AFRICA UNIVERSITY
(A United Methodist-Related Institution)

DISTRIBUTION OF HUMAN PAPILLOMA VIRUS GENOTYPES AMONG WOMEN AT HARARE LANCET CLINICAL LABORATORIES FROM JANUARY 2024 TO DECEMBER 2024

BY

PRECIOUS RAZA

A DISSERTATION SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF BACHELOR OF MEDICAL LABORATORY SCIENCES IN THE COLLEGE OF HEALTH, AGRICULTURE AND NATURAL SCIENCES

2025

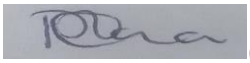
ABSTRACT

The infection caused by Human Papilloma Virus (HPV) is a public health concern with a significant number of females being infected with the virus. Scarcity of data regarding the distribution of genotypes in Zimbabwe was noted. This was the knowledge gap that this study sought to address. A research on HPV was therefore necessary in order to establish the genotypes that were commonly detected among the study population. The information obtained may add insights to the national HPV infection and genotype statistics. The study aimed to determine the distribution of HPV genotypes among women. Three objectives for the study were to determine the prevalence rate of HPV infection, to identify the common genotypes that were detected as well as identifying the age group that was mainly infected. The study was a retrospective cross sectional in a total of 366 samples from women who visited Lancet Clinical Laboratories between January and December 2024. Simple random sampling was used to select the participants. Only samples within the time frame mentioned were considered. No payment was made to the participants. Informed consent to carry out the study was sought from Lancet laboratories through the laboratory manager. The data extraction sheet as shown in appendix 3 was used to compile the data which was then presented in tables, charts and graphs. The results obtained revealed a prevalence rate of 23.2%. Genotype 16 being was dominant with 17.65%. Group B had 29% and group A had 13%. However these (A & B) groups comprised of more than 5 different genotypes. The mostly infected age group was 36-45 years as well as 26-35 years with a prevalence rate of 30.59% and 29.4% respectively. There is therefore a need to prioritize such age groups in HPV screening. The study showed a decrease in the rate of infection as the age increased. A 23.2% prevalence rate highlights the ongoing public health concern. This study therefore concluded that close to a quarter of the studied population was infected with HPV and genotype 16 dominated. Given the dominance of genotype 16, there is need for targeted prevention strategies. The results obtained may contribute valuable data to national HPV statistics which will then guide in crafting effective interventions and monitoring the impact of vaccinations and campaigns for HPV.

Keywords: Human papilloma virus, cancer, genotypes

Declaration

I, Precious Raza, student number 200274, do hereby declare that this dissertation is my original work except where sources have been cited and acknowledged. The work has never been submitted, nor will it ever be submitted to another university for the award of a Bachelor of Science degree.

Precious Raza	 (25/03/2025
Student's Full Name	Student's signature (Date)
Mr Thabani T. Dzvairo	24/03/2025
Main Supervisor's Full Name	Main Supervisor's signature (Date)

Copyright

Acknowledgement

I express my heartfelt gratitude to Mr Thabani Dzvairo the project supervisor, for his invaluable guidance and assistance throughout. From writing the proposal up to the final dissertation. His encouragement has been instrumental in shaping my work. I would like to thank Mr Brian Magaisa, the manager at Lancet laboratories and Ms Charlotte Mabhena, the molecular laboratory head of department for the permission granted to conduct the study. I also acknowledge Ms Blessing Chimwayi for assisting and guiding me in data extraction.

Dedication

I dedicate this research to my husband Allan Bonyongwe for the unwavering support and prayers. Being a mother and wife, I would not have been able to complete this dissertation without his love, support and prayers. To my children, Prince, Trinity and Shane, I hope this will be an inspiration.

List of Acronyms and Abbreviations

HPV Human Papilloma virus

DNA Deoxyribonucleic Acid

STD Sexually Transmitted Disease

AIDS Acquired Immuno- Deficiency Syndrome

HIV Human Immunodeficiency Virus

WHO World Health Organization

PCR Polymerase Chain Reaction

LBC Liquid Based Cytology

HR High Risk

LR Low Risk

AUREC Africa University Research Ethics Committee

MoHCC Ministry of Health and Child Care

Definition of Key terms

Distribution: Is a measure of how common a phenomenon is and how it is spread across a population.

Genotype: It refers to the genetic makeup of an organism.

Table of Contents

List of Tables

List of figures

List of appendices

CHAPTER 1 INTRODUCTION

1.1 Introduction

Human Papillomavirus (HPV) is a group of non- enveloped Deoxyribonucleic acid (DNA) viruses which specifically affects human epithelial cells (Bahi et al., 2024). It is both a sexually and non -sexually transmitted infection which has got a high prevalence globally (Ashry et al., 2024). According to Jensen et al. (2024), greater than 80% of adults who are sexually active will be exposed to the HPV infection in life. Non sexual transmission of this virus can be through skin to skin contact, mother to child during pregnancy and or parturition. Non sexual HPV was confirmed in children who had genital warts and other females who were still virgin (Petca et al., 2020).

There are currently over 200 known HPV genotypes. They are categorized as high-risk (HR) or low-risk (LR) genotypes according to how carcinogenic they are. It has been established that one of the main causes of precancerous lesions of the cervix as well as cervical cancer is chronic infection with the HR HPV genotype16 and 18 in particular. Other HR types apart from 16 and 18 include HPV 31, 33, 35, 39, 45, 51, 52, 56, 58, 59 and 68 (Li et al., 2022). About 40 HPV genotypes affect genitals as well as mouth and throat. Type 6 and 11, which are LR strains, typically do not result in cancer. However, they can lead to the development of warts on the genitals, anus, mouth and throat. These genotypes are called low risk as they do not transform to cancer nor do they cause serious health problems (Roman & Aragones, 2021). At least 70% of cervical cancers are caused by type 16 and 18 and a significant number of oropharyngeal and ano-genital cancers is also caused by the same genotypes (Bakhshani et al., 2023).

Cervical cancer is commonly associated with high-risk HPV infection, with genotype distribution and prevalence of the virus varying significantly among populations (Song et

al., 2020). Its association with various cancers especially cervical cancer makes it a significant public health concern (Bahi et al., 2024). It takes about 10 to 20 years for HPV lesions to progress to cancer and by so doing, many people with the virus have no symptoms and feel fine so they usually don't know that they are infected (Huang et al., 2022).

In Zimbabwe, the first lady Doctor Auxillia Mnangagwa is in support of the cervical cancer screening program to a greater extent (UNFPA. Zimbabwe). This is indeed a vital step forward in early detection and prevention. While preventive measures such as vaccination as well as screening have been implemented, the burden of HPV infection still persists and there was a knowledge gap on its genotype prevalence especially in the female population. This current study therefore aimed to determine the prevalence of HPV genotypes among women who visited Harare Lancet laboratories from January 2024 to December 2024.

1.2 Background to the study

The infection caused by HPV is a significant public health concern worldwide, impacting approximately 600 million people globally (WHO. 2024). HPV is thought to be the cause of 45-90% of oropharyngeal cancers, 99% of cervical cancers, 90% of anal cancers and 50% of vulva cancers (Petca et al., 2020). Despite the presence of HPV vaccines and screening programs, cervical cancer continues to pose a significant public health challenge on a global scale (Bahi et al., 2024). Cervical cancer associated with HPV is the fourth leading cause of cancer- related deaths among women worldwide with about 311 000 fatalities reported in 2020 (Zibako et al., 2022).

Cervical cancer ranks as the second most common cause of cancer–related fatalities among women in Africa, with approximately 75 000 deaths recorded in 2020 (Jedy-Agba

et al., 2020). The Southern African region faces one of the highest incidences of cervical cancer on the continent (Roman & Aragones, 2021). According to the Human Papillomavirus and related cancers fact sheet of 2023, about 5.24 million Zimbabwean women who are at least 15 years or above are at risk of HPV infection.

In Zimbabwe, cancer of the cervix is the second most prevalent cause of cancer-related deaths among women, with an estimated 2000 fatalities reported in 2020 of which the primary driver of cervical cancer in the country is HPV infection. It has a prevalence rate of 22.4% among women who are diagnosed with the disease. However there is scarcity of data regarding the distribution of HPV genotypes within the general populace (WHO., 2023).

1.2.1 Laboratory diagnosis of HPV

HPV detection is a multiplex Polymerase Chain Reaction (PCR) assay which allows simultaneous amplification, detection and differentiation of target nucleic acids. The Anyplex HPV is commonly used to detect HR genotypes in Liquid Based Cytology (LBC) and cervical swab specimens (Marembo et al., 2019). It was also discovered that urine samples could be used to detect HPV DNA in women especially those who have little healthcare access. However it was reported to have decreased sensitivity as compared to cervical swab specimens (Xu et al., 2020).

1.3 Problem statement

During placement in the molecular department, a large volume of samples were received for HPV testing. According to the Zimbabwe Human Papillomavirus and related Cancers information centre Fact sheet of 2023, there was limited data on the burden of HPV in the general female populace. This might be due to a greater number of individuals from higher socioeconomic backgrounds who visit private healthcare institutions like Lancet

Laboratory in Harare to obtain medical services including HPV testing. Furthermore, little has so far been reported as far as the distribution of HPV genotypes in Zimbabwe is concerned (Marembo et al., 2024). Therefore, there was a significant shortfall in the inclusion of data from private laboratories in national prevalence studies. This could have led to an underestimation of HPV genotype prevalence. Although the Zimbabwean Ministry of Health and Child care (MoHCC) was striving to monitor and manage HPV infections, inadequate knowledge of HPV genotype distribution arise from the exclusion of private laboratory data thus impeding the development of effective control and preventive measures. This study therefore aimed to determine the distribution of HPV genotypes among women at Lancet Clinical Laboratories in Harare from January to December 2024.

1.4 Research objectives

1.4.1 Broad objective

The purpose of this study was to investigate the distribution of Human Papilloma virus genotypes among women who attended Zimbabwe Harare Lancet laboratories from January 2024 to December 2024

1.4.2 Specific objectives

Specifically the aims of this study were:

1. To determine the prevalence rate of Human Papilloma virus among women at Harare Lancet laboratories from January 2024 to December 2024.
2. To determine the common genotypes that were detected among HPV positive women at Harare Lancet laboratories from January 2024 to December 2024.
3. To determine the age group that was most infected by HPV among the study population at Harare Lancet laboratories from January 2024 to December 2024.

1.5 Research questions

1. What was the prevalence rate of Human Papilloma virus among women at Harare Lancet laboratories from January 2024 to December 2024?
2. Which were the most common genotypes detected among HPV positive women at Harare Lancet laboratories from January 2024 to December 2024?
3. Which age group was mostly infected by HPV among the study population at Harare Lancet laboratories from January 2024 to December 2024?

1.6 Justification of the study

Screening programs must be complemented by a robust research on HPV genotypes in Zimbabwe. Using the quantitative approach, this study sought to explore the distribution of HPV genotypes among women who visited Lancet laboratory in Harare. The study may add insights to the national female HPV infection statistics. To identify high- risk populations, it was crucial to comprehend the genotypes and prevalence of HPV. Policymakers will have the evidence that they need to create focused health initiatives from comprehensive prevalence data. This could result in better resource distribution as well as educational initiatives that will be focused at lowering the prevalence of diseases connected to HPV. It was essential to establish a baseline knowledge of HPV genotype prevalence for continuing research projects. The outcome might also be helpful in assessing the effects of immunization and screening programs as well as tracking changes over a period of time. The researcher will gain knowledge and expertise from conducting a health research hence contributing to the literature of the topic. The research findings could as well lead to new perceptions and discoveries that could be so beneficial to public health. This study therefore sought to determine the distribution of HPV genotypes among women who visited Harare Lancet laboratories from January to December 2024.

1.7 Delimitations of the study

The scope of this study was limited to Harare Lancet Clinical laboratories and analyzing samples for women who were tested from January to December 2024. Furthermore, the study sorely focused on data collected from the specified timeframe

1.8 Limitations of the study.

The Laboratory information system that the study site uses could not reveal specific genotypes that were present in the groups A and group B. The research findings from Lancet laboratories may not be generalizable to the broader population of Zimbabwean women.

1.9 Chapter Summary

The whole of chapter one provided an overview of the research project. It included the introduction being the first. It was followed by background of the study which highlighted the burden of the virus across the globe. The problem statement was clearly articulated. The broad objective, specific objectives and the research questions were clearly expressed. Study limitations were included and the chapter ended with the study delimitation.

CHAPTER 2 REVIEW OF RELATED LITERATURE

2.1 Introduction

This chapter presented an in depth review of literature and theoretical framework related to HPV genotypes. It started by outlining the theoretical framework. Different studies about HPV prevalence in diverse populations were analyzed. By so doing, a solid foundation for the current research was established and hence gaps that this project seeks to address may be identified.

2.2 Theoretical framework- an application of the Health Belief Model (HBM)

The theory suggests that an individual's health related actions are shaped by their personal beliefs and the perceived advantages of taking steps to prevent or alleviate those issues. The health belief model has six components as follows: perceived susceptibility, perceived severity, perceived benefits, perceived barriers, cues to action and self-efficacy (Alyafei & Easton-Carr, 2025).

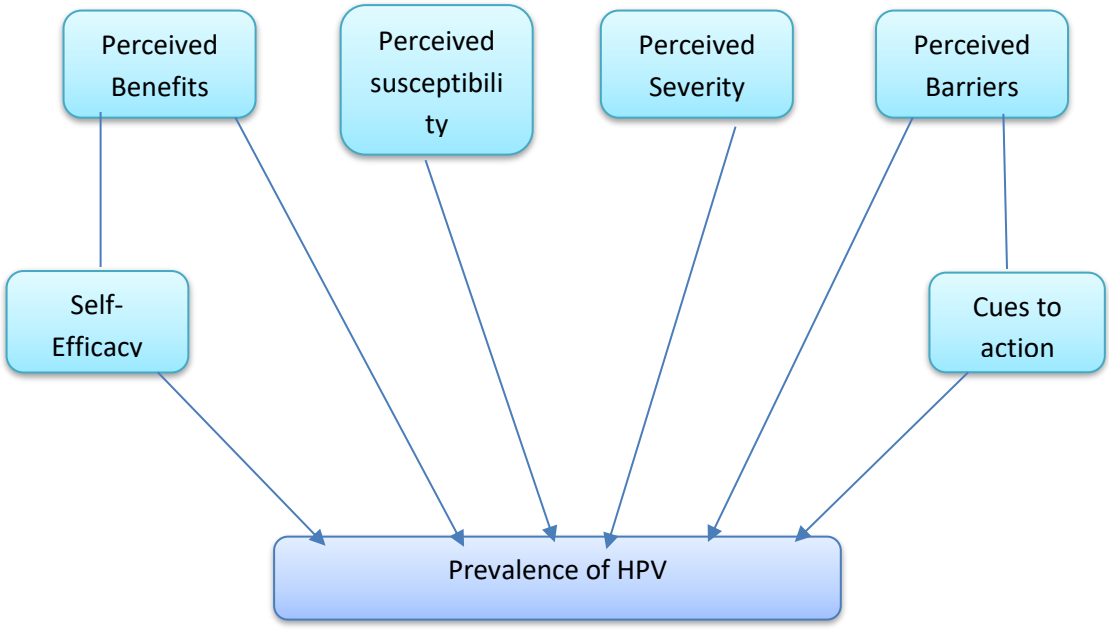


Figure 1*: *Components of the HBM

When considering HPV, this framework clarifies how women's views on HPV risk, vulnerability, severity and the benefits of preventive measures impact the prevalence of various HPV genotypes. Women's perceptions of their likelihood of contracting HPV significantly affect their health behaviour. This perception could influence their involvement in screening initiatives which will affect the prevalence of HPV.

2.2.1 Assumptions

The various components of Health Belief Model are interconnected and have an impact on each other. Zimbabwean women's attitudes and beliefs regarding HPV and cervical cancer impact their vaccination and screening practices.

2.2.2 Ideas

An increased chance of HPV screening as well as vaccination is associated with higher perceived susceptibility and severity.

Vaccination and screening for HPV are more likely when perceived benefits are greater and barriers are lower.

2.3 LITERATURE REVIEW IN RELATION TO OBJECTIVES

2.3.1 Prevalence of Human Papilloma virus

In about 19 studies conducted in 2020, 8175 samples were collected from HIV positive women in developing countries. The estimated pooled prevalence of all genotypes was 63%. The pooled prevalence of both HR and LR genotypes was 51%. (Bogale et al., 2020) However in another survey, 427, 401 Chinese women of 20 years of age or older, the prevalence of HR HPV was 12.2% and that of cervical HPV was 15% (Bao et al., 2021). A different study in the United States revealed a total prevalence of 40% among men and women (Lewis et al., 2021).

Eastern and Southern Africa reported a high prevalence rate which was between 23.6% and 70.5%. HR was reported in women who had early sexual debut (Macleod & Reynolds, 2021). This however shows that a significant portion of the people in the region was at risk for HPV infection. Similarly, In Zimbabwe a cross sectional study was done on women with invasive cell carcinoma in urban referral hospitals from June 2014 to December 2015. The study revealed a 94% prevalence rate of HPV (Mudini et al., 2018). These statistics suggest a very strong correlation that is between cervical cancer and HPV infection.

2.3.2 Common HPV genotypes among women

In 2021, a study was conducted at a clinic in Harare Zimbabwe where 600 women were recruited. Anal swabs were collected in duplicate, self -collection as well as clinician collected. Next generation sequencing was done to detect the DNA of the virus. The common genotypes that were detected were 52 followed by 62, 70, 44, 53 and 68 (Dube Mandishora et al., 2021).

In a multi-centric population based study in the largest health clinic in China, most HR genotypes which were detected were 52, 58, 16 and 18. Low risk genotypes 6 and 11were relatively low (Bao et al., 2021).

In an article published by the international journal of STD and AIDS, a study based on 51 articles was conducted between 2015 and 2021. During the study, HPV genotype 16 was most prevalent with 41% followed by genotype 52 which had 17% and type 58 with 14%. However a comparative analysis was done between HIV positive and HIV negative participants. Genotype 16 was frequent in both groups. Types 58, 31 and 52 were more

frequent in HPV/HIV co infected group. Type 18 was common in HIV-negative participants (Paraná et al., 2022)

A similar study was conducted in Northern Guangdong in China where 100.994 women were recruited. Out of the selected number, 25 710 came out HPV positive and the number of genotypes was greater than the number of women who were infected. The infection rate was 19.04%. 23 HR genotypes were detected. However the top 10 and most prevalent were 52, 16, 58, 53, 68, 51, 18, 56, 33 as well as 59. The LR genotypes detected were 81, 43, 42, 6, 11 and 33 (Huang et al., 2022). In about 19 studies conducted in 2020, 8175 samples were collected from HIV positive women in developing countries. Pooled prevalence of genotypes 16, 18 and 52 was 20%, 15% & 13% respectively (Bogale et al., 2020)

Basing on the above reviewed literature, some studies were showing differences in the most common HPV genotypes being detected in the different regions. Therefore prevalence of genotypes varied with regions for example China and Zimbabwe. Comparatively in most studies, HR types 16, 18, 52 &58 were more prevalent than 6, 11 &81 which are LR types. Also Given the fact that more genotypes were frequently found than there were cases of infection, some research implied that women may have more than one HPV genotype. Overally, among women in different studies, the most prevalent high-risk (HR) HPV genotypes found were 52, 16, 58, 18, and 53, whereas the most prevalent low-risk (LR) genotypes found were 6, 11, and 81. Depending on the demographic, geographic region and methodology, the prevalence rates of HPV infection ranged from 19.04% to 63% in various researches.

2.3.4 Commonly affected age groups

The global observation showed that the prevalence of HPV reaches its highest point right after sexual debut and then decreased as age increased. A prevalence study carried out in Japanese women showed a highest peak in the age group of 29-39 years (Palmer et al., 2022). This is agreeing with a different study that was conducted in Nigeria. A random selection of participants among women of child bearing age was done in Yola, Adamawa state in Nigeria and it revealed a high prevalence in women between the ages of 24 to 41 years whereas no positive samples was detected among age group 18 to 23. This however showed that the prevalence was associated with their number of sexual partners (Nafisat Adamu Kachalla et al., 2021).

A systematic review as cited by De Sanjose. (2019) revealed that younger women especially those aged between 15 and 24 years had the increased rates of HPV infection. According to Bergqvist et al. (2021) this may be largely attributed to having multiple sexual partners as well as high sexual activity during this life stage. However, while many of such infections are temporary, there was a trend that was so alarming. It was the HR genotypes persistence which was more prevalent in older women over 50 years in particular (Roura et al., 2021). This shift in demographics calls for targeted screening and intervention strategies for those older populace as their risk of cervical cancer is increased. Additionally, another study was done by (Akinyi et al., 2024) and it highlighted that women aged 30-39 exhibit a significant rise in HR genotype prevalence as compared to younger groups. This trend is so worrisome because in cases of late or delayed diagnosis in such women can result in more advanced cervical cancers cases. Based on the above literature, there is need for early and timely awareness as well as screening campaigns which target this affected cohort.

2.4 Chapter summary

The chapter provided a comprehensive overview of what other authors came up with in different studies. It started with an introduction. A theoretical framework was used in context of HPV prevalence and a diagrammatic illustration of the health belief model was included. Literature was then reviewed in relation to objectives thereby reinforcing the relevance of study objectives.

CHAPTER 3. RESEARCH METHODOLOGY

3.1 Introduction

This chapter focused on the methodology that was used in this study to determine the prevalence of HPV genotypes among women who visited Harare Lancet Laboratories from January 2024 to December 2024. The chapter provided an overview of the research design, the data collection methods as well as techniques. The ethical considerations were discussed in this chapter. It also gage an overview of the study site, study population, the sample size as well as the sampling methods.

3.2 The Research Design

The study was a retrospective cross sectional study of human papilloma virus genotypes that were detected from samples tested at Lancet Clinical Laboratories from January 2024 to December 2024. This design was ideal to use because of its efficiency and there was no follow up required. It consumed less time and allowed the researcher to use already existing data. A retrospective study was also cost effective as it reduced costs that were associated with collection of data and recruiting participants. There was minimal risk since the study did not involve intervention of human subjects, only available data was utilized. Available results were used to compile all the information on the prevalence of HPV genotypes among women of different age groups.

3.3 Study Population and sampling

The study was done on samples from women who were tested for HPV at Harare Lancet laboratories from January to December 2024.

3.3.1 Inclusion Criteria

Samples from women who were tested for HPV at Harare Lancet Laboratory from January to December 2024 were included.

3.3.2 Exclusion Criteria

Samples which did not fall under the study period were not considered. Women samples that were used for a pilot study were excluded in the main study.

3.3.3 Sample size

A sample was taken from the study population and consisted of 366 subjects .Sample size was calculated using the Cochran's formula as follows:

$$SS = \frac{Z^2(p)(1-p)}{E^2}$$

Where;

SS = Sample size

Z = the Z value (1.96 for a 95% confidence level)

P = percentage of population picking a choice (expressed as a decimal)

E = Margin of error (0.05)

Therefore $SS = \frac{1.96^2(0.39)(1-0.39)}{0.05^2}$

=366 participants

3.3.4 Sampling Procedure

The study used a simple random sampling which is a Probability sampling method. This is whereby every member had an equal chance of being selected. It was ideal to use because it ensured that sample is representative of a larger population thus it allowed generalizability of research findings. The likelihood of bias was minimal as participants were randomly selected. This led to more reliable results.

3.4 Data Collection Instruments

The data was collected using an excel sheet through Meditech- the information system which the study site used.

3.5 Pilot Study

A small scale test of methods and procedures which were to be used in a study was done. It helped to see whether or not the proposed study design was feasible. In this study, the pilot study was done at Lancet Clinical Laboratories in 20 women so that if there were issues that may have negatively impacted the study, they would be addressed before the

larger scale study was done. The participants used in the pilot study were not used in the main study.

3.5.1 Study Setting

The research study was conducted at Lancet Clinical Laboratories which is located at 22 corner Blakiston and 5 Avenue in Harare as shown in figure 2 below.

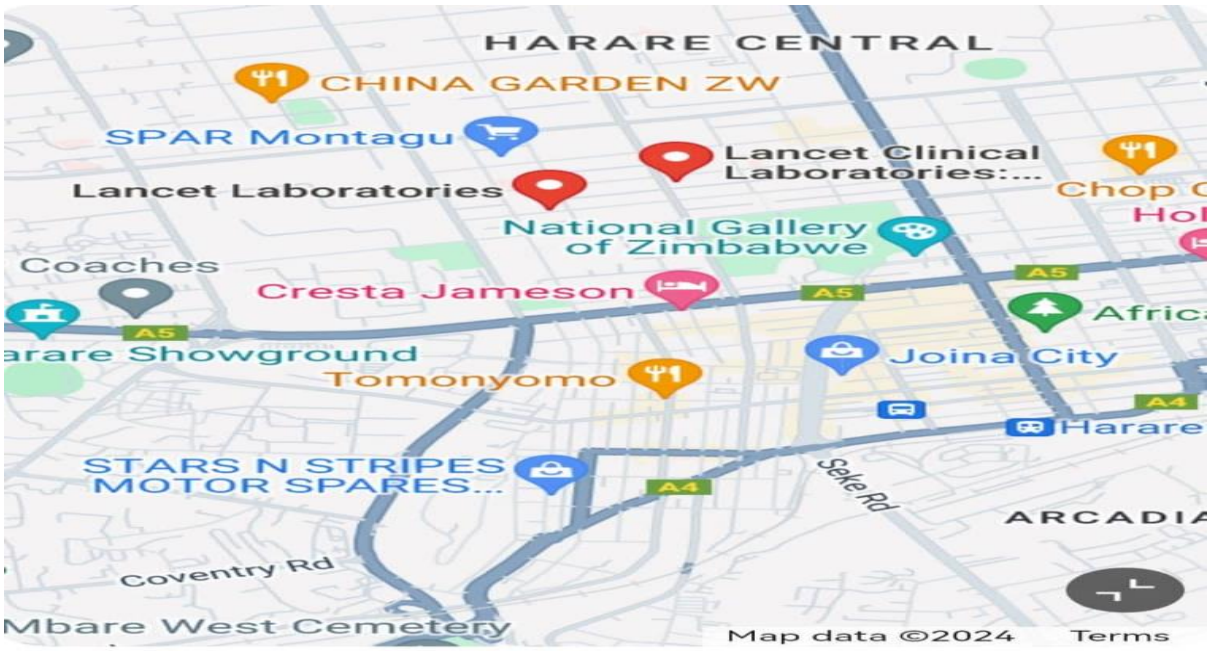


Figure 2: *A map showing Harare Lancet clinical Laboratories location*

The Laboratory serves as the central testing site for a quite a number of outstations that serve as collection locations. For this reason, there was an opportunity to access a varied collection of specimens from a larger population at Lancet Harare than being limited to a smaller collection site.

3.6 Data collection procedure

Consent from the Laboratory authorities to carry out the study was sought and after getting it, the available data in Lancet database was extracted using MEDTECH - the laboratory information system which the study site used. The reference numbers with HPV tests were

identified using the computer mnemonics so that only the required tests were displayed. Excel sheet was used to organize the extracted data

3.7 Analysis and organization of Data

In order to come up with a conclusion, a systematic application of techniques to describe and evaluate collected data was done. In this study, Microsoft excel was used to organize the extracted data. In order to guarantee accuracy and consistency, the data was cleansed, coded and then categorized. Visualization tools such as tables, pie charts and graphs were used to analyze for easier understanding. Univariate analysis was done which means one variable was analyzed at a time.

3.8 Ethical considerations

For a research to be considered ethical, it must satisfy ethical principles such as respect for individuals (autonomy), do no harm (beneficence), truth telling (veracity) and confidentiality. In this study, the ethical clearance was obtained from Africa University Research Ethics Committee (AUREC). Before data collection process, consent was sought from the Chief Executive Officer, the Laboratory manager and the molecular lab Head of department at Lancet Clinical Laboratories. An approval letter was obtained from the study site through the Laboratory manager. The researcher maintained privacy and confidentiality throughout the study. Patients' names were not used in the study but only laboratory reference numbers were used. Patients' results and medical records were considered as private and confidential. The researcher made sure that the process does not cause harm to any patient or others in the society. Lastly, correct data and figures were analyzed with neither additions nor subtractions.

3.9 Summary

This study was a retrospective cross sectional study of human papilloma virus genotypes among women whose samples were tested for HPV between January and December 2024 at Lancet Clinical Laboratories. The study population were women. Simple random sampling was done. Data extraction sheet as shown in Appendix 3 was used to collect data. Permission to carry out the study was sought from AUREC and a permission letter to collect data was sought from Lancet Clinical Laboratories Manager. The study was done in a way that caused no harm and with respect for persons. Every patient information was kept as private and confidential.

CHAPTER 4. DATA PRESENTATION, ANALYSIS AND INTERPRETATION

4.1 Introduction

This chapter provides an outline and overview of the results that were obtained for HPV genotypes among women at Harare Lancet laboratories from January to December 2024. The data extraction tool as shown in Appendix 3 was used. The results obtained were presented in tables, charts as well as graphs to understand the trends clearly. They show prevalence of HPV, the dominant/common genotypes that were detected and the most infected age groups.

4.1.2 Socio-demographic characteristics of patients with HPV infection.

Table 1*: mean age group of participants*

Attribute	Frequency (N)
Mean –Age (years)	43

Out of the 366 participants, the mean age of 43 years suggests a middle-aged demographic. Age can influence several health outcomes as well as health seeking behavior.

4.2 Prevalence of HPV at Lancet Clinical laboratories

A total number of 366 samples from females were tested. Different genotypes were detected in 85 out of 366 women and 281 out of 366 were negative. This means that there was a 23.2% overall prevalence of HPV across age groups at Lancet Clinical laboratories as shown in table 1 below. The prevalence rate was calculated using the formula as follows: $\frac{number\ of\ positive\ cases}{total\ tested}\ x100$

$\frac{85}{366}\ x100$ =23.25%

Table 2*: Prevalence of HPV*

Detected cases	Not detected	Total samples tested	Prevalence
85	281	366	23.2%

4.2.1 Common genotypes detected

Several HPV genotypes were found and with different frequencies when analyzed. Type 16 was the most common with 15 detections. Type 45 was the least common with 2 cases detected. In terms of grouping, Group B which comprises of genotypes 35, 39, 51, 56, 59, 66 & 68 had a greater number accounting for 29 cases detected. Group A which comprises of genotypes 31, 33, 52 & 58 had 13 detections. Table 3 below summarizes the findings.

Table 3*: frequency of genotypes*

Genotypes	Frequency (N)	Percentage (%)
Category 1-single genotypes		
16	15	17.6
45	2	2.3
Group A (31, 33, 52 & 58)	13	15.3
Group B (35, 39, 51, 56, 59, 66 & 68.)	29	34
Category 2-multiple genotypes		
16 &18	1	1.2
18 & group B	1	1.2
16 & 45	1	1.2
45 & group A	1	1.2
16 & group B	5	5.9
16, 18 & group A	1	1.2
Group A & B	11	12.9
16, group A & B	5	5.9
Total	**85**	**100%**

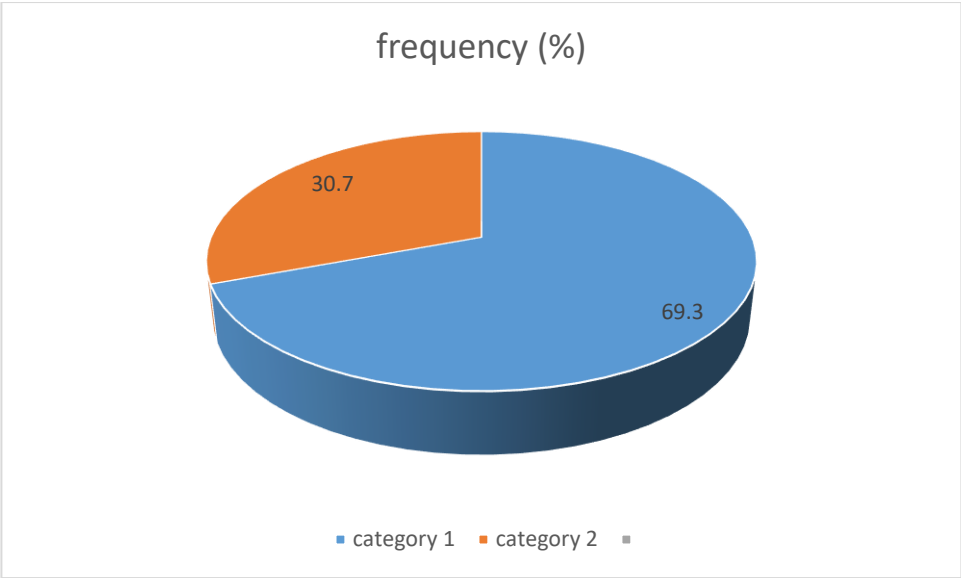


Figure 3: *single genotypes (cat.1) vs multiple genotype infection (cat.2)*

4.2.2 Age groups mainly infected

Basing on the study, table 4 below gives a summary of the percentages of HPV cases across various age groups. HPV was highest in the 36-45 age group which had a prevalence of 30.59%. It was followed by a 29.4% prevalence from 26-35 age group. The group range of 46-55 years had a prevalence of 20%. However, with only a prevalence 1.18%, the 66-75, 0-14 and 76-85 years age group had the lowest rate.

Table 4: *Distribution across various age groups*

codes	Age group (years)	Number of cases	Percentage (%)
Code 0	0-14	1	1.18
Code 1	15-25	9	10.59
Code 2	26-35	25	29.4
Code 3	36-45	26	30.59
Code 4	46-55	17	20
Code 5	56-65	5	5.88
Code 6	66-75	1	1.18
Code 7	76-85	1	1.18
Code 8	86-95	0	0
	TOTAL	**85**	**100**

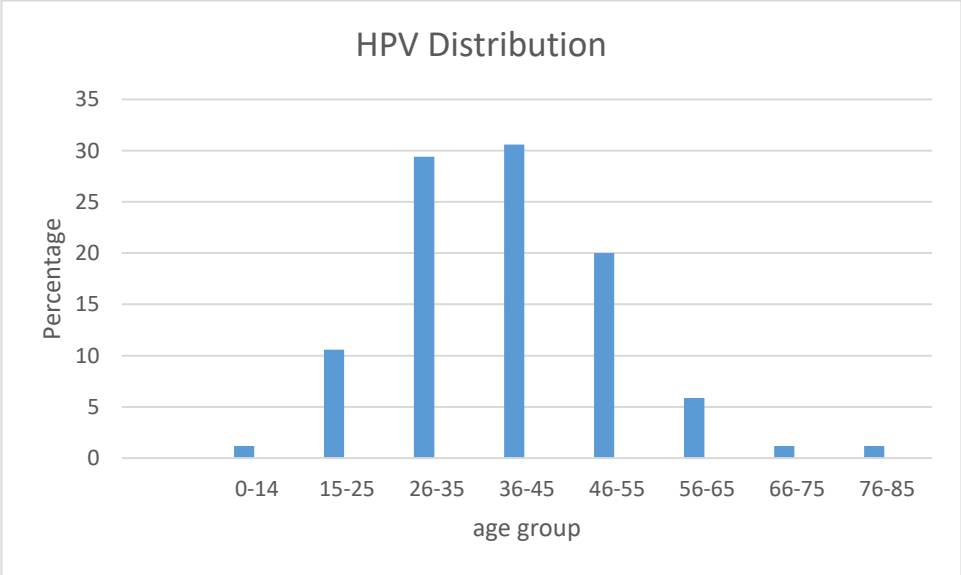


Figure 4: *Distribution of HPV across age groups*

4.3 Summary

The chapter clearly outlined the results that were obtained during the study and were outlined with respect to all the objectives. There was a 23.2% prevalence rate of HPV discovered from the study population which is so significant. Different genotypes were discovered in various age groups with the commonest being genotype 16. Group A and B also posed a significant number with each group having 13and 29 cases respectively. However group A and B consisted of 11 different genotypes altogether. The most affected age group was 36-45years which had a prevalence of 30.59% as well as 26-35 years which had 29.4%.

CHAPTER 5 DISCUSSION, CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

The chapter gives a summary of the research findings. This was done in relation to all the research objectives as well as literature review. Likenesses and variances of the study in similar studies that were done were clearly highlighted. The study limitations, suggestions recommendations were discussed.

5.2 Discussion

5.2.1 Prevalence of HPV

In this study, 366 samples were analyzed and the results obtained showed a prevalence rate of 23.2%. This differs with research findings from a study in China where women from the age of 20 years showed a lower prevalence of 12.2% (Bao et al., 2021). Another study which was done in Eastern and Southern Africa concur with this study findings as it showed a prevalence rate which ranged from 23.6 %. However that same study had a maximum prevalence rate of 70.5% which does not concur with this study (Macleod & Reynolds, 2021).

5.2.2 Common genotypes

Genotype 16 was most common in this study concurring with a study which also detected type 16 as the most prevalent (Paraná et al., 2022). A study conducted in Northern Guangdong, China obtained genotype 16 as one of the most prevalent. The number of samples that were tested was lower than the number of genotypes detected (Huang et al., 2022). This was in agreement with the research findings of this study as the number of genotypes detected exceeded the number of samples. It was seen in the study that some people were infected with more than one HPV genotype. A research by Bogale et al. (2020), concluded that genotype 16 and 18 were the most common genotypes detected.

Therefore basing on the current study findings as well those from other researchers it can be concluded that genotype 16 prevailed most in different countries and regions.

5.2.3 Age groups mainly affected

It was found in the study that the most affected age group was 36 to 45 years. This does not concur with findings from De Sanjose et al. (2019), a study which revealed that younger women between the age of 15 and 24 years had increased rates of infection. A study by Akinyi et al. (2024) highlighted that women from 30 to 39 years exhibited a higher prevalence as compared to younger females. This concurs with the research findings of this study as the same age group had a higher prevalence rate of infection than younger ones although they also posed a significant rate of infection. Roura et al. (2021) obtained a worrisome trend in women above 50 years who had HR genotypes detected and it differs with the research findings for the current study as infection rate declined as the age increased. The current research findings however concurs with the global observation which showed that the prevalence of HPV reaches its highest point right after sexual debut and then decreases as age increases. According to Bergqvist et al. (2021) the younger age group being the most affected maybe attributed to having many sexual partners and maybe without protection.

5.3 Conclusion

The research drew a conclusion that close to a quarter of the studied female population at Lancet Clinical Laboratories from January to December 2024 were infected with HPV. The age groups of 36-45 years and 26-35 years were mostly infected with HPV. Some individuals were infected with more than one genotype. Type 16 was the commonly detected genotype.

5.4 Implications of the study to public health

The extensive distribution of HPV genotypes 16 across different countries and regions highlights the necessity for ongoing vaccination initiatives. A comprehensive national vaccination strategy is essential to mitigate HPV related illnesses. The Ministry of Health and Child care should persist in administering vaccines that specifically target these genotypes. It should boost vaccine acceptance. This means that people should be motivated to receive vaccinations by addressing their concerns and dispelling myths that surround HPV vaccines. Since younger age groups are more susceptible as found in this study and concurring with other studies, suggests that they are likely to be engaging in high risk behavior such as having multiple sex partners and unprotected acts. The MoHCC should therefore raise awareness campaigns and give health education to young adults.

5.5 Recommendations

It is recommended that the MoHCC expands the HPV vaccination programs, enhance public awareness and educate women, particularly young and middle aged women. More funding should be directed towards improving access to HPV testing.

5.6 Suggestions for further research

For future research, it is recommended that there be looked into which age group is being infected with multiple HPV genotypes.

List of references

Akinyi, I., Awandu, S. S., Broeck, D. V., Pereira, A. R., Redzic, N., & Bogers, J. (2024). Prevalence and genotype distribution of potential high-risk and high-risk human papillomavirus among women attending selected reproductive health clinics in lake victoria basin-kenya: A cross-sectional study. *BMC Women's Health*, *24*(1), 468. https://doi.org/10.1186/s12905-024-03303-9

Alyafei, A., & Easton-Carr, R. (2025). The Health Belief Model of Behavior Change. In *StatPearls*. StatPearls Publishing. http://www.ncbi.nlm.nih.gov/books/NBK606120/

Ashry, M., Shawky, S., Mounir, Z., Fathy, F., Elsayed, H., Kamal, W., & Hassany, M. (2024). Prevalence and risk factors of human papilloma virus infection among women living with HIV, Egypt, a cross sectional study. *BMC Public Health*, *24*(1), 1821. https://doi.org/10.1186/s12889-024-19240-z

Bahi, M. C., Bahramand, S., Jan, R., Boulaaras, S., Ahmad, H., & Guefaifia, R. (2024). Fractional view analysis of sexual transmitted human papilloma virus infection for public health. *Scientific Reports*, *14*(1), 3048. https://doi.org/10.1038/s41598-024-53696-8

Bakhshani, A., Ganjali, R., & Tabatabaeizadeh, S.-E. (2023). Prevalence of Human Papillomavirus (HPV) Genotypes among Women During 2015–2020 in Mashhad, Iran. *Archives of Iranian Medicine*, *26*(8), 419–426. https://doi.org/10.34172/aim.2023.64

Bao, H.-L., Jin, C., Wang, S., Song, Y., Xu, Z.-Y., Yan, X.-J., Li, L.-M., Ning, Y., & Wang, H.-J. (2021). Prevalence of cervicovaginal human papillomavirus infection and genotypes in the pre-vaccine era in China: A nationwide population-based study. *Journal of Infection*, *82*(4), 75–83. https://doi.org/10.1016/j.jinf.2021.02.017

Bergqvist, L., Kalliala, I., Aro, K., Auvinen, E., Jakobsson, M., Kiviharju, M., Virtanen, S., Dillner, J., Nieminen, P., & Louvanto, K. (2021). Distribution of HPV Genotypes Differs Depending on Behavioural Factors among Young Women. *Microorganisms*, *9*(4), 750. https://doi.org/10.3390/microorganisms9040750

Bogale, A. L., Belay, N. B., Medhin, G., & Ali, J. H. (2020). Molecular epidemiology of human papillomavirus among HIV infected women in developing countries: Systematic review and meta-analysis. *Virology Journal*, *17*(1), 179. https://doi.org/10.1186/s12985-020-01448-1

Dube Mandishora, R. S., Rounge, T. B., Fitzpatrick, M., Christiansen, I. K., Ambur, O. H., Lagström, S., Stray-Pedersen, B., Tommasino, M., Palefsky, J., & Chirenje, Z. M. (2021). Self-collected and clinician-collected anal swabs show modest agreement for HPV genotyping. *PLOS ONE*, *16*(4), e0250426. https://doi.org/10.1371/journal.pone.0250426

Huang, W., Xu, H., Hu, H., Zhang, D., Liu, Y., Guo, Y., Xiao, F., Chen, W., & Ma, Z. (2022). The prevalence of human papillomavirus among women in northern Guangdong Province of China. *Scientific Reports*, *12*(1), 13353. https://doi.org/10.1038/s41598-022-17632-y

Jedy-Agba, E., Joko, W. Y., Liu, B., Buziba, N. G., Borok, M., Korir, A., Masamba, L., Manraj, S. S., Finesse, A., Wabinga, H., Somdyala, N., & Parkin, D. M. (2020). Trends in cervical cancer incidence in sub-Saharan Africa. *British Journal of Cancer*, *123*(1), 148–154. https://doi.org/10.1038/s41416-020-0831-9

Lewis, R. M., Laprise, J.-F., Gargano, J. W., Unger, E. R., Querec, T. D., Chesson, H. W., Brisson, M., & Markowitz, L. E. (2021). Estimated Prevalence and Incidence of Disease-Associated Human Papillomavirus Types Among 15- to 59-Year-Olds in the United States. *Sexually Transmitted Diseases*, *48*(4), 273–277. https://doi.org/10.1097/OLQ.0000000000001356

Li, X., Xiang, F., Dai, J., Zhang, T., Chen, Z., Zhang, M., Wu, R., & Kang, X. (2022). Prevalence of cervicovaginal human papillomavirus infection and genotype distribution in Shanghai, China. *Virology Journal*, *19*(1), 146. https://doi.org/10.1186/s12985-022-01879-y

Macleod, C. I., & Reynolds, J. H. (2021). Human Papilloma Virus infection and cervical cancer among women who sell sex in Eastern and Southern Africa: A scoping review. *Women's Health*, *17*, 174550652110583. https://doi.org/10.1177/17455065211058349

Marembo, T., Dube Mandishora, R., & Borok, M. (2019). Use of Multiplex Polymerase Chain Reaction for Detection of High-Risk Human Papillomavirus Genotypes in Women Attending Routine Cervical Cancer Screening in Harare. *Intervirology*, *62*(2), 90–95. https://doi.org/10.1159/000502206

Mudini, W., Palefsky, J. M., Hale, M. J., Chirenje, M. Z., Makunike-Mutasa, R., Mutisi, F., Murahwa, A., & Mario, A. (2018). Human Papillomavirus Genotypes in Invasive Cervical Carcinoma in HIV-Seropositive and HIV-Seronegative Women in Zimbabwe. *JAIDS Journal of Acquired Immune Deficiency Syndromes*, *79*(1), e1–e6. https://doi.org/10.1097/QAI.0000000000001754

Nafisat Adamu Kachalla, Halima Isa, Mohammed Bashir, & Shinjawa Yunana. (2021). Prevalence of Human Papilloma Virus among women of child bearing Age in Yola Adamawa State, Nigeria. *UMYU Journal of Microbiology Research (UJMR)*, *6*(2), 24–29. https://doi.org/10.47430/ujmr.2162.004

Palmer, M., Katanoda, K., Saito, E., Acuti Martellucci, C., Tanaka, S., Ikeda, S., Sakamoto, H., Machelek, D., Ml Brotherton, J., & Hocking, J. S. (2022). Genotype prevalence and age distribution of human papillomavirus from infection to cervical cancer

in Japanese women: A systematic review and meta-analysis. *Vaccine*, *40*(41), 5971–5996. https://doi.org/10.1016/j.vaccine.2022.07.052

Paraná, V. C., Souza Santos, D., Barreto De Souza Silva, D. I., Lima, G. C., Gois, L. L., & Santos, L. A. (2022). Anal and cervical human papillomavirus genotypes in women co-infected with human immunodeficiency virus: A systematic review. *International Journal of STD & AIDS*, *33*(6), 530–543. https://doi.org/10.1177/09564624221076293

Petca, A., Borislavschi, A., Zvanca, M., Petca, R.-C., Sandru, F., & Dumitrascu, M. (2020). Non-sexual HPV transmission and role of vaccination for a better future (Review). *Experimental and Therapeutic Medicine*, *20*(6), 1–1. https://doi.org/10.3892/etm.2020.9316

Roman, B. R., & Aragones, A. (2021). Epidemiology and incidence of HPV-related cancers of the head and neck. *Journal of Surgical Oncology*, *124*(6), 920–922. https://doi.org/10.1002/jso.26687

Song, L., Lyu, Y., Ding, L., Li, X., Gao, W., Wang, M., Hao, M., Wang, Z., & Wang, J. (2020). Prevalence and Genotype Distribution of High-Risk Human Papillomavirus Infection in Women with Abnormal Cervical Cytology: A Population-Based Study in Shanxi Province, China. *Cancer Management and Research*, *Volume 12*, 12583–12591. https://doi.org/10.2147/CMAR.S269050

Xu, H., Yu, Y., George, W., Smith, J. S., Hu, S., Dang, L., Zhang, X., Pan, Q., Qiao, Y., & Zhao, F. (2020). Comparison of the performance of paired urine and cervical samples for cervical cancer screening in screening population. *Journal of Medical Virology*, *92*(2), 234–240. https://doi.org/10.1002/jmv.25597

Zibako, P., Tsikai, N., Manyame, S., & Ginindza, T. G. (2022). Cervical cancer management in Zimbabwe (2019–2020). *PLOS ONE*, *17*(9), e0274884. https://doi.org/10.1371/journal.pone.0274884

APPENDICES

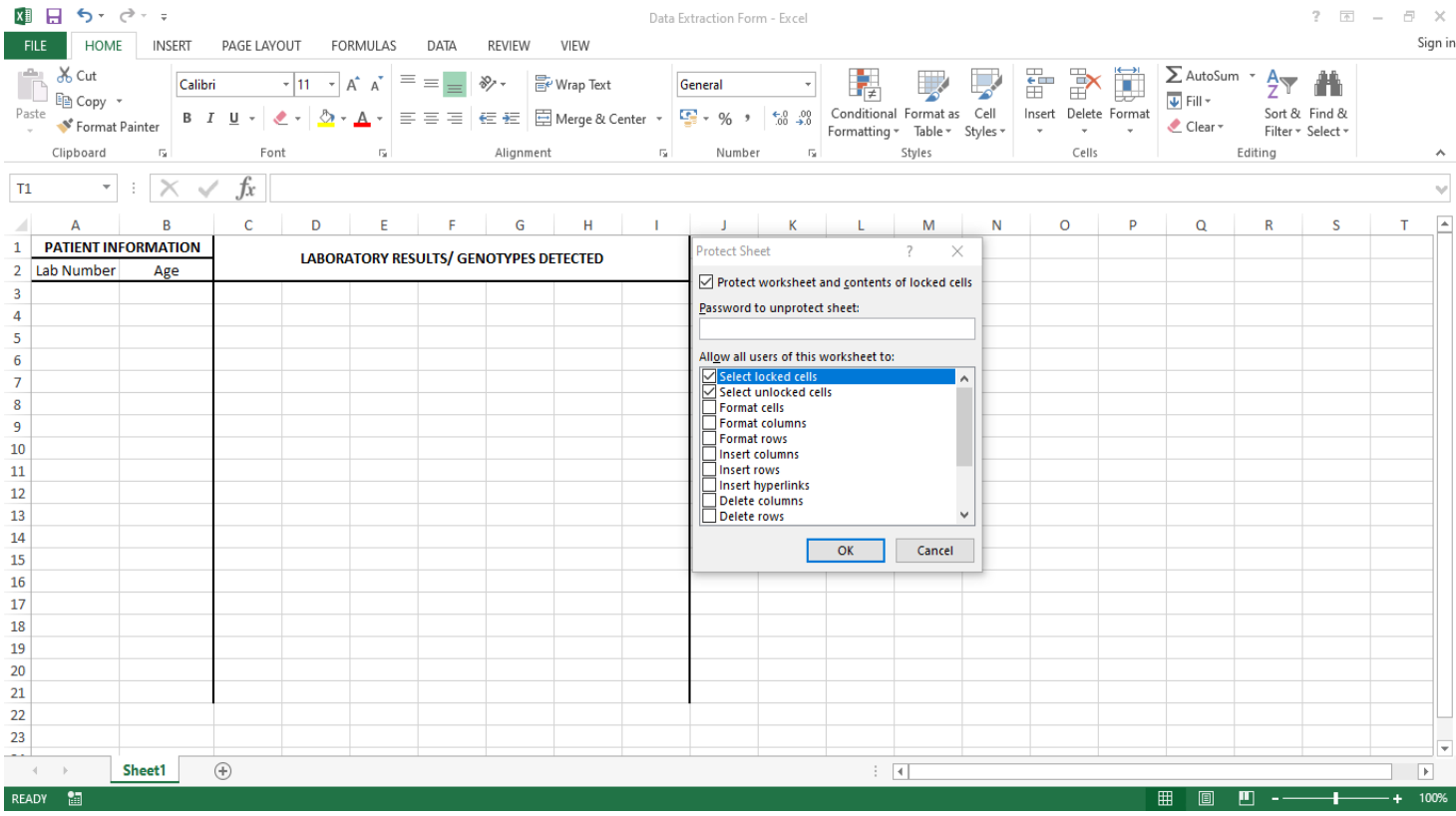
Appendix 1: Time frame

	Month	**August 2024**				**September 2024**				**January 2025**				**February 2025**				**March 2025**			
	Week	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Activity																					
Preparation and submission of proposal to AUREC																					
Pretesting																					
Data collection																					
Data processing and analysis																					
Final project writing																					
Project submission to Africa University																					

Appendix 2: Budget

ITEM	QUANTITY	PER UNIT COST (USD)	TOTAL $USD
Transport costs	-	10	10
Bond paper	1 ream	7	7
Printing and Binding	-	15	15
Stationery (pens, pencils, eraser)	-	-	3
Total			35

Appendix 3: Data collection Tool



Appendix 4: Approval from study site

Africa University

P.O Box 1320

Mutare

30 September 2024

LANCET
CLINICAL LABORATORIES
22 FIFE AVE / Cnr BLAKISTONE ST.
P.O. BOX BW260
HOWDALE, HARARE

Approved
01/10/24

Lancet Clinical Laboratories

22 Cnr Fife Avenue & Blakiston Street

Harare

Dear Mr Magaisa

RE: REQUEST FOR PERMISSION TO CARRYOUT A RESEARCH ON THE DISTRIBUTION OF HUMAN PAPILLOMA VIRUS GENOTYPES AMONG WOMEN ATTENDING LANCET CLINICAL LABORATORIES FROM JANUARY 2024 TO DECEMBER 2024

I am writing to request for permission to conduct a retrospective cross sectional research study in the molecular department at Lancet Clinical Laboratories. The research is part of my degree requirements. I am in my final year at Africa University and currently attached to your laboratory. My research topic reads, "Distribution of Human Papilloma virus genotypes among women attending Lancet Clinical Laboratories from January 2024 to December 2024". I wish to start the data collection process in November 2024.

I assure you that I will consider all the obtained data as private and confidential and will only be used for the purpose of the research project.

Looking forward to a favourable reply.

Yours sincerely

Precious Raza

Appendix 5: Letter from supervisor

AFRICA UNIVERSITY

"Investing in Africa's Future"

DEPARTMENT OF PUBLIC HEALTH AND NURSING: COLLEGE OF HEALTH, AGRICULTURE AND NATURAL RESOURCES

25 October 2024

To: AUREC Administrator

Dear Madam

RE: PERMISSION TO SUBMIT TO AUREC FOR RAZA PRECIOUS

PROGRAMME: BACHELOR OF MEDICAL LABORATORY SCIENCES HONOURS

This letter serves to confirm that I have supervised the above-mentioned student and she has satisfied all the requirements of the college in developing her research proposal and is ready for ethical review.

Your facilitation for review of the proposal is greatly appreciated.

Thank you

Mr Tawanda Thabani Dzvairo
Research Supervisor

Appendix 6: Approval letter from AUREC

"Investing in Africa's future"

AFRICA UNIVERSITY RESEARCH ETHICS COMMITTEE (AUREC)

P.O. Box 1320 Mutare, Zimbabwe, Off Nyanga Road, Old Mutare-Tel (+263-20) 60075/60026/61611 Fax: (+263 20) 61785 Website: www.africau.edu

Ref: AU 3500/24 7 November, 2024

PRECIOUS RAZA
C/O Africa University
Box 1320
MUTARE

RE: DISTRIBUTION OF HUMAN PAPILLOMA VIRUS GENOTYPES AMONG WOMEN AT HARARE LANCET CLINICAL LABORATORIES FROM JANUARY 2024 TO DECEMBER 2024

Thank you for the above-titled proposal you submitted to the Africa University Research Ethics Committee for review. Please be advised that AUREC has reviewed and approved your application to conduct the above research.

The approval is based on the following.

a) Research proposal

- **APPROVAL NUMBER** AUREC 3500/24
  This number should be used on all correspondences, consent forms, and appropriate document
- **AUREC MEETING DATE** NA
- **APPROVAL DATE** November 7 2024
- **EXPIRATION DATE** November 7, 2025
- **TYPE OF MEETING**: Expedited
  After the expiration date, this research may only continue upon renewal. A progress report on a standard AUREC form should be submitted a month before the expiration date for renewal purposes.
- **SERIOUS ADVERSE EVENTS** All serious problems concerning subject safety must be reported to AUREC within 3 working days on the standard AUREC form.
- **MODIFICATIONS** Prior AUREC approval is required before implementing any changes in the proposal (including changes in the consent documents)
- **TERMINATION OF STUDY** Upon termination of the study a report has to be submitted to AUREC.

Yours Faithfully

MARY CHINZOU
ASSISTANT RESEARCH OFFICER: FOR CHAIRPERSON
AFRICA UNIVERSITY RESEARCH ETHICS COMMITTEE