence the assessment of their knowledge towards causes of cervical cancer, HPV infection and of prevention strategies can lead to successful reduction of disease burden and control of cervical cancer in Kenya. Creating knowledge and awareness among adolescents, coupled with screening, HPV detection and prevention strategies can help in further reduction of cervical cancer disease burden.

In Uasin Gishu County, there is limited data available of involvement of adolescents in cervical cancer prevention programs. The Kenya National Guidelines for Cancer Prevention (2012) elaborates the government's proposal for adolescent-centered primary prevention methods for cervical cancer through school-based programs for HPV vaccination; however, there is so far no program in place to execute this. There is need to establish the level of knowledge the adolescents have with regard to HPV transmission and cervical cancer and gauge their level of acceptability of primary cervical cancer prevention strategies.

1.4 Research Questions and Objectives

1.4.2 Hypothesis

There is no difference in knowledge of cervical cancer between HPV vaccinated and non-vaccinated adolescents.

1.4.2 Research Questions

1. Is there a difference in knowledge of cervical cancer in vaccinated as compared to unvaccinated adolescents?
2. Do the vaccinated and unvaccinated adolescents share the same sources of information for cervical cancer?
3. Are the vaccinated adolescents more amenable to accept cervical cancer prevention methods as compared to unvaccinated adolescents?

1.4.2 Broad Objective

To compare the knowledge and source of information of cervical cancer and acceptability of prevention strategies among vaccinated and unvaccinated adolescents after an HPV vaccination initiative in Uasin Gishu County.

1.4.3 Specific Objectives

1. To compare the HPV vaccinated and unvaccinated adolescents' knowledge regarding cervical cancer
2. To compare the HPV vaccinated and unvaccinated adolescents' source of information with regard to cervical cancer
3. To compare the HPV vaccinated and unvaccinated adolescents' acceptance of cervical cancer prevention strategies

CHAPTER TWO: LITERATURE REVIEW

2.1 Virology

The human papilloma virus is a double-stranded DNA virus belonging to the Papova group of viruses. (Levinson, 2010) More than 100 HPV types have been identified with about 40 which can infect the genital area. (Munoz, 2003) The non-oncogenic (low risk) types like type 6 and 11 have been associated with causation of oropharyngeal/genital warts and recurrent respiratory papillomatosis whilst the oncogenic (high risk) types like type 16 and 18 cause invasive genital carcinoma. (Lacey, 2006 and Watson, 2009) It is the commonest sexually transmitted viral infection. Worldwide, an estimated 291 million women are harboring HPV DNA at any one time. Based on Kenya studies detecting HPV in cervical samples, about 9.1% of women in the general population are estimated to harbor cervical HPV-16/18 infection at a given time. (HPV Report,2015) 23% of these infections are related to HPV 16; 8.5% are related to HPV 18. (de Sanjosé et al, 2007)

Women are at risk of HPV infection throughout their lives. Up to 80% of sexually active women will be infected with HPV at some point in their lifetime. (Bosch and de Sanjosé, 2003, Brown et al, 2005 and Koutsky, 1997) Thus the need for long term protection.

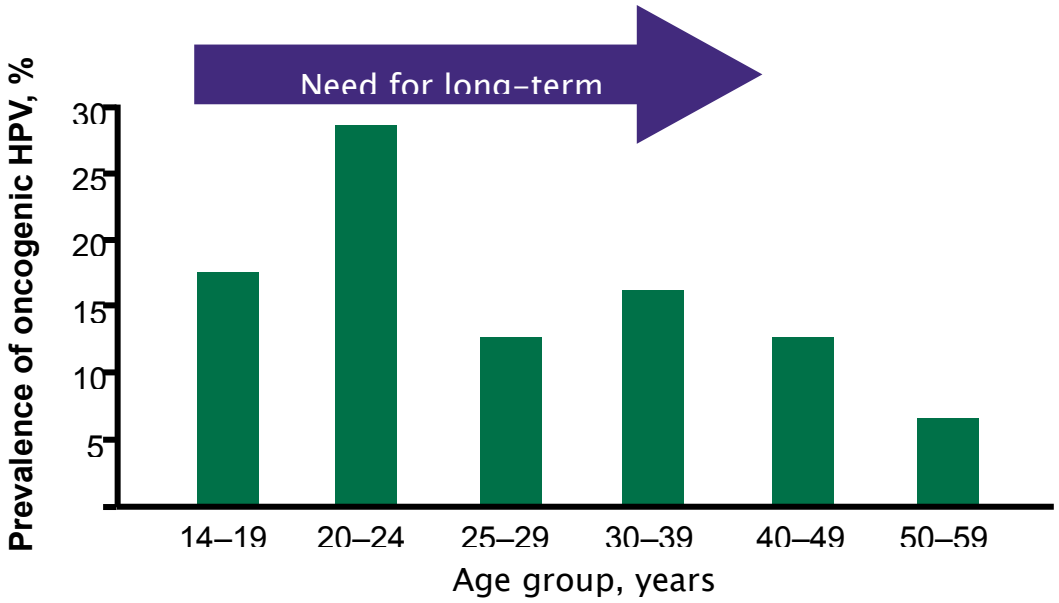


Figure 2:Prevalence of HPV in terms of age

2.2 Physiology of the cervix

The lower-most portion of the uterus is called the cervix, which is Latin for 'neck'. It is cylindrical in shape and consists of the ectocervix; the portion visible and accessible through the vaginal canal, and the endocervix; the internal, canal-like portion that opens up into the uterus. The cervix contains two types of cells, columnar and squamous epithelial cells. The former, form a single layer of mucus-secreting cells, primarily located in the endocervix while the latter are predominantly in the ectocervix. The transformation zone is the junction where the columnar cells meet the squamous layer. Normally, the fragile columnar epithelial cells are replaced with the more durable squamous multilayered cells over time in order to protect against the acid in the vagina. It has a high turnover rate and low maturation level of the cells. This makes it particularly vulnerable to pre-cancerous changes (dysplasia). (ASCCP, 2015)

In pre-adolescence, the endocervix is located on the vaginal portion of the cervix but retreats as the woman's age advances. At this stage, the exposure of the endocervix which

is linked to the primary site of infectivity of several STDs such as HIV, Chlamydia and HPV, makes the adolescents more susceptible to infection. This cervical biologic immaturity is an important risk factor for development of CIN in adolescent girls (Moscicki, Winkler, Irwin & Schachter, 1989). Thus HPV infection peaks before the age of 25 years. (Sellors, 2003)

2.3 Pathogenesis

The productive lifecycle of HPV is linked to epithelial differentiation. The virus attacks cells in the basal layer and establish their genome as nuclear episomes. The viral DNA is replicated together with the cellular chromosomes. A daughter cell then migrates through the basal layer and differentiates resulting in virion production with the help of genes (E1, E2, E6 and E7) responsible for the continued replication and evasion of immune mechanism and thus better survival of the virus. (Longworth, 2004) Since HPV remains entirely intraepithelial and can fail to trigger inflammation and an immune response, any immunity provided by early infections may not be sufficient to prevent subsequent infection. (Castle, 2005)

Figure 3: A parous cervix with pre-cancerous changes noted by the white area around the cervical os

2.4 GAP Initiative

The Global Alliance for Vaccines and Immunization, GAVI, a public-private global health partnership committed to increasing access to immunization in poor countries, together with WHO and other international nonprofit organizations launched the Gardasil® Access Program through Merck & Co.,Inc. (Corporate Responsibility Report, 2014) Kenya was selected as one of the participants and 9600 doses of the vaccine were supplied to the then national adolescent vaccination program coordinator who is currently an Obstetrician and Gynecologist attached to MTRH. The target population was medical school students, children of hospital staff as well as children in local primary schools within Eldoret.

The parents/guardians of children in the local primary schools were addressed during regular school Parent-Teacher Association (PTA) meetings. Thereafter the teachers were left with consent forms which they gave the students to take home in order to reach all the parents/guardians including those not present during the PTA meeting. The consent form included request for their telephone numbers and addresses in case they needed to be contacted further. The parents/guardians who gave consent for their daughters to be vaccinated brought them to the hospital (MTRH) where both the parents and children were counseled on the vaccine prior to vaccination.

The program coordinator kept a record of the children vaccinated as part of the hospital's records.

In a bid to examine the entire pathway that led to the uptake of the vaccine, Vermandere, Mabeya et al., (2015) carried out a longitudinal study restricted to randomly selected governmental primary schools for a hospital-based vaccination on Saturdays and

Wednesdays. The guardians had a pre- and post- vaccination interview session with the investigators. Their conclusion was the need for adequate information to the community about the vaccine and cervical cancer would determine the uptake of the vaccine as well as addressing the fears of potential side effects of the vaccine. It was also clear that there were socio-cultural influences on decision-making especially where partner consent was involved. It also showed that school-based vaccination was a better option as compared to hospital-based vaccination as it eliminates physical barriers such as accessibility and time.

The schools involved and number of students is illustrated in the table below:

Table 1: Number of schools and students vaccinated

SCHOOL	**VACCINATED**
Eldoret union	63
Huruma	82
Kapsoya	13
Kapyemit	5
Kimalel	9
Kimumu	41
Kipkaren	66
Langas	81
Tuiyobei	4
Uasin gishu	77
TOTAL	**441**

Mabeya (2018) went on to assess the level of awareness of cervical cancer vis à vis HPV among mothers of adolescents and discovered the awareness of cervical cancer was higher than that for HPV. He also identified a knowledge gap where adolescents were concerned, which led him to recommend the need for research into adolescents to further identify hindrances to HPV vaccine uptake for the purpose of program planning.

2.5 Knowledge of Cervical Cancer Among Adolescents

Generally, adolescents' awareness of risk factors for cancer is low. (Kyle, Nicoll, Forbat & Hubbard, 2013) Cross-sectional surveys conducted among school-attending adolescents aged 13 to 20 years showed that awareness and knowledge of sexually transmitted infections like HPV varied among the adolescents depending on gender (females being more knowledgeable). The lowest proportions were reported for HPV, with awareness as low as 5.4% in one study. (Samkange-Zeeb, Spallek & Zeeb, 2011)

Knowledge of cervical cancer is focused on the awareness of the risk factors, symptoms, causative agent (being the HPV virus) and preventive strategies such as the HPV vaccine, behavioral modifications as well as screening modalities.

A mixed methods systematic review to ascertain the level of HPV and HPV vaccine knowledge that exists among European adolescents showed that overall, European adolescents had poor understanding of basic HPV and HPV vaccine knowledge. (Patel, Jeve, Sherman & Moss, 2016) A nationwide survey of Hungarian primary and secondary going students, showed that only 35% of this population that is potentially susceptible to HPV infection had heard of HPV prior to the survey. (Marek et al., 2011) This was replicable in Puerto Rico where mothers as well as their daughters showed limited knowledge of HPV and cervical cancer in general and were very apprehensive on the implication and perceived risks of the HPV vaccine. (Fernández et al., 2014)

A comparative analysis in Uganda showed that, as expected, the vaccinated adolescents were more knowledgeable about cervical cancer than the non-vaccinated adolescents, however, this consisted only a minority of the vaccinated adolescents. (Turiho et al., 2015)

2.6 Acceptability of Cervical Cancer Prevention Strategies by Adolescents

Cervical cancer prevention strategies include primary prevention, which is predominantly by HPV vaccination.

2.6.1 HPV Vaccines

The years 2006 and 2007 witnessed progressive medical advancement with the inception of two vaccines for HPV. Merck's *Gardasil*®, is approved for use by girls and women ages 9-26 and protects against highly oncogenic strains 16 and 18 and also protects against low risk genital warts causing serotypes 6 and 11. It is administered intramuscularly in the deltoid region of the upper arm or in the higher anterolateral area of the thigh as a 0.5ml dose each, given at 0, 2 and 6 months.

In 2015, the US Food and Drug Administration (FDA) approved a new vaccine for Merck, the *Gardasil 9*®. It is indicated for girls in the 9 to 26 years' age bracket for the prevention of cervical, vulvar and anal cancers caused by HPV types 16, 18, 31, 33, 45, 52 and 58 as well as genital warts caused by HPV types 6 and 11 (Simon, 2015).

Table 2: Recommended dosing regimen for Gardasil 9®

Age	Regimen	Schedule
9 through 14 years	2-dose	0, 6 to 12 months[a]
	3-dose	0, 2, 6 months
15 through 26 years	3-dose	0, 2, 6 months
[a]If the second dose is administered earlier than 5 months after the first dose, administer a third dose at least 4 months after the second dose.		
As in the clinical trial If using the 2-dose schedule, the first dose must be administered before the child's 15th birthday.[20]		

Ermel, Omenge and Brown (2016) looked at the HPV type distribution in invasive cervical cancer in the U.S., Kenya and Botswana. Their results showed that the percentages of invasive cervical carcinoma covered by the bivalent/quadrivalent HPV vaccines were 93.5, 93.9, and 61.8 % respectively, and these values increase to 100, 98, and 77.8 % for the nanovalent vaccine.

GlaxoSmithKline developed *Cervarix*®, a bivalent vaccine protective against HPV type 16 and 18 that are linked to over 70% of the cancers. It consists of 3 doses of 0.5 ml each in a prefilled TIP-LOK® syringe. The schedule is at 0, 1 and 6 months. It is given only as an intramuscular suspension preferably in the deltoid region of the upper arm.

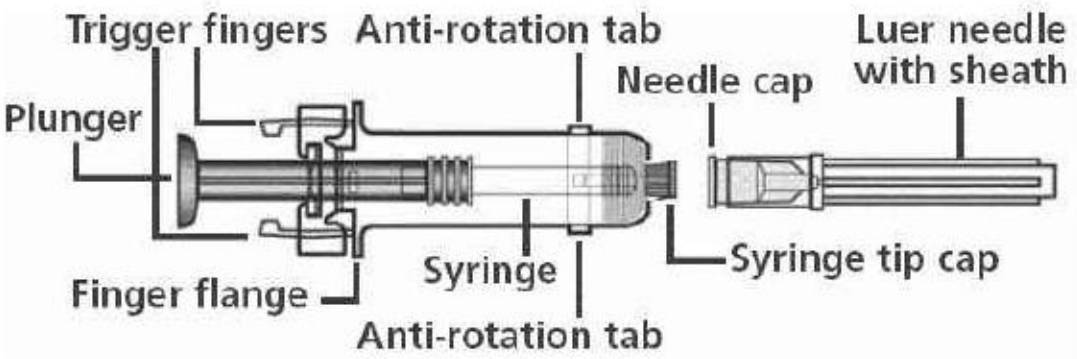


Figure 4: The prefilled TIP-LOK® syringe

Both vaccines have a low risk profile as they consist of papilloma-like particles which are basically empty shells of viral structural proteins from brewer's yeast and thus cannot transmit the virus. The commonest adverse effect included pain at the injection site and low grade fever. (ACS, 2006) In 2008, fainting and nausea was reported in 94% of adolescents vaccinated with *Gardasil*® but it resolved within 15 minutes. (FDA, 2008)

The HPV vaccines have peak efficiency among young females at the age of 9 to 15 years if given before the first coitus. This is because the antibody response is high in this age group and vaccine efficacy is highest in those who are naïve to vaccine- specific oncogenic HPV types. Clinical trials evidenced a 100% protection against persistent HPV infection in the 20,000+ girls and women vaccinated but they do not eliminate an already existing infection. (Markowitz, 2006)

Immunogenicity and safety studies were conducted for the quadrivalent vaccine in females aged 9 to 15 (Reisinger et al, 2007) and for the bivalent vaccine in females aged 10–14 years of age to bridge the antibody titers to females in the efficacy trials. (Einstein et al, 2009) For both vaccines, over 99% of study participants developed antibodies after vaccination; titers were higher for young girls than for older females participating in the efficacy trials. Mugo and her colleagues (2015) evaluated the safety and immunogenicity of a quadrivalent human papillomavirus vaccine in healthy females between 9 and 26 years in Sub-Saharan Africa and found that the commonest side effects were pain in the injection site, swelling and erythema but there were no serious consequences e.g fatalities which addresses several safety concerns in the vaccine debate.

2.6.2 HPV Vaccine and Boys

Brown and White in 2011 posed the question "*Could Male Vaccination Have a Significant Impact?*" They were answered by the data from clinical trials which demonstrated high efficacy of the quadrivalent vaccine against HPV vaccine type-related genital warts and anal HPV vaccine type-related precancers among males aged 16–26 years. (Giuliano et al, 2011) These data resulted in FDA licensure of the quadrivalent

vaccine for prevention of genital warts and anal cancers among males aged 9–26 years. (MMWR, 2010)

The Center for Disease Control and Prevention (CDC, 2016) recommends vaccination for boys up to 21 years of age. It also includes the following population:

- young men (up to age 26) who have or intend to have sex with men; can either be gay or bisexual
- young adults (up to age 26) who are transgender
- young adults (up to age 26) with immunocompromising conditions e.g. HIV

The Cancer Research UK (2013) have recorded a sharp rise in oral cancers from 4,400 a year in 2002 to 6,200 in 2012 with two thirds of the cases reportedly occurring in men. The rise in cases has been attributed to high risk strains of HPV spread via oral sex in heterosexual couples and men who have sex with men. This led the National Health Service, NHS (2013) with the backing of a report from the Joint Committee on Vaccination and Immunization (JCVI) to advice the use of the HPV vaccine on boys to protect against genital warts.

German gynecologists have shown a remarkable willingness to vaccinate their sons as they do agree it will decrease the disease burden among males and will also aid in the protection of women due to an interrupted transmission. However most have not vaccinated their boys due to lack of cost coverage for boys in the country (Kolben et al., 2016).

Australia became the first country to vaccinate boys as part of their national adolescent vaccination program. (Hitt, 2012) Male vaccination however is not in the national

guidelines of most countries as studies are still ongoing on the same but there has been high uptake on individual basis.

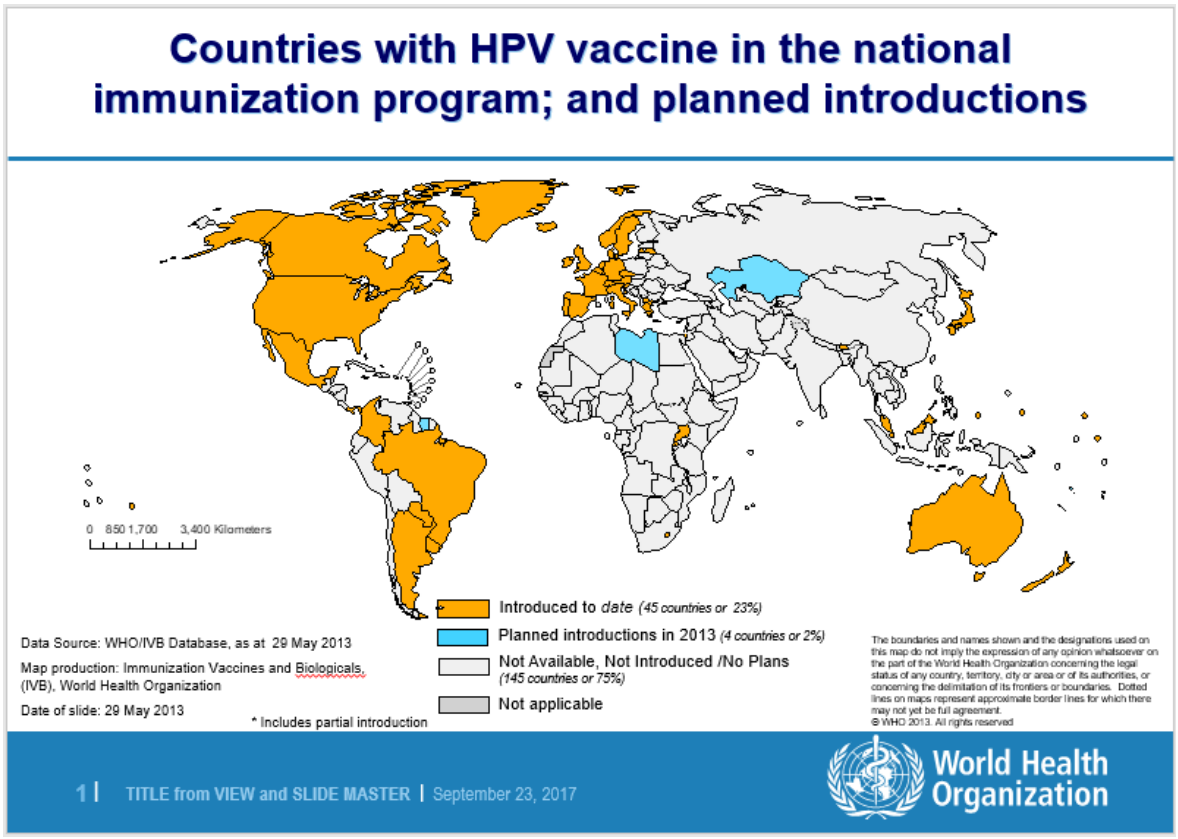


Figure 5: HPV Vaccine Utilization, WHO, 2013

2.6.3 Knowledge and Acceptability of women on HPV vaccine

Weiss et al (2011) set out to identify the attitudes of women aged 27-45 in the US in relation to the HPV vaccine. Their conclusion was that most women felt the HPV vaccine was relevant to them because of its ability to protect them from HPV infection and HPV-related diseases. The majority of women in this group said they were likely to consider vaccination if the vaccine became available to their age group. Women who did not feel the vaccine was relevant did not perceive themselves at risk for HPV infection or HPV-related diseases.

In an attempt to determine ethnic diversity in decision-making over vaccination of their daughters, Allen and her colleagues established that most white participants were ready and willing to participate in the vaccination program for their daughters. Hispanic men deferred the decision to their female counterparts who as much as were willing to take an active role in the decision-making process, preferred to let their daughter's care giver make the decision. The African American population sampled showed they preferred the primary female caregiver to make the decision without necessarily involving the daughter. Across the board, there was reported lack of information and general concern about the safety of the vaccine. (Allen et al, 2011)

Among African parents in a city in the north of England, Mupandawana and Cross (2016) showed that HPV and cervical cancer awareness was low with fathers being the least informed. It was found that HPV vaccination was unacceptable due to unfounded fears of promiscuity, infertility and general fear of potential adverse effects from a relatively new vaccine with possibility of undiscovered side effects. There was also significant HPV risk denial due to the perception of religion, good upbringing and the assumption that it was a 'white person's disease'.

In a study in Kenya in 2010, it was shown that most Kenyan women had very little knowledge about HPV let alone the HPV vaccine and some even confused it with HIV or Hepatitis B. They were willing to let their daughters be vaccinated if it meant prophylaxis against cancer however they would prefer a more inexpensive option with fewer dosages. (Becker-Dreps et al, 2010)

It is clear that both in the developed and developing worlds there is still insufficient knowledge of the HPV vaccine. In developed countries, the underserved communities

have the most ignorance about the same. African Americans show the most resistance to the inception of the vaccine and are not willing to share this information with their daughters. It is therefore not surprising to find very little knowledge in Kenya about the HPV infection and the vaccine. It is however very encouraging to see that Kenyan women are very willing to get their daughter's vaccinated should they be given a chance.

2.6.4 Kenya National Guidelines on HPV vaccine

The Kenya National Guidelines on HPV vaccine sets its recommendations for a target population of pre and young adolescent girls before first coitus, generally age 9-13. It accepts both the bivalent and quadrivalent vaccine. The best approach recommended is in line with the free primary education thus a school-based program targeting classes 4-8. For the out of school population, they will be reached via in reach and outreach approaches. Of note is the acceptance of catch up vaccination for non-sexually active older girls however booster vaccination is not recommended due to the lack of data on efficacy as of the time of the policy-making.

In an attempt to see how the vaccine can be propagated, Allison Friedman (2012) carried out a study in Western Kenya where she interviewed both caregivers and opinion leaders. She found that cervical cancer was not commonly recognized and the fact that it was associated with the genital organs it created much fear and stigmatization. Overall acceptability of the vaccine was quite high as long as it was endorsed and the community was sensitized by reputable channels. She concluded that for successful vaccination introduction in Kenya, there was need to promote cervical cancer awareness in a way that can reduce the stigmatism associated with it and to provide reassurance for the safety and efficacy of the vaccine.

It is clear that Kenyans are quite willing to take responsibility for their daughters' as well as their own health in terms of primary prevention of cervical cancer. It is imperative to include the adolescents in the cervical awareness programs and generally provide the public an opportunity to learn of the benefits afforded by the vaccine.

2.6.5 Vaccine Acceptability to Adolescents

While looking at adolescent acceptance of the HPV vaccine in New York, Blumenthal and her colleagues (2012) found a marginal willingness to receive the vaccine and this was attributed to lack of knowledge about HPV and cervical cancer. Of the 223 surveyed adolescents, 4% believed they were at risk of HPV infection.

In contrast, adolescents in Haiti, Greece, India, Saudi Arabia, had very little knowledge about HPV vaccines and cervical cancer but were very recipient of the idea of the vaccination for themselves (Gichane et al., 2017, Vaidakis et al., 2017, Rashid, Labani, & Das, 2016 and Hussain et al., 2016).

However, in Kenya, there is very little data on how adolescents perceive the HPV vaccine and what knowledge they have on the transmission of HPV and its correlation to cervical cancer.

2.6.6 Behavioral Modification

The main behavioral risks associated with incidence of cervical cancer include early age of sexual debut, smoking, multiple sexual partners and lack of use of protection during intercourse increasing risk of STIs like HIV/AIDS, *Trichomonas vaginalis* and *Chlamydia trachomatis*. (Tao et al., 2014) Due to the sexualization of cervical cancer, there has been a great deal of stigmatization of this disease yet this is the main avenue for

information dissemination to influence behavioral adaptations in a sociocultural context that guarantee its eradication. (D'Orazio, Taylor-Ford & Meyerowitz, 2014)

Adolescents unanimously associate cigarette smoking with increased risk of cancers. (Kyle, Nicoll, Forbat & Hubbard, 2013)

In the United States, most adolescents have their sexual debut by the 12th grade (age 17-18) but this may be a gross underestimate. (Cavazos-Rehg et al., 2009) Age of sexual debut in Kenya has declined to 12 years. (Kenya HPV Factsheet, 2017) which is in line with overt social media exposure and promotion of sex in advertisements and programs.

Lindberg & Maddow-Zimet (2012) proved that receipt of sex education, regardless of type, was associated with delays in first sex for both genders, as compared to receiving no sex education. The importance of this is that sexually active adolescents have the highest rates of prevalent and incident HPV infection rates with over 50–80% having infections within 2–3 years of initiating intercourse. (Moscicki, 2007) There is little data on the views of Kenyan adolescents in terms of the benefits of delaying sexual debut.

Condom use by adolescents has been attributed to prevention of pregnancy and HIV predominantly. (Grandahl et al., 2016) The uptake of condom still remains low mainly due to sociocultural inhibitions to the adolescent use of condoms. Condoms do not protect against HPV infection but in preventing other STIs, it remarkably reduces the risk of acquiring HR-HPV. Thus the importance of educational interventions targeting socially and economically disadvantaged women in which information provision is complemented by sexual negotiation skill development can encourage sexual risk reduction behavior. This effect has the potential to reduce the transmission of HPV and

thus possibly reduce the incidence of cervical carcinoma. (Shepherd, Peersman, Weston & Napuli, 2000)

In Kenya, barriers to contraceptive use including condoms has been attributed to myths and misconceptions. (Ochako et al., 2015) There is little information on whether adolescents share in these misconceptions and the barriers they face when it comes to use of condoms.

2.6.7 Screening

The current vaccines only protect against 70% of disease and are only effective for those not yet exposed to the virus so there is a generation of women who will be helped by screening. (Kerr & Fiander, 2009)

Most studies show a marginally low acceptability to cervical cancer screening by adolescents. This apprehension has been predominantly associated with their lack of knowledge of the methods available. (Zouheir, Daouam, Hamdi, Alaoui & Fechtali, 2016)

Adolescents are self-conscious about their body image and will therefore resist intimate examinations by health professionals. Following educational surveys, use of the self-test for HPV detection has proven to be very popular among adolescents and thus is an excellent avenue to increase compliance to clinical recommendations and protocols for cervical screening in this age group. (Kahn, Rosenthal & Huang, 2004 and Quincy, 2014)

There is little information on how adolescents in Kenya perceive cervical cancer screening and whether they find the methods acceptable.

CHAPTER THREE: METHOD

3.1 Study Design

This cross sectional comparative study was carried out in selected schools from the GAP vaccination initiative.

3.2 Study Setting

The study was set in Uasin Gishu County, among schools in the once known Eldoret Municipality. The public schools that were selected for the GAP initiative were the same ones used for this study as representative of the population (See Appendix 4).

3.3 Study Population

The study population was the adolescents in Uasin Gishu County age 9-14 years.

3.4 Sample Size Determination

The objective of the study was to compare knowledge of cervical cancer and acceptability of cervical cancer prevention strategies between primary school going adolescent girls who were vaccinated and those who were not vaccinated. The sample size estimated was one that would be sufficiently powered to assess the difference in knowledge between the two groups. The sample size obtained would also be sufficient to assess the acceptability with enough power to detect the differences between the two groups. Literature showed that up to 22.6% of the vaccinated adolescents were knowledgeable compared to 5.3% among those who were not vaccinated (Patel, H., 2015) Due to the wide difference, an effect size of 15% was selected for sample size computation. Thus, in order to be 95% sure with probability 80% that this difference would be captured in this study, the sample was estimated using the following formula (Sullivan, K., 2007):

$$n = \frac{r+1}{r} \times \left(\frac{Z_{1-\alpha/2} + Z_{1-\beta}}{p_1 - p_2} \right)^2 \times \bar{p} \times (1 - \bar{p})$$
$$= \frac{3}{2} \times \left(\frac{1.96 + 0.84}{0.23 - 0.08} \right)^2 \times 0.13 \times (1 - 0.13)$$
$$= 60$$

The value p_1 represents the proportion of knowledgeable participants among those who were **not** vaccinated, which is 8%; p_2 is the proportion of knowledgeable participants among those who were vaccinated, which is 23%. For $\bar{p} = (r \times p_1 + p_2) / r + 1$, r is the ratio of the unvaccinated to the vaccinated participants, and n is the number of vaccinated participants. The chosen ratio is therefore two unvaccinated for every one vaccinated adolescent by using the sample size of an unmatched case control study (Sullivan, K., 2007). So the number of vaccinated adolescents needed for this study will be 60 while the number of unvaccinated adolescents will be 120.

3.4.1 Sampling

Preliminary data from MTRH showed that 441 adolescents from 10 primary schools were immunized. Multi-stage sampling done by cluster random sampling of the schools into two groups each containing three schools. One cluster contained schools for selection of vaccinated adolescents (Eldoret Union, Huruma and Langas) and the second cluster contained the schools to be used to select unvaccinated adolescents (Kapsoya, Kimumu and Kipkaren). Simple random sampling was then used to select the adolescents by proportionate allocation of the sample size in order to have 60 for vaccinated and 120 for non-vaccinated. The distribution of participants is as per Figure 6:

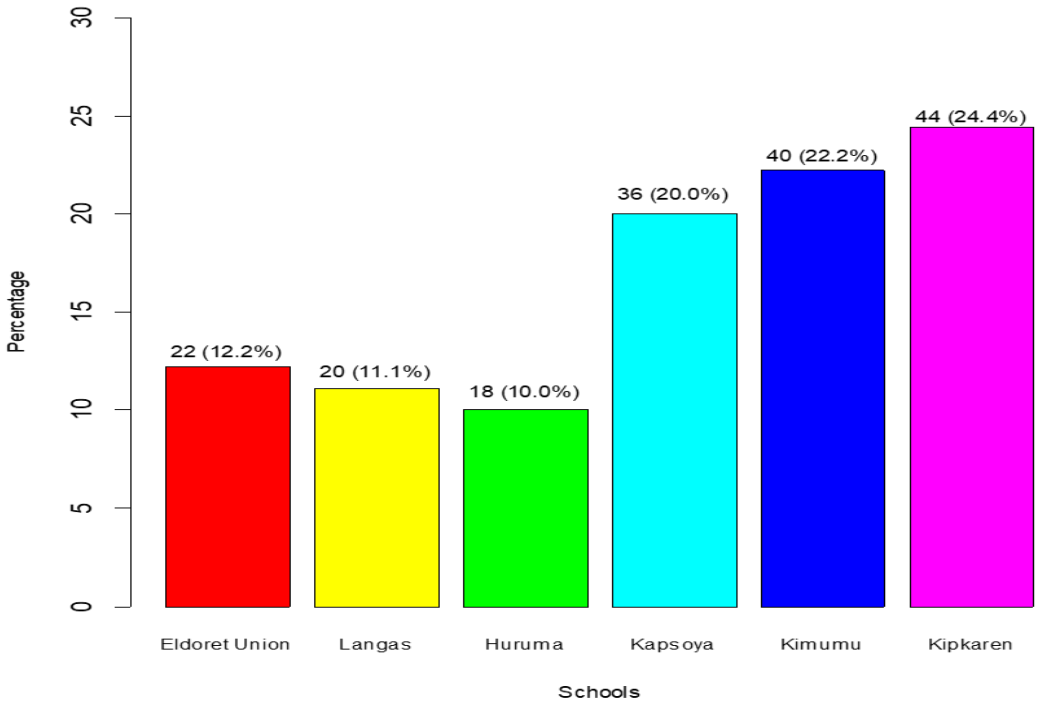


Figure 6: Distribution of the participants by schools

3.5 Inclusion and Exclusion Criteria

3.5.1 Inclusion Criteria

- Girls who were vaccinated as part of the GAP initiative.
- They should have been between age 9 and 14 years at the time of vaccination.
- Girls of the same age group who were not vaccinated during the time of the program

3.5.2 Exclusion Criteria

- Any girl vaccinated as part of a personal initiative and not under the GAP initiative.
- Girls vaccinated when they were older than 9-14 years.
- Girls who have left the schools since the vaccination program

3.5.3 Study Procedures

Ethical approval to carry out the study was obtained from IREC (FAN:1625). The head teachers of the 6 schools selected were given a letter of intent, describing the study procedure and what was required. After they gave their verbal consent, the head teachers gave the principal investigator a date and time to return to the schools for the interviews. Universally, the acceptable time was at 3pm when the students were out for games thus not interrupting their learning schedules. On the day of the interviews, the head teacher introduced the principal investigator to the teachers and selected 2-3 teachers to aid in gathering the students. From the vaccination records, the vaccinated students in each of the three schools selected for sampling vaccinated adolescents were identified gathered in a group and the study explained to them. The students who gave verbal assent were then led into classrooms where they were supplied with consent forms to take home to their parents.

In the schools selected for non-vaccinated adolescents, the vaccination records were used to ensure none of the girls selected for interview had been previously vaccinated and the rest of the procedure was the same. On the day of the survey, the students returned the consent forms and those selected were assembled in one or two rooms where the pre-tested interviewer-administered questionnaire was used. Individually and confidentially, each girl filled the questionnaire under close supervision of the researcher and research assistant.

Following the completion of the surveys, the principal investigator gathered the students, those who participated in the study and those who did not (boys included), and gave a health talk on cervical cancer and had a question and answer session with the students

about reproductive health in general. At the behest of the head teachers, the principal investigator returned on separate dates and educated the teachers on cervical cancer and screening.

3.6 Data Collection Instruments

The primary tool was an Interviewer-administered questionnaire. The tool was largely based on a validated questionnaire used to assess knowledge of cervical cancer amongst adolescents in Uganda. (Turiho, 2015) For this study, it was pre-tested in two of the schools that had participated in the vaccination initiative but which were not included in my study.

3.7.1 Data Management

The gathered data was de-identified and entered into an electronic database. The database was encrypted to ensure confidentiality of the data, and the password made available to the principal investigator alone. Back up of the data was done to cushion against loss. Once the data had completely been converted into the electronic database, the questionnaires were kept in a safe cabinet under lock and key, and access will be allowed to the principal investigator alone. They will be shredded after five years.

3.7.2 Data Analysis

Categorical variables were summarized using frequencies and the corresponding percentages. Continuous variables were summarized using mean and the corresponding standard deviation if the Gaussian assumptions were holding. The median and the corresponding inter quartile range whenever the Gaussian assumptions were violated. Gaussian assumptions were assessed using Shapiro-Wilk test, the normal probability plots and histograms.

Proportions were compared using Pearson's Chi Square test. However, whenever the Chi Square assumptions were violated, Fisher's exact test was used. Normally distributed continuous variables were compared between two levels of a categorical variable using independent sample t-test or one-way Analysis of Variance (ANOVA) test between more than two levels of a categorical variable. The two-sample Wilcoxon rank sum test was used to compare two continuous variables whenever the Gaussian assumptions were violated.

The knowledge level on cervical cancer and HPV vaccine was assessed through responses to twenty-six factual statements based on information from print material used for community sensitization on cervical cancer. Some statements were correct while others incorrect. A correct answer was scored 1 and an incorrect answer was scored as 0, then all responses were summed. The derived score was converted to percentage by dividing by the maximum possible score of 26 and multiplying by 100. The knowledge score was compared between the vaccinated and the unvaccinated using a linear regression model adjusting for potential confounding variables. This was reported by the regression estimates and the corresponding 95% confidence intervals (95 CI). Data analysis was done using R: A language and environment for statistical Computing (R core team, 2017).

Results were presented using tables and graphs.

3.8 Ethical Issues

1. IREC approval for the study was obtained before the study commenced
2. Permission to conduct the research was obtained from the various schools that participated in the previous study.
3. Informed written consent was obtained from parents of the participants before their enrolment into the study.
4. Informed verbal assent was gotten from the participants.
5. Education and counseling services was provided freely to all participants as well as students and teachers from the schools.
6. Confidentiality was maintained strictly by storing the questionnaires in locked data cabinets, databases were pass worded with password known only by the principal investigator.

CHAPTER FOUR: RESULTS

Demographics

The median age of all 180 participants was 14.0 years (IQR: 13, 15.0) with a range of 12.0 to 19.0 years. Eighteen of 180 girls (10%) were in class six (12 to 13 years of age), 56 of 180 girls (31.1%) were in class seven (13 to 14 years of age), and 106 of 180 girls (58.9%) were in class eight (14 to 15 years of age). No vaccinated girls were in class six, Forty-nine of the 60 (81.7%) vaccinated adolescents were in class eight, and the mean age for vaccination was 14 years.

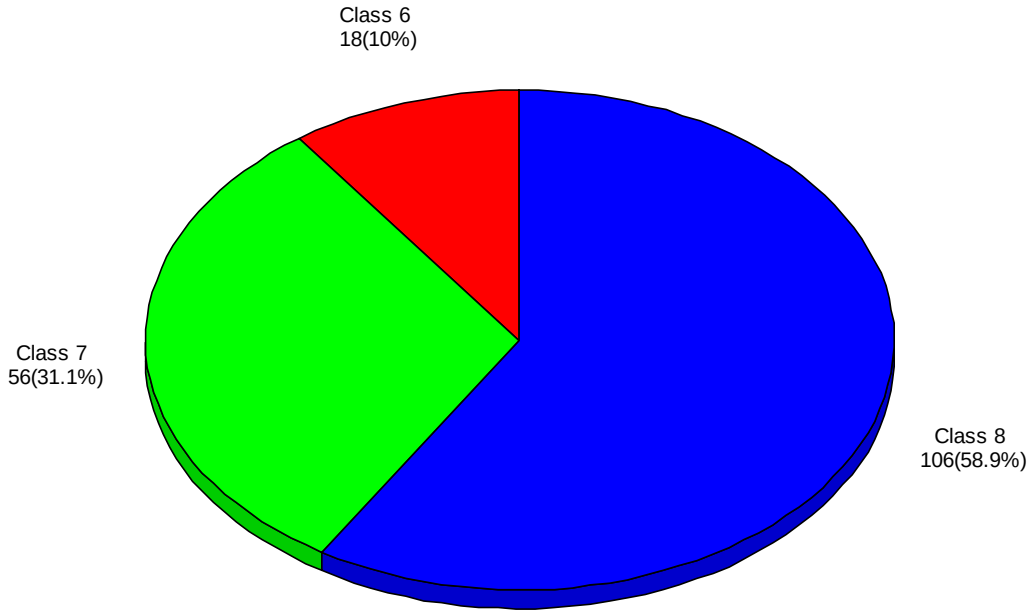


Figure 7: Current class

The current classes were six, seven and eight as shown in Figure 7.

Data collected on each parent was to show their level of education and their presence in the girl's life over the past one year. The level of education ranged from no education (none) to tertiary level. Parents who were deceased, divorced or separated were termed as "Not around". Notably, the father was the missing element in the family unit with 61

(33.9%) being reported as being absent in the adolescent's life over the last one year preceding the study. The parent's levels of education were as shown in Figure 8.

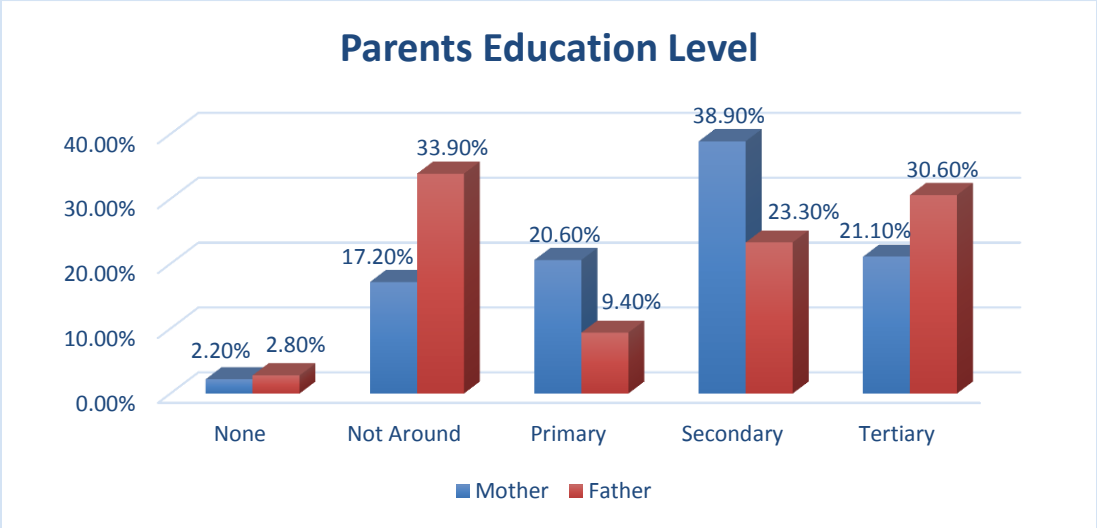


Figure 8: Parent's levels of education

Comparison of those who had received HPV vaccine to those who had not, showed that the median ages were similar at 14.0 years (IQR: 13.0, 15.0), p = 0.213. In terms of distribution among the different classes, 81.7% (49/60) of the vaccinated adolescents were in class 8 and 47.5% (57/120) of the unvaccinated adolescents were in the same class with the remaining 11 (18.3%) from the vaccinated cohort being in class 7 as seen in Table 3.

The education level reported for the mothers of the study participants with the highest selection was high school, which was similar for both cohorts of vaccinated and unvaccinated adolescents, [50 from vaccinated cohort (49.0%) and 20 from unvaccinated group (42.6%) respectively, p = 0.577]. For the fathers, it was a tertiary level of education which again was similar in the two cohorts, [37 (42.0%) of vaccinated and 18 (58.1%) from unvaccinated, p=0.184].

Table 3. Demographics of participants vaccinated or unvaccinated against HPV

		Vaccinated		
		No (N = 120)	Yes (N = 60)	
Variable		Median (IQR[a]) or N (% of participants)		P-value[*]
Age (years)		14.0 (13.0, 15.0)	14.0 (13.0, 15.0)	0.213[w]
Current class	Six	18 (15.0)	0 (0.0)	0.004[c]
	Seven	45 (37.5)	11 (18.3)	0.014 [c]
	Eight	57 (47.5)	49 (81.7)	<0.001 [c]
Mother's Education level (n=149)	None	4 (3.9%)	0 (0.0%)	0.308[f]
	Primary	24 (23.5%)	13 (27.7%)	0.735[c]
	Secondary	50 (49.0%)	20 (42.6%)	0.577[c]
	Tertiary / College	24 (23.5%)	14 (29.8%)	0.541[c]
Father's Education level (n=119)	None	5 (5.7%)	0 (0.0%)	0.325[f]
	Primary	12 (13.6%)	5 (16.1%)	0.966[c]
	Secondary	34 (38.6%)	8 (25.8%)	0.286[c]
	Tertiary / College	37 (42.0%)	18 (58.1%)	0.184[c]

Notes:
[a]Interquartile range
[w] Two-sample Wilcoxon rank-sum test; [c] Pearson's Chi Square test, [f] Fisher's Exact test.
[*]Significance is at $P \leq 0.05$

Knowledge

The difference between the two cohorts for knowledge of the HPV vaccine was significant (p < 0.001) with 93.3% (56/60) vaccinated adolescents having prior knowledge of it as compared to 5% (6/120) in unvaccinated group. There was a similar trend seen in identification of transmission pathways for HPV where 41.7% (25/60) of the vaccinated adolescents and only 5% (6/120) of unvaccinated adolescents correctly selected sexual contact as the main mode of transmission (p <0.001). Table 4

In terms of knowledge of risk factors for cervical cancer, 93.3% (56/60) of the vaccinated adolescents compared to 70.8% (85/120) unvaccinated adolescents, knew that an early sexual debut was a predisposing factor for cervical cancer, p = 0.001.

Other risk factors; smoking, having multiple sexual partners, and having a partner with multiple sexual partners, were identified similarly by the two cohorts as predispositions to cervical cancer as seen in Table 4.

Table 4. Comparison of knowledge of cervical cancer, HPV and its risk factors

Variable	Vaccinated		P-value*
	No (120)	Yes (60)	
	N (% of participants)		
General knowledge:			
Heard of cervical cancer *(yes)*	61 (50.8)	58 (96.7)	<0.001[c]
Heard of HPV vaccine *(yes*)	6 (5.0)	56 (93.3)	<0.001 [c]
HPV Transmission:			
Sexual contact *(correctly responded yes)*	6 (5.0)	25 (41.7)	<0.001 [c]
Blood transfusion *(incorrectly responded yes)*	6 (5.0)	8 (13.3)	0.074 [f]
Don't know	108 (90.0)	27 (45.0)	<0.001 [c]
Cervical cancer risk factors[a]:			
Early sexual debut	85 (70.8)	56 (93.3)	0.001 [c]
Smoking	62 (51.7)	33 (55.0)	0.792 [c]
Multiple sexual partners	90 (75.0)	49 (81.7)	0.414 [c]
Male partner with multiple partners	101 (84.2)	49 (81.7)	0.832 [c]

Notes:
[a]Correctly answered yes
[c] Pearson's Chi Square test; [f] Fisher's Exact test
*Significance is at $P \leq 0.05$

Comparison of the knowledge of signs and symptoms of early and late stage cervical cancer among the vaccinated and unvaccinated groups showed that 8.3% (10/120) of the unvaccinated adolescents knew that cervical cancer was largely asymptomatic in its early stages as compared to only 3.3% (2/60) from the vaccinated group. There was no

significant difference in the selection of signs and symptoms of late stage cervical cancer between the vaccinated and unvaccinated adolescents (Table 5).

Table 5. Comparison of knowledge of symptom profile, treatment and screening modalities for cervical cancer

	Vaccinated		
	No (N = 120)	Yes (N = 60)	
Variable	**N (% of participants)**		**P-value**
Correct responses for symptom profile			
Early stage cervical cancer			
Rare	10 (8.3)	2 (3.3)	0.342[f]
Late stage cervical cancer			
Lower abdominal pain	69 (57.5)	47 (78.3)	0.010[c]
Vaginal bleeding	73 (60.8)	38 (63.3)	0.871[c]
Vaginal discharge	75 (62.5)	35 (58.3)	0.705[c]
Anemia	43 (35.8)	26 (43.3)	0.416[c]
Post-coital bleeding	61 (50.8)	37 (61.7)	0.224[c]
Urine & fecal incontinence	38 (31.7)	30 (50.0)	0.026[c]
Weakness	78 (65.0)	45 (75.0)	0.234[c]
Correct responses for treatment options			
Chemotherapy	22 (18.3)	46 (76.7)	<0.001[c]
Radiation	9 (7.5)	29 (48.3)	<0.001[c]
Surgery	18 (15.0)	36 (60.0)	<0.001[c]
Don't know	79 (65.8)	5 (8.3)	<0.001[c]
Cervical cancer can be prevented	102 (85.0%)	58(96.7%)	0.036[c]
Correct responses for screening options			
Blood tests	40 (33.3)	32 (53.3)	0.015[c]
Pap smear	11 (9.2)	10 (16.7)	0.218[c]
VIA[b]	13 (10.8)	7 (11.7)	>0.999[c]
Don't know	60 (50.0)	21 (35.0)	0.080[c]

Notes:
[b]Visual Inspection with acetic acid
[c] Pearson's Chi Square test; [f] Fisher's Exact test
Significance is at $P \leq 0.05$

Comparison of the treatment modalities showed that the adolescents who had been vaccinated were more likely to select chemotherapy, radiation or surgery as viable treatment modalities for cervical cancer as seen in Table 5.

Fifty-eight of the 60 adolescents in the vaccinated group were of the opinion that cervical cancer could be prevented (96.7%). A similar opinion was expressed by 85.0% (102/120) unvaccinated participants.

There was no statistical significance in the difference between the vaccinated and unvaccinated adolescents when selecting screening modalities for cervical cancer (Table 5) with only 10 of the 60 vaccinated adolescents and 11 of the 120 unvaccinated correctly selecting pap smear as a screen test and only 7 of the 60 vaccinated adolescents and 13 of the 120 unvaccinated correctly selecting VIA.

Table 6: Comparison of the cervical cancer knowledge score between the vaccinated and unvaccinated participants

Variable		N	Knowledge score Mean (SD)	P-value
Vaccinated	No	120	22.9 (6.6)	
	Yes	60	37.6 (7.4)	<0.001[a]
Age (Years)	12	18	25.4 (7.2)	
	13	52	27.7 (10.2)	
	14	58	28.2 (10.3)	0.848[a]
	15	32	28.4 (9.1)	
	16+	20	28.5 (10.4)	
Class	6 or 7	74	24.8 (6.1)	
	8	106	30.0 (10.1)	<0.001[a]
Mother's Level of Education	Parent NOT around	31	27.5 (8.7)	
	None	4	24.0 (1.9)	
	Primary	37	27.9 (11.9)	0.692[a]
	Secondary	70	27.2 (9.2)	
	Tertiary	38	29.7 (9.8)	
Father's Level of Education	Parent NOT around	61	30.3 (10.3)	
	None	5	24.6 (7.0)	
	Primary	17	21.5 (7.1)	0.016[a]
	Secondary	42	28.0 (9.2)	
	Tertiary	55	27.2 (9.6)	

Notes:
[a] One-way Analysis of variance (ANOVA)
Significance is at $P \leq 0.05$

When subjected to a multivariate analysis, the findings demonstrate a significantly higher knowledge score among the participants who had been vaccinated [Mean = 37.6 (SD: 7.4)] compared to those unvaccinated [Mean = 22.9 (SD: 6.6)], p <0.001. Interestingly, there was no difference in the knowledge score as categorized by age (p = 0.848).

Assessment of level of primary education in association to knowledge score (Table 6) showed that participants who were in class 8 were more likely to have a higher knowledge score [Mean = 30.0 (SD: 10.1)] compared to those who were in class 6 or 7

[Mean = 24.8 (SD: 6.1)], $p < 0.001$. This was further subjected to a regression model to ascertain if 'class' was a viable predictor of knowledge as shown in Table 7.

Moreover, the education level or presence of the parent (mother or father) in the adolescent's life had no statistical significance in determining whether the adolescent would have a better knowledge of cervical cancer.

Table 7: Predictors of knowledge of cervical cancer derived by logistics regression analysis

Variable	Unadjusted OR* (95% CI)	Adjusted OR* (95% CI)
Vaccinated	14.7 (12.6, 16.8)	14.4 (12.2, 16.7) †
Class 8	5.3 (2.5, 8.1)	0.7 (-1.4, 2.9)

Notes:
*Odds ratio: Subject to logistics regression, only a positive vaccination status was the true predictor of knowledge of cervical cancer with grade 8 not increasing the chance of being knowledgeable.
†Significance is at $P \leq 0.05$

In bivariate logistics regression, adolescents who were vaccinated were more likely to be knowledgeable about cervical cancer than the unvaccinated counterparts, the education level (class) notwithstanding (Adjusted Odds Ratio, AOR ,14.4; 95% CI: 12.2-16.7).

Source of Information

The sources of information were assessed through response to the questions "*Have you ever heard of the HPV vaccine*?" and "*Have you ever heard of cervical cancer?*". From the vaccinated cohort, 33.9% (19/60) had heard of cervical cancer from the GAP initiative, 30.4% (17/60) from school health talks and 14.3% (8/60) had heard of it from a health professional. Out of 120 unvaccinated adolescents, only 3 had heard of the vaccine

with one having heard of it from a health professional while 2 had heard of it from the school.

There was no statistical difference in the participants' source of information about cervical cancer as both cohorts reported receiving this information predominantly from the school during health talks [34.5% (20/60) vaccinated adolescents; 36.1% (22/120) unvaccinated], $p > 0.999$. Other sources included social media [13 vaccinated adolescents (22.4%); 19 unvaccinated adolescents (31.1%)], health professional/doctor [13 vaccinated adolescents (22.4%); 5 unvaccinated adolescents (8.2%) as well as from a family member or friend who had suffered from it [11 (19%) of the vaccinated adolescents; 11 (18%) of the unvaccinated adolescents].

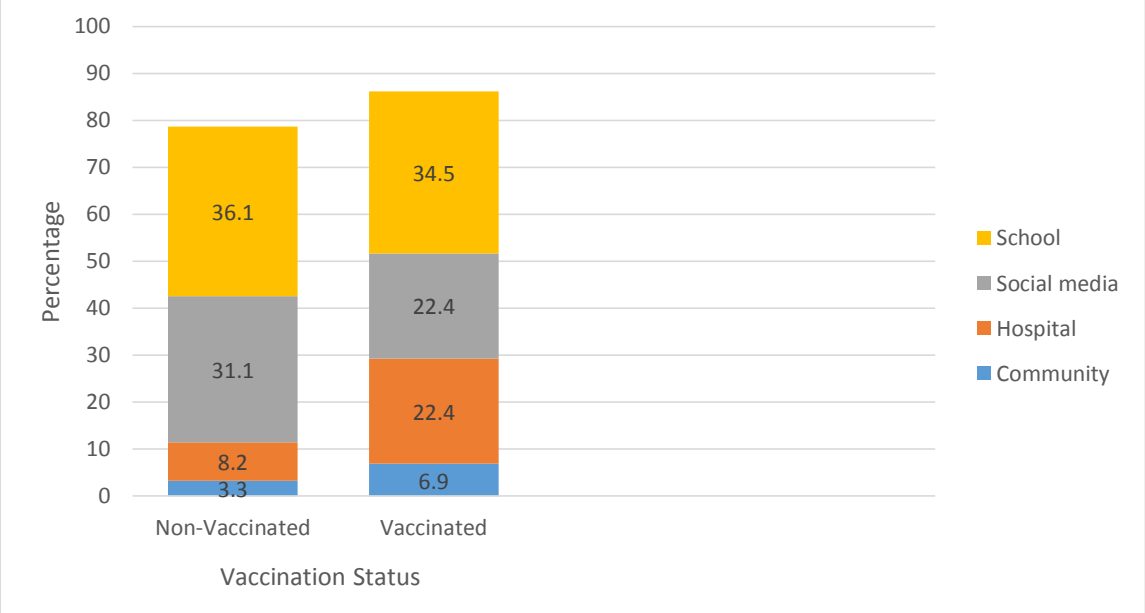


Figure 9. Comparison of sources of information for the vaccinated and unvaccinated adolescents

Acceptability of cervical cancer prevention strategies

Table 8: Comparison of acceptability of prevention strategies for cervical cancer among participants unvaccinated or vaccinated against HPV

	Vaccinated		
	No (N =120)	Yes (N = 60)	
Variable[a]	**N (% of participants)**		**P-value**
Self-perceived risk of HPV infection	27 (22.5)	32 (53.3)	<0.001[c]
Acceptable age of sexual debut			
10 - 20 yrs	2 (1.7)	0(0.0)	0.553[f]
21 - 30 yrs	68 (56.7)	32 (53.3)	0.791[c]
≥ 31 yrs	50 (41.7)	28 (46.7)	0.632 [c]
Acceptable frequency of using condom (n = 178)[b]			
Always	87 (73.7)	41 (68.3)	0.561[c]
Sometimes	21 (17.8)	12 (20.0)	0.878[c]
Never	10 (8.5)	7 (11.7)	0.678[c]
Would accept to receive HPV vaccine (n=118)[g]	***75 (63.6)***		
Would accept to be screened for cervical cancer	102 (85.0)	52 (86.7)	0.940[c]
Vaccination protects you from all STI[d] so no need for safe sex practices (n=60)		***11 (18.3)***	

Notes:
[a]Number of participants selecting the option best acceptable to them
[b]Use of the male condom. Figures do not add up to 180 due to missing data
[c] Pearson's Chi Square test; [f] Fisher's Exact test
[g]Figures do not add up to 120 due to missing data
[d]Sexually Transmitted Infection
Significance is at $P \leq 0.05$

An assessment of the individual perceived risk of infection by HPV showed that 53.3% (32/60) of the vaccinated participants reported a higher sense of self-perceived risk as compared to 22.5% (27/120) of the unvaccinated cohort (P< 0.001). (Table 6)

The 21 to 30-year-old age group was selected by both the vaccinated and unvaccinated cohorts as being the most preferable for initiating a sexual debut (P=0.791) rather than the 10 to 20 years age group or above 31 years.

A high frequency of use of male condoms was also deemed acceptable by both the vaccinated (68.3%; 41/60) and the unvaccinated (73.7%; 87/120) adolescents.

Seventy-five of 118 unvaccinated adolescents, (63.6%), would accept the HPV vaccine with a majority of those who wouldn't accept it (43.2%, 16/37) reporting it was due to lack of knowledge on what it is.

Among those vaccinated, 18.3% (11/60) thought that since they were vaccinated, they were protected from all sexually transmitted infections so would not need to engage in safe sex practices. (Table 8)

Table 9: Association between acceptance of cervical cancer screening and history of vaccination

	Vaccinated		
	No (n = 120)	**Yes (n = 60)**	
Variable	**n (%)**		**P-value**
Would accept to be screened for cervical cancer	102 (85.0%)	52 (86.7%)	0.940[c]

Notes
[c] Pearson's Chi Square test

A bivariate analysis tested for association between uptake of cervical cancer screening with relation to the vaccination status. As shown in Table 6, similar proportions of participants among those who had been vaccinated (86.7%, 52/60) and those unvaccinated against HPV (85%, 102/120) would accept to be screened for cervical cancer when they come of age (P= 0.940). (Table 9)

CHAPTER FIVE: DISCUSSION

5.1 Demographics

Numerous studies have been done locally and internationally with regard to knowledge and attitudes towards HPV and HPV vaccine (Blackman et al., 2013) but there is limited data involving adolescents in this region. The adolescents in this study were matched for age, sex and socioeconomic status by selection of schools in the same low resource setting. The defining element was the vaccination status. The vaccinated adolescents were predominantly in class 8 as they had been vaccinated 3 years prior to this study. This was also the case in similar studies done in Uganda (Turiho et al., 2015), Greece (Vaidakis et al., 2017) and the US (Mays et al., 2000).

There demographic profile of the parents of the adolescents in this study was similar between the vaccinated and unvaccinated groups. There were adolescents, both vaccinated and unvaccinated, who came from broken homes with the father being the predominantly missing element in the family unit. There were students who reported being raised by a relative or even a neighbor. The schools were located in settings which were largely low resource. The relevance of this is that it shows that with the current cost of the vaccine, a large number of adolescents in this region will not get the protection against cervical cancer they need as they will not be able to afford it if the vaccine is not provided free of charge as part of the national program. This also means that this demographic are unlikely to have access to proper health care and screening services.

The parents' level of education is important when it comes to educating them on HPV and cervical cancer. A learned individual is more likely to be open to discussions that

serve to debunk myths and reduce stigma. (Macdonald, Germine, Anderson, Christodoulou & McGrath, 2017) The main intervention as a cervical cancer prevention strategy involving adolescents is HPV vaccination which has sparked a lot of debate on its safety and utility and can only be administered following the consent of the parent/guardian. For the parents of the adolescents in this study, their education level was comparable with most of the parents having at least a high school education which shows that for this population the parent's level of education may not necessary negatively impact their consent for uptake of the vaccine and other preventive strategies. This is in line with several studies, including one done by Wisk, Allchin & Witt (2014) that showed that women with higher education as well as income were more likely to initiate vaccination for their adolescents.

Various socio-economic factors seem to impact on the uptake of vaccination programs by parents and studies are still ongoing on this but the main premise lies on the value of education of the parent (Aragones, Bruno, Ehrenberg, Tonda-Salcedo & Gany, 2015)

5.2 Knowledge

It was anticipated that the vaccinated adolescents would be more knowledgeable about cervical cancer and thus perceive themselves at a higher risk of HPV infection (Prayudi et al., 2016 and Blumenthal et al., 2012). In this study population, the adolescents in both groups perceived themselves at a higher risk of acquiring the virus but this could be attributed to the very low knowledge they had on the transmission of HPV or their undisclosed sexual activity. Adolescents from both the vaccinated and unvaccinated cohort could identify some of the risk factors for acquisition of HPV, including an early

sexual debut, multiple sexual partners or having a sexual partner with multiple sexual partners and smoking. Knowledge of treatment and screening modalities for cervical cancer was low in both groups in this study as seen in other adolescent populations where there is a unanimous record of low levels recorded in terms of knowledge of HPV, its transmission, what it causes, prevention strategies and cervical cancer among adolescents. (Panobianco M., 2013, Dell D., 2000 and Fishman J., 2014) This shows that as much as a positive vaccination status can improve the chance of knowledge of cervical cancer, it does not afford a sufficient awareness of the same if education offered during vaccination is not comprehensive and sufficient.

Previous studies have shown concern among parents that HPV vaccination may give the adolescent a perception of being safeguarded from all sexually transmitted illnesses and thus propelling them into promiscuity (Elbarazi et al., 2016 and Linares et al., 2015). The vaccinated group in my study did not think that the vaccine would cause them to have such a mentality which was also evidenced in a previous study (Vázquez-Otero et al., 2016) which strove to dispel this myth by exploring the association between getting the vaccine and engaging in risky sexual behavior and found there was none. Studies assessing for a link between risky sexual behavior following HPV vaccination and found that HPV vaccination was a good way of reiterating the need for safe sex practices among adolescents and young women (Mullins et al., 2016). In Western Uganda (Turiho et al., 2018), it was also established that HPV vaccination, knowledge and perceived sexual risk did not predict sexual behavior intentions but with high parental involvement and communication, sexual debut could be delayed. The importance of this lies in the fact that

early sexual debut and early age at first pregnancy have been irrevocably linked to the development of cervical cancer. (Louie et al., 2009)

From this study, the adolescents reported a high potential for use of condoms primarily as a protective measure against pregnancy and HIV/AIDS but several studies locally and internationally re-count several barriers for adolescents to accessing condoms such as unavailability of Youth-Friendly facilities providing free condoms, judgmental health practitioners and social disapproval; common barriers experienced by adolescents in Low- and Middle- Income Countries. (Chandra-Mouli et al., 2014) A study in Sweden showed that a school-based program promoting condom use increased the uptake of condoms for HPV prevention among adolescents. (Grandahl et al., 2016)

5.3 Source of Information

There are several sources of information for HPV and cervical cancer such as social media, radio/television advertisements, print material, community outreach health talks and information garnered from a health professional at a hospital to name but a few.

From the data accrued from the interviews, the adolescents in my study showed an immense reliance on the teachers for information on health. This is in line with the surmise of Masika et al (2015) that the empowerment of teachers would be a more feasible way to increase uptake of the vaccine through their dissemination of information on the vaccine and cervical cancer in a low resource setting such as in Eldoret, Kenya.

Similarly, a previous study in this region (Vermandeere e al., 2015) saw the need for a collaborative effort between health workers and teachers to provide correct information whilst tackling stigmatism and myths that are a big hindrance to the primary prevention of cervical cancer.

It is clear that adolescents need exposure to other avenues of information disbursement and to be given access to other sources at their level. For instance, the Cancer Registry of Norway developed an application called FightHPV™, an interactive game that can be downloaded on various android and Apple devices by adolescents and anyone with limited knowledge of HPV and cervical cancer to learn and understand the disease and how to protect oneself.

5.4 Acceptability

The unvaccinated group showed great willingness to be vaccinated which was higher as compared to other studies such as that of Moroccan adolescents which revealed that only 27% (282/1044) of participants were willing to accept HPV vaccination. (Zouheir et al., 2017)

The acceptability of screening for cervical cancer at an appropriate age was remarkably high in both cohorts of adolescents despite their minimal collective knowledge of screening modalities available. This was higher than most studies where the adolescents showed very low levels of desire to be screened. (Blumenthal et al., 2012 and Dell et al., 2000) This phenomenon could be explained by the possible exposure to community-based messaging on cervical cancer in this region urging women to go for screening thus making the adolescents realize their potential for susceptibility to cervical cancer.

5.5 Limitations of the Study

There may be social desirability bias wherein the students may feel the need to give responses in accordance to what they think the interviewer wants to hear due to the

reverence attributed to medical personnel. This was deferred by creating an informal set up for the interviews and discussions to make the girls feel at liberty to speak.

The population under study was small and thus the results may not be reflective of the entire adolescent population.

CHAPTER SIX: CONCLUSION AND RECOMMENDATIONS

6.1 Conclusion

1. Exposure to the HPV vaccine was associated with a higher knowledge of cervical cancer.
2. The adolescents predominantly rely on the school for health information.
3. Adolescents, both vaccinated and unvaccinated, show high acceptance of cervical cancer prevention strategies.

6.2 Recommendations

1. Education on cervical cancer must be comprehensive and elaborate to ensure adolescents are sufficiently informed.

2. Empowerment of the teachers by health care workers to ensure information dissemination.

3. The high acceptance of cervical cancer prevention strategies should further encourage provision of these services such as rolling out the nationwide HPV vaccination.

REFERENCE

Allen, J. D., de Jesus, M., Mars, D., Tom, L., Cloutier, L., & Shelton, R. C. (2012). Decision-making about the HPV vaccine among ethnically diverse parents: implications for health communications. *Journal of oncology*

Aragones, A., Bruno, D., Ehrenberg, M., Tonda-Salcedo, J., & Gany, F. (2015). Parental education and text messaging reminders as effective community based tools to increase HPV vaccination rates among Mexican American children. *Preventive Medicine Reports*, *2*, 554-558. http://dx.doi.org/10.1016/j.pmedr.2015.06.015

Becker-Dreps, S., Otieno, W. A., Brewer, N. T., Agot, K., & Smith, J. S. (2010). HPV vaccine acceptability among Kenyan women. *Vaccine, 28*(31), 4864-4867.

Blackman, E., Thurman, N., Halliday, D., Butler, R., Francis, D., & Joseph, M. (2013). Multicenter Study of Human Papillomavirus and the Human Papillomavirus Vaccine: Knowledge and Attitudes among People of African Descent. *Infectious Diseases In Obstetrics And Gynecology*, 1-8. http://dx.doi.org/10.1155/2013/428582

Blumenthal J, Frey M, Worley M, Tchabo N, Soren K, Slomovitz B. (2012) Adolescent Understanding and Acceptance of the HPV Vaccination in an Underserved Population in New York City. *Journal of Oncology*. 1-8.

Bosch FX & de Sanjosé S. (2003) Human papilloma virus and cervical cancer burden and assessment of causality. *Journal of National Cancer Institute Monograph* 31:3–13.

Bray, F., Ferlay, J., Soerjomataram, I., Siegel, R., Torre, L., & Jemal, A. (2018). Global cancer statistics 2018: GLOBOCAN estimates of incidence and mortality worldwide for 36 cancers in 185 countries. *CA: A Cancer Journal For Clinicians*, *68*(6), 394-424. doi: 10.3322/caac.21492

Brown, V., & White, K. A. (2010). The HPV vaccination strategy: could male vaccination have a significant impact? *Computational and Mathematical Methods in Medicine*, *11*(3), 223-237.

Bruni, L., Barrionuevo-Rosas, L., Albero, G., Aldea, M., Serrano, B., Valencia, S., ... & Muñoz, J. (2016). Human papillomavirus and related diseases in Kenya. *Summary report*.

Chandra-Mouli, V., McCarraher, D., Phillips, S., Williamson, N., & Hainsworth, G. (2014). Contraception for adolescents in low and middle income countries: needs, barriers, and access. *Reproductive Health*, *11*(1). http://dx.doi.org/10.1186/1742-4755-11-1

Dell, D., Chen, H., Ahmad, F., & Stewart, d. (2000). Knowledge About Human Papillomavirus Among Adolescents. *Obstetrics & Gynecology*, *96*(5, Part 1), 653-656. http://dx.doi.org/10.1097/00006250-200011000-00002

de Sanjose, S., Quint, W. G., Alemany, L., Geraets, D. T., Klaustermeier, J. E., Lloveras, B., ... & Vallejos, C. S. (2010). Human papillomavirus genotype attribution in invasive cervical cancer: a retrospective cross-sectional worldwide study. *The lancet oncology*, *11*(11), 1048-1056.

D'Orazio, L., Taylor-Ford, M., & Meyerowitz, B. (2014). Cervical Cancer Prevention among Latinas in a Post-HPV Vaccine World: Considering the Sociocultural Context. *Women&Therapy*,*37*(3-4), 264-281. http://dx.doi.org/10.1080/02703149.2014.897552

Dunne, E., Unger, E., Sternberg, M., McQuillan, G., Swan, D., Patel, S., & Markowitz, L. (2007). Prevalence of HPV Infection Among Females in the United States. *Journal of American Medical Association*, *297*(8), 813. http://dx.doi.org/10.1001/jama.297.8.813

Einstein, M. H., Baron, M., Levin, M. J., Chatterjee, A., Edwards, R. P., Zepp, F., ... & Dubin, G. (2009). Comparison of the immunogenicity and safety of Cervarix™ and Gardasil® human papillomavirus (HPV) cervical cancer vaccines in healthy women aged 18–45 years. *Human vaccines*, *5*(10), 705-719.

Elbarazi, I., Raheel, H., Cummings, K., & Loney, T. (2016). A Content Analysis of Arabic and English Newspapers before, during, and after the Human Papillomavirus Vaccination Campaign in the United Arab Emirates. *Frontiers In Public Health*, *4*. http://dx.doi.org/10.3389/fpubh.2016.00176

Ermel, A., Qadadri, B., Tong, Y., Orang'o, O., Macharia, B., Ramogola-Masire, D., ... & Brown, D. R. (2016). Invasive cervical cancers in the United States, Botswana and Kenya: HPV type distribution and health policy implications. *Infectious agents and cancer*, *11*(1), 56.

Faridi, R., Zahra, A., Khan, K., & Idrees, M. (2011). Oncogenic potential of Human Papillomavirus (HPV) and its relation with cervical cancer. *Virology Journal*, *8*(1), 269.

Feiring, B., Laake, I., Molden, T., Cappelen, I., Håberg, S. E., Magnus, P., ... & Trogstad, L. (2015). Do parental education and income matter? A nationwide register-based study on HPV vaccine uptake in the school-based immunisation programme in Norway. *BMJ open*, *5*(5), e006422.

Fernández, M. E., Le, Y. C. L., Fernández-Espada, N., Calo, W. A., Savas, L. S., Vélez, C., ... & Colón-López, V. (2014). Peer Reviewed: Knowledge, Attitudes, and Beliefs About Human Papillomavirus (HPV) Vaccination Among Puerto Rican Mothers and Daughters, 2010: A Qualitative Study. *Preventing chronic disease*, *11*.

Friedman, A., Oruko, K., Habel, M., Ford, J., Kinsey, J., Dunne, F. (2014). Preparing for human papillomavirus vaccine introduction in Kenya: implications from focus-group and interview discussions with caregivers and opinion leaders in Western Kenya. *BMC Public Health*, *14*(1). doi: 10.1186/1471-2458-14-855 American Society for Colposcopy & Cervical Pathology. Practice Management: The Cervix. Retrieved from http://www.asccp.org/edu/practice/cervix/histology.shtml.

Fishman, J., Taylor, L., Kooker, P., & Frank, I. (2014). Parent and Adolescent Knowledge of HPV and Subsequent Vaccination. *PEDIATRICS*, *134*(4), e1049-e1056. http://dx.doi.org/10.1542/peds.2013-3454

Gichane, M., Calo, W., McCarthy, S., Walmer, K., Boggan, J., & Brewer, N. (2017). Human Papillomavirus Awareness in Haiti: Preparing for a National HPV Vaccination Program. *Journal Of Pediatric And Adolescent Gynecology*, *30*(1), 96-101. http://dx.doi.org/10.1016/j.jpag.2016.07.003

Giuliano, A. R., Palefsky, J. M., Goldstone, S., Moreira Jr, E. D., Penny, M. E., Aranda, C., ... & Chang, Y. H. (2011). Efficacy of quadrivalent HPV vaccine against HPV Infection and disease in males. *New England Journal of Medicine*, *364*(5), 401-411.

Grandahl, M., Rosenblad, A., Stenhammar, C., Tydén, T., Westerling, R., & Larsson, M. et al. (2016). School-based intervention for the prevention of HPV among adolescents: a cluster randomised controlled study. *BMJ Open*, *6*(1), e009875. http://dx.doi.org/10.1136/bmjopen-2015-009875

Hitt, E. (2012). Australia To Vaccinate Boys. Retrieved from https://www.medscape.com/viewarticle/767653

Holman, D., Benard, V., Roland, K., Watson, M., Liddon, N., & Stokley, S. (2014). Barriers to Human Papillomavirus Vaccination Among US Adolescents. *JAMA Pediatrics*, *168*(1), 76. http://dx.doi.org/10.1001/jamapediatrics.2013.2752

Hussain, A., Alkhenizan, A., McWalter, P., Qazi, N., Alshmassi, A., Farooqi, S., & Abdulkarim, A. (2016). Attitudes and perceptions towards HPV vaccination among young women in Saudi Arabia. *Journal Of Family And Community Medicine*, *23*(3), 145. http://dx.doi.org/10.4103/2230-8229.189107

Kahn, J., Rosenthal, S., & Huang, B. (2004). Acceptability of HPV Self-Testing In Adolescents. *Journal Of Adolescent Health*, *34*(2). Retrieved from https://www.deepdyve.com/lp/elsevier/acceptability-of-hpv-self-testing-in-adolescents-kk6sb0FEcP

Kerr, D., & Fiander, A. (2009). Towards Prevention of Cervical Cancer in Africa. *The Oxford Declaration*.

Kolben, T. M., Dannecker, C., Baltateanu, K., Goess, C., Starrach, T., Semmlinger, A., ... & Kolben, T. (2016). HPV vaccination: Attitude and knowledge among German gynecologists. *Geburtshilfe und Frauenheilkunde*, *76*(10), 1074-1080.

Kyle, R., Nicoll, A., Forbat, L., & Hubbard, G. (2013). Adolescents' awareness of cancer risk factors and associations with health-related behaviours. *Health Education Research*, *28*(5), 816-827. http://dx.doi.org/10.1093/her/cyt055

Lacey, C. J., Lowndes, C. M., & Shah, K. V. (2006). Burden and management of non-cancerous HPV-related conditions: HPV-6/11 disease. *Vaccine*, *24*, S35-S41.

Linares, L. O., Shankar, V., Diaz, A., Nucci-Sack, A., Strickler, H. D., Peake, K., ... & Schlecht, N. F. (2015). The Association between Cumulative Psychosocial Risk and

Cervical HPV Infection Among Female Adolescents in a Free Vaccination Program. *Journal of developmental and behavioral pediatrics: JDBP*, *36*(8), 620.

Lindberg, L., & Maddow-Zimet, I. (2012). Consequences of Sex Education on Teen and Young Adult Sexual Behaviors and Outcomes. *Journal Of Adolescent Health*, *51*(4), 332-338. http://dx.doi.org/10.1016/j.jadohealth.2011.12.028

Longworth, M and Laimins, LA., (2004) Pathogenesis of Human Papillomaviruses in Differentiating Epithelia. *Microbiology and Molecular Biology Reviews* vol. 68 (2) 362-372

Louie, K., de Sanjose, S., Diaz, M., Castellsagué, X., Herrero, R., & Meijer, C. (2009). Early age at first sexual intercourse and early pregnancy are risk factors for cervical cancer in developing countries. *British Journal Of Cancer*, *100*(7), 1191-1197. http://dx.doi.org/10.1038/sj.bjc.6604974

Macdonald, K., Germine, L., Anderson, A., Christodoulou, J., & McGrath, L. (2017). Dispelling the Myth: Training in Education or Neuroscience Decreases but Does Not Eliminate Beliefs in Neuromyths. *Frontiers In Psychology*, *8*. doi: 10.3389/fpsyg.2017.01314

Mao, C., Koutsky, L., Ault, K., Wheeler, C., Brown, D., & Wiley, D. (2006). Efficacy of human papilloma virus – 16 vaccine to prevent cervical intraepithelial neoplasia-a randomized controlled trial. *Journal of Infectious Diseases* 191:182–192; doi: 10.1097/01.aog.0000192397.41191.fb

Marek, E., Dergez, T., Rebek-Nagy, G., Kricskovics, A., Kovacs, K., & Bozsa, S. (2011). Adolescents' awareness of HPV infections and attitudes towards HPV vaccination 3

years following the introduction of the HPV vaccine in Hungary. *Vaccine*, *29*(47), 8591-8598. http://dx.doi.org/10.1016/j.vaccine.2011.09.018

Markowitz, L., Hariri, S., Lin, C., Dunne, E., Steinau, M., McQuillan, G., & Unger, E. (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. *The Journal Of Infectious Diseases, 208*(3), 385-393. http://dx.doi.org/10.1093/infdis/jit192

Masika, M., Ogembo, J., Chabeda, S., Wamai, R., & Mugo, N. (2015). Knowledge on HPV Vaccine and Cervical Cancer Facilitates Vaccine Acceptability among School Teachers in Kitui County, Kenya. *PLOS ONE*, *10*(8), e0135563. http://dx.doi.org/10.1371/journal.pone.0135563

Mati, J. K., Mbugua, S., & Ndavi, M. (1984). Control of cancer of the cervix: feasibility of screening for premalignant lesions in an African environment. *IARC scientific publications*, (63), 451-463.

Moscicki, A. B. (2007). HPV infections in adolescents. *Disease markers*, *23*(4), 229-234.

Mugo, N., Ansah, N., Marino, D., Saah, A., & Garner, E. (2015). Evaluation of safety and immunogenicity of a quadrivalent human papillomavirus vaccine in healthy females between 9 and 26 years of age in Sub-Saharan Africa. *Human Vaccines & Immunotherapeutics*, *11*(6), 1323-1330. http://dx.doi.org/10.1080/21645515.2015.1008877

Mullins, T., Zimet, G., Rosenthal, S., Morrow, C., Ding, L., Huang, B., & Kahn, J. (2016). Human papillomavirus vaccine-related risk perceptions and subsequent

sexual behaviors and sexually transmitted infections among vaccinated adolescent women. *Vaccine, 34*(34), 4040-4045. http://dx.doi.org/10.1016/j.vaccine.2016.06.026

Muñoz, N., Bosch, F. X., De Sanjosé, S., Herrero, R., Castellsagué, X., Shah, K. V., ... & Meijer, C. J. (2003). Epidemiologic classification of human papillomavirus types associated with cervical cancer. *New England Journal of Medicine*, *348*(6), 518-527.

Mupandawana, E., & Cross, R. (2016). Attitudes towards human papillomavirus vaccination among African parents in a city in the north of England: a qualitative study. *Reproductive Health*, *13*(1). http://dx.doi.org/10.1186/s12978-016-0209-x

Ochako, R., Mbondo, M., Aloo, S., Kaimenyi, S., Thompson, R., Temmerman, M., & Kays, M. (2015). Barriers to modern contraceptive methods uptake among young women in Kenya: a qualitative study. *BMC Public Health*, *15*(1). http://dx.doi.org/10.1186/s12889-015-1483-1

Oslo Universitetssykehus HF. (2017) *Fight HPV App. Available from: https://itunes.apple.com/sg/app/fight-hpv/id1091559571?mt=8*

Panobianco, M., Lima, A., Oliveira, I., & Gozzo, T. (2013). Knowledge concerning HPV among adolescent undergraduate nursing students. *Texto & Contexto - Enfermagem*, *22*(1), 201-207. http://dx.doi.org/10.1590/s0104-07072013000100024

Patel, H., Jeve, Y., Sherman, S., & Moss, E. (2016). Knowledge of human papillomavirus and the human papillomavirus vaccine in European adolescents: a systematic review. *Sexually Transmitted Infections*, *92*(6), 474-479. http://dx.doi.org/10.1136/sextrans-2015-052341

Peirson, L., Fitzpatrick-Lewis, D., Ciliska, D., & Warren, R. (2013). Screening for cervical cancer: a systematic review and meta-analysis. *Systematic Reviews*, *2*(1). http://dx.doi.org/10.1186/2046-4053-2-35

Photo courtesy of JHPIEGO. (2000 *Atlas of Visual Inspection of the Cervix with Acetic Acid (VIA)*. JHPIEGO: Baltimore, MD.

Prayudi, P., Permatasari, A., Winata, I., & Suwiyoga, K. (2016). Impact of human papilloma virus vaccination on adolescent knowledge, perception of sexual risk and need for safer sexual behaviors in Bali, Indonesia. *Journal Of Obstetrics And Gynaecology Research*, *42*(12), 1829-1838. http://dx.doi.org/10.1111/jog.13123

Quincy, B. (2014). Acceptability of self-collected human papillomavirus specimens in cervical cancer screening: A review. *World Journal Of Obstetrics And Gynecology*, *3*(3), 90. http://dx.doi.org/10.5317/wjog.v3.i3.90

R Core Team. (2015) R: A language and environment for statistical computing. R Foundation for Statistical Computing, Vienna, Austria. Retrieved from https://www.R-project.org/.

Rashid, S., Labani, S., & Das, B. (2016). Knowledge, Awareness and Attitude on HPV, HPV Vaccine and Cervical Cancer among the College Students in India. *PLOS ONE*, *11*(11), e0166713. http://dx.doi.org/10.1371/journal.pone.0166713

Reisinger, K. S., Block, S. L., Lazcano-Ponce, E., Samakoses, R., Esser, M. T., Erick, J., ... & Alvarez, F. B. (2007). Safety and persistent immunogenicity of a quadrivalent human papillomavirus types 6, 11, 16, 18 L1 virus-like particle vaccine in preadolescents and adolescents: a randomized controlled trial. *The Pediatric infectious disease journal*, *26*(3), 201-209.

Rogo, K. O., Omany, J., Onyango, J. N., Ojwang, S. B., & Stendahl, U. (1990). Carcinoma of the cervix in the African setting. *International Journal of Gynecology & Obstetrics*, *33*(3), 249-255.

Rose M. Mays, Gregory D. Zimet, Yve. (2000). Human Papillomavirus, Genital Warts, Pap Smears, And Cervical Cancer: Knowledge And Beliefs Of Adolescent And Adult Women. *Health Care For Women International*, *21*(5), 361-374. http://dx.doi.org/10.1080/07399330050082218

Samkange-Zeeb, F., Spallek, L., & Zeeb, H. (2011). Awareness and knowledge of sexually transmitted diseases (STDs) among school-going adolescents in Europe: a systematic review of published literature. *BMC Public Health*, *11*(1). http://dx.doi.org/10.1186/1471-2458-11-727

Shepherd, J., Peersman, G., Weston, R., & Napuli, I. (2000). Cervical cancer and sexual lifestyle: a systematic review of health education interventions targeted at women. *Health Education Research*, *15*(6), 681-694. http://dx.doi.org/10.1093/her/15.6.681

Simon, S. (2015). FDA Approves Gardasil 9 HPV Vaccine. *American Cancer Society*. Retrieved from http://FDA Approves Gardasil 9 HPV Vaccine

Sullivan, K., Soe, M. (2016) Sample Size For An Unmatched Case-Control Study Retrieved from http://www.openepi.com/PDFDocs/SSCCDoc.pdf

Tao, L., Han, L., Li, X., Gao, Q., Pan, L., & Wu, L. (2014). Prevalence and risk factors for cervical neoplasia: a cervical cancer screening program in Beijing. *BMC Public Health*, *14*(1). http://dx.doi.org/10.1186/1471-2458-14-1185

Thompson, V., Butler-Barnes, S., Jones, B., Wells, A., Cunningham-Williams, R., & Williams, S. (2016). Factors Associated with Human Papillomavirus Vaccination

Status at U.S. Colleges and Universities. *Health & Social Work*, *42*(1), e1-e7. http://dx.doi.org/10.1093/hsw/hlw050

Trim, K., Nagji, N., Elit, L., & Roy, K. (2012). Parental Knowledge, Attitudes, and Behaviours towards Human Papillomavirus Vaccination for Their Children: A Systematic Review from 2001 to 2011. *Obstetrics And Gynecology International*, *2012*, 1-12. http://dx.doi.org/10.1155/2012/921236

Turiho, A., Muhwezi, W., Okello, E., Tumwesigye, N., Banura, C., & Katahoire, A. (2015). Human Papillomavirus (HPV) Vaccination and Adolescent Girls' Knowledge and Sexuality in Western Uganda: A Comparative Cross-Sectional Study. *PLOS ONE*, *10*(9), e0137094. http://dx.doi.org/10.1371/journal.pone.0137094

Vaidakis, D., Moustaki, I., Zervas, I., Barbouni, A., Merakou, K., Chrysi, M. S., ... & Panoskaltsis, T. (2017). Knowledge of Greek adolescents on human papilloma virus (HPV) and vaccination: A national epidemiologic study. *Medicine*, *96*(1).

Vázquez-Otero, C., Thompson, E., Daley, E., Griner, S., Logan, R., & Vamos, C. (2016). Dispelling the myth: Exploring associations between the HPV vaccine and inconsistent condom use among college students. *Preventive Medicine*, *93*, 147-150. http://dx.doi.org/10.1016/j.ypmed.2016.10.007

Vermandere, H., Naanyu, V., Degomme, O., & Michielsen, K. (2015). Implementation of an HPV vaccination program in Eldoret, Kenya: results from a qualitative assessment by key stakeholders. *BMC Public Health*, *15*(1). http://dx.doi.org/10.1186/s12889-015-2219-y

Vermandere, H., Mabeya, H., (2015) Determinants of Acceptance and Subsequent Uptake of the HPV Vaccine in a Cohort in Eldoret, Kenya. (2015). *PLOS ONE, 10*(3), e0117761. http://dx.doi.org/10.1371/journal.pone.0117761

Wardle, J., Robb, K., Vernon, S., & Waller, J. (2015). Screening for prevention and early diagnosis of cancer. *American Psychologist*, *70*(2), 119-133. http://dx.doi.org/10.1037/a0037357

Watson, M., Saraiya, M., & Wu, X. (2009). Update of HPV-associated female genital cancers in the United States, 1999–2004. *Journal of Women's Health*, *18*(11), 1731-1738.

Weiss, T. W., Rosenthal, S. L., & Zimet, G. D. (2011). Attitudes toward HPV vaccination among women aged 27 to 45. *ISRN obstetrics and gynecology*, *2011*.

Wisk, L. E., Allchin, A., & Witt, W. P. (2014). Disparities in human papillomavirus vaccine awareness among US parents of preadolescents and adolescents. *Sexually transmitted diseases*, *41*(2), 117.

Zouheir, Y., Daouam, S., Hamdi, S., Alaoui, A., & Fechtali, T. (2016). Knowledge of Human Papillomavirus and Acceptability to Vaccinate in Adolescents and Young Adults of the Moroccan Population. *Journal Of Pediatric And Adolescent Gynecology*, *29*(3), 292-298. http://dx.doi.org/10.1016/j.jpag.2015.11.002

APPENDICES

Appendix 1. Consent form

My name is Dr. Anisa Mburu. I am a resident in Obstetrics and Gynecology at Moi University/MTRH. Part of my studies is to do a dissertation of which I am looking at the ***Knowledge of Cervical Cancer and Acceptability of Prevention Strategies Among HPV Vaccinated and Non-Vaccinated Adolescents After a Vaccination Initiative in Uasin Gishu County***.

My study looks at the girls who were vaccinated from May 2012 to March 2013, through an international vaccination program and assesses their knowledge, sources of information and acceptability of cervical cancer prevention strategies. It will also look at girls in the same age group and schools who were not vaccinated to see any differences in the same. This will be done through questions that the girls will be asked. No procedure or medication will be administered. The participating girls will be provided some snacks after the interview.

Information gathered will be treated with utmost confidentiality; your child's identity will be protected (her name will not be used and she will be identified with a number, only known to me and my immediate assistant). The information obtained will be used to improve services in the community, to form protocols and may be published in medical journals and/or presented in scientific symposia (both local and international).

The MTRH/MUSOM Moi University Ethics and Research Committee has approved this study

For any question or clarification, please do not hesitate to contact me on 0721 411 078 or contact:

The Chairperson of IREC, MOI TEACHING AND REFERAL HOSPITAL

P.O BOX 3-30100 ELDORET

May I proceed with the questions? Yes/ No.

Respondent's signature…… Date ……

TaarifayaRidhaa: Toleo la Kiswahili

Kwa majina naitwa Daktari Anisa Mburu.Ninasomea shahada kuu ya udaktari wa uja uzito na magonjwa ya kina mama katika hospitali kuu ya MTRH. Ninafanya uchunguzi kuhusu chanjo ya HPV baina ya wale waliopewa chanjo na wale ambao hawakupewa ilikujua kiwango cha elimu, vitendo na namna wanavyo uchukulia ukingaji wa ugonjwa huu wa saratani ya kizazi na chanjo yake katika kaunti ya Uasin Gishu.

Uchunguzi wangu unaangalia wasichana waliopata chanjo kutoka Mei 2012 hadi Machi 2013, kupitia mpango wa kimataifa wa chanjo ambao unaangalia kiwango cha elimu, vitendo na namna wanavyouchukulia ukingaji wa ugonjwa huu wa saratani ya kizazi. Utaangalia pia wasichana walio katika umri mmoja na wanaosomea shule moja ambao hawakupata chanjo ili kuangalia tofauti zozote. Haya yatafanyika kupitia maswali watakayoulizwa wasichana. Hakuna matibabu wala uchunguzi mwingine wowote utakaofanyika. Baada ya kujibu maswali, wasichana hao watapatiwa vitafunio.

Maelezo yatakayopatikana yatahifadhiwa ipasavyo na kwa uficho ili mwanao asijulikane na wengine kwa majina bali kwa nambari itakayofahamika na mimi pamoja na msaidizi wangu peke yetu. Maelezo hayo yatatumika kuisaidia jamii kiafya, kutengeza kanuni za kisheria na pia kuchapishwa katika nakala na mijadala ya kiafya hapa nchini na ulimwenguni kwa jumla.

Uchunguzi huu umeidhinishwa na Kamati ya uchunguzi wa wasomi na haki za wanaochunguzwa (IREC) ya chuo kikuu cha Moi na hospitali ya Moi.

Kwa maelezo zaidi unaweza wasiliana na mimi kwa nambari 0721 411 078

Au IREC kupitia anuani ifuatayo:

Mwenyekiti IREC

MTRH

S. L. P. 3, Eldoret

Ninaweza endelea na maswali? Ndio/La

Sahihi…..... Jina..... Tarehe.....

Appendix 2. Questionnaire

BACKGROUND INFORMATION

Participant ID number _____ School code _____

Q1. Interviewee age _____ Interview Date _____

Q2. Current class _____

Q3. What is the highest education level of your mother?

None

Primary

Secondary

Tertiary/College

Other _____

Q4. What is the highest education level of your father?

None

Primary

Secondary

Tertiary/College

Other _____

KNOWLEDGE AND SOURCE OF INFORMATION

Q5. Have you heard of the HPV vaccine?

Yes (If yes, go to question 6)

No (If no, go to question 7)

Q6. How did you hear about it?

Family member/friend

Hospital

GAP Initiative

School Health Talk

Community Outreach Program

Social media (TV, radio, Facebook, Twitter)

Q7. How is HPV transmitted?

Sexual contact

Blood transfusion

Sharing utensils

I don't know…..

Q8. Have you heard of cervical cancer?

Yes (If yes, go to question 9)

No (If no, go to question 10)

Q9. How did you hear about it?

Family member/friend suffered from it

Doctor

Community Outreach Program

School Health Talk

Social media (TV, radio, Facebook, Twitter)

Q10. Do you think having sex at an early age is a risk for cervical cancer?

Yes No

Q11. Do you think smoking is a risk factor for cervical cancer?

Yes No

Q12. Do you think having many sexual partners is a risk factor for cervical cancer?

Yes No

Q13. Do you think having a male partner who has many sexual partners is a risk for cervical cancer?

Yes No

Q14. A person suffering from early cervical cancer will have the following signs and symptoms

(tick √ for Yes and cross X for No)

None

Lower abdominal pain

Vaginal bleeding

Vaginal discharge

Anemia

Post coital bleeding

Involuntary loss of urine and/or feces through the vagina

Weakness

Weight loss

Q15. A person suffering from late cervical cancer will have the following signs and symptoms

(tick √ for Yes and cross X for No)

Lower abdominal pain

Vaginal bleeding

Vaginal discharge

Anemia

Post coital bleeding

Involuntary loss of urine and/or feces through the vagina

Weakness

Weight loss

Q16. What are the treatment modalities available for cervical cancer?

(tick √ for Yes and cross X for No)

Antibiotics

Chemotherapy

Radiation

Chemotherapy and Radiation

There is no treatment for cervical cancer

I do not know

Q17.What are the screening modalities used to detect early cervical cancer?

Blood tests

Pap smear

VIA/VILLI

I don't know

Q18. Can cervical cancer be prevented?

Yes No

Q19. Have you received the HPV vaccine?

Yes (If yes, go to question 20)

No (If no, go to question 23)

Q20. Through which means were you vaccinated?

The GAP Initiative?

Personal initiative?

Other funded program?

Q21. How many doses did you get?

One

Two

Three

Q22. If you got one or two doses only, why did you not get the full three doses?

I didn't know

Couldn't access the place for vaccination

My parent/guardian didn't think it was necessary

Q23. Do you think you are at risk of getting HPV infection?

Yes No

If yes, why?.....

Q24. What do you think is the best age to start having sex?

10-20

20-30

Above 30 years

Q25. How often should someone use protection during intercourse?

Sometimes Always Never

ACCEPTABILITY

Q26. For those not vaccinated, would you accept to receive the HPV vaccine if it was availed to you?

Yes (If yes, go to question 28)
No (If no, go to question 27)

Q27. Why would you not be willing to receive the vaccine?

I don't know what it is

I am worried about side effects

My parent/guardian would not allow me to get it

I can't afford it

Other…….

Q28. Do you think now that you are protected from cervical cancer it would make you not practice safe sex?

Yes

No

Q29. Would you accept to be screened for cervical cancer when you come of age?

Yes

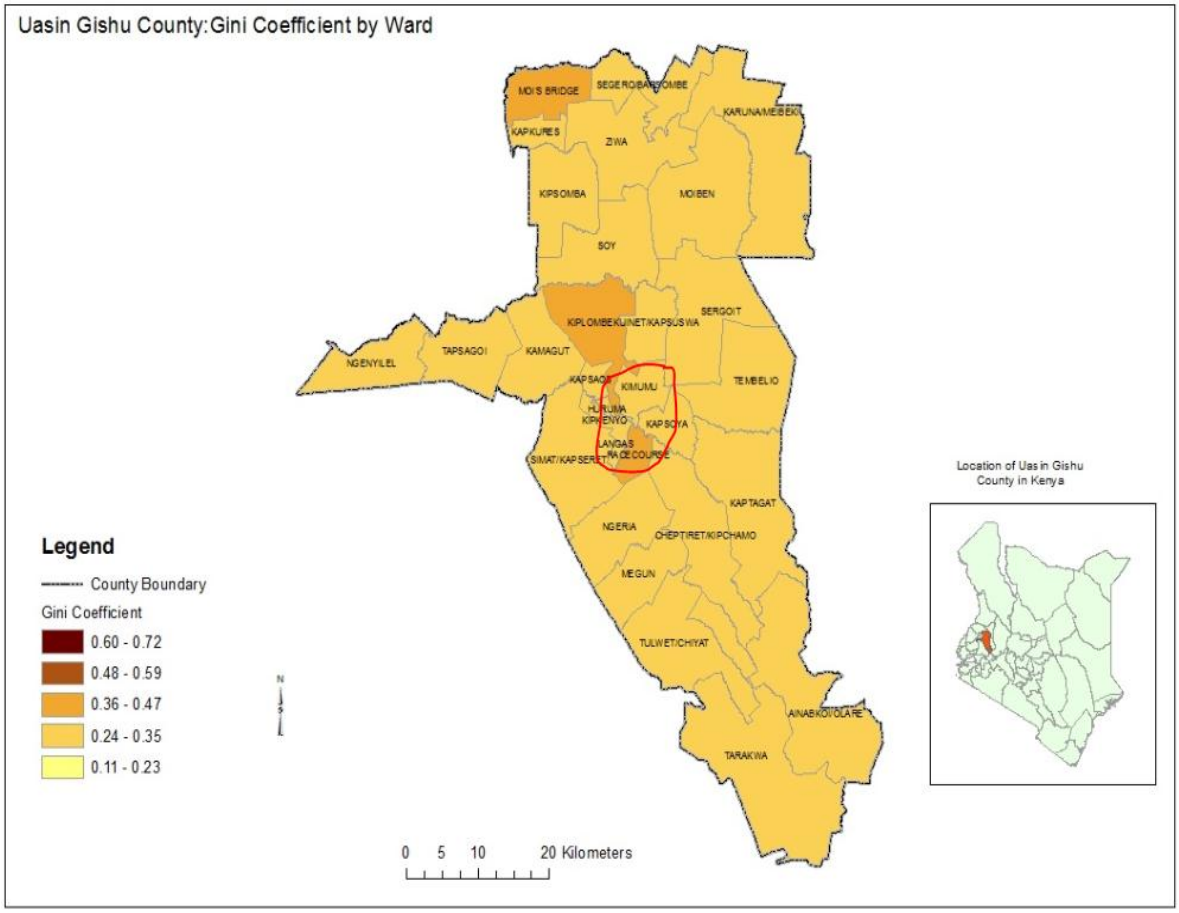
No

Other

Appendix 3: Budget

Items	**Quantity**	**Unit Price (Kshs)**	**Total (Kshs)**
Stationery & Equipment			
Printing Papers	5 reams	500.00	2,500.00
Black Cartridges	2	2,000.00	4,000.00
Writing Pens	1 packet	500.00	500.00
Flash Discs	1	2,000.00	2,000.00
Box Files	2	200.00	400.00
Document Wallets	2	50.00	100.00
Sub total			**9,500.00**
Research Proposal Development			
Printing drafts & final proposal	10 copies	500.00	5,000.00
Photocopies of final proposal	6 copies	100.00	600.00
Binding of copies of Proposal	5 copies	100.00	500.00
Sub total			**6,100.00**
Personnel			
Biostatistician	1	10,000.00	10,000.00
Research assistant	2	10,000.00	20,000.00
Transport	2	20, 000.00	40,000.00
Refreshment	200	100.00	20,000.00
Sub total			**90,000.00**
Thesis Development			
Printing of drafts and final thesis	10 copies	800.00	8,000.00
Photocopy of final thesis	6 copies	200.00	1,200.00
Binding of thesis	6 copies	300.00	1,800.00
Transport to locales			10, 000.00
Sub total			**21,000.00**
Total			
Miscellaneous Expenditure (10% of Total)			**12,660.00**
Grand Total			**139, 660.00**

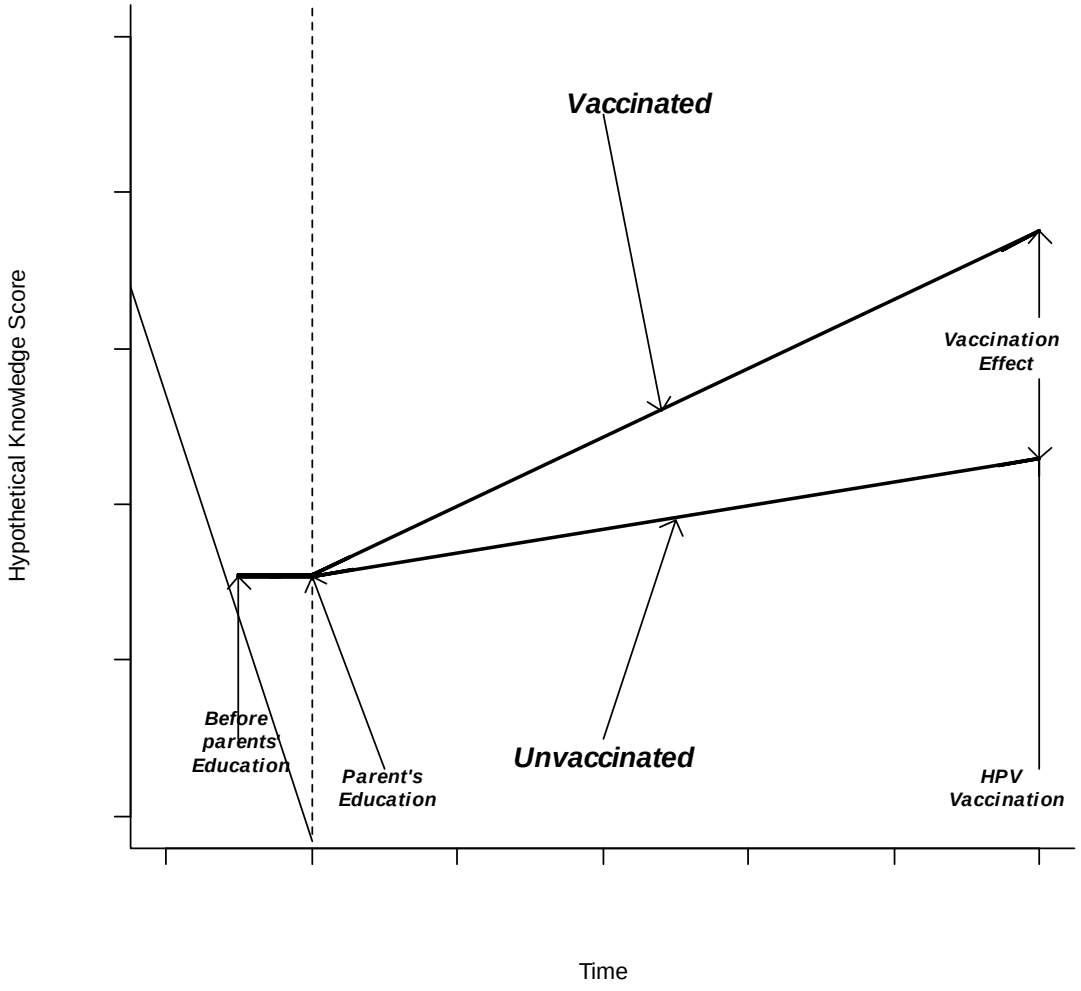
Appendix 4: Map of Uasin Gishu



Map adapted from Kenya Information Guide; Uasin Gishu County Wards, retrieved from *www.kenya-information-guide.com/uasin-gishu-county.htm*

Area marked with the red pen represents area of schools included in the study within a 10-20 km radius of the hospital (Moi Teaching and Referral Hospital).

Appendix 5: Schematic illustration of the anticipated effect of vaccination



Appendix 6: IREC Approval

INSTITUTIONAL RESEARCH AND ETHICS COMMITTEE (IREC)

MOI TEACHING AND REFERRAL HOSPITAL
P.O. BOX 3
ELDORET
Tel: 33471//2/3

MOI UNIVERSITY
SCHOOL OF MEDICINE
P.O. BOX 4606
ELDORET

Reference: IREC/2015/279
Approval Number: 0001625

12th May, 2016

Dr. Anisa Wanjiru Mburu,
Moi University,
School of Medicine,
P.O. Box 4606-30100,
ELDORET-KENYA.

INSTITUTIONAL RESEARCH & ETHICS COMMITTEE
12 MAY 2016
APPROVED
P. O. Box 4606-30100 ELDORET

Dear Dr. Mburu,

RE: FORMAL APPROVAL

The Institutional Research and Ethics Committee has reviewed your research proposal titled:-

" A Comparison of HPV Vaccinated and Non-Vaccinated Adolescent's Knowledge, Practices and Acceptability of Cervical Cancer Prevention after HPV Vaccination Initiative in Uasin Gishu County."

Your proposal has been granted a Formal Approval Number: ***FAN: IREC 1625*** on 12th May, 2016. You are therefore permitted to begin your investigations.

Note that this approval is for 1 year; it will thus expire on 11th May, 2017. If it is necessary to continue with this research beyond the expiry date, a request for continuation should be made in writing to IREC Secretariat two months prior to the expiry date.

You are required to submit progress report(s) regularly as dictated by your proposal. Furthermore, you must notify the Committee of any proposal change (s) or amendment (s), serious or unexpected outcomes related to the conduct of the study, or study termination for any reason. The Committee expects to receive a final report at the end of the study.

Sincerely,

PROF. E. WERE
CHAIRMAN
INSTITUTIONAL RESEARCH AND ETHICS COMMITTEE

cc	CEO	-	MTRH	Dean	-	SOP	Dean	-	SOM
	Principal	-	CHS	Dean	-	SON	Dean	-	SOD