KPONG, EASTERN REGION, GHANA

DEPARTMENT OF COMMUNITY HEALTH

CLINICO-HISTOPATHOLOGICAL ASSESSMENT OF UTERINE FIBROID CASES EXAMINED AT THE GHANA STANDARDS AUTHORITY LABORATORY

BY

ABENA ADOBEA ADJAPONG

JUNE, 2025

KPONG, EASTERN REGION, GHANA

DEPARTMENT OF COMMUNITY HEALTH

CLINICO-HISTOPATHOLOGICAL ASSESSMENT OF UTERINE FIBROID CASES EXAMINED AT THE GHANA STANDARDS AUTHORITY LABORATORY

BY

ABENA ADOBEA ADJAPONG

(247100283)

A THESIS SUBMITTED TO THE DEPARTMENT OF COMMUNITY HEALTH, FACULTY OF PUBLIC HEALTH, ENSIGN GLOBAL UNIVERSITY IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE MASTER OF PUBLIC HEALTH DEGREE

JUNE, 2025

DECLARATION AND CERTIFICATION

I hereby declare that this thesis is an original work done by myself under the supervision of my supervisor. All materials and resources used have been duly referenced and acknowledged, and this work has not been presented in whole or part for the award of any degree elsewhere.

Abena Adobea Adjapong (247100283)  5th June, 2025

(Student Name & ID) Signature Date

Certified by:

Dr. Sandra Boatemaa Kushitor Signature Date

(Supervisor)

Certified by:

Dr. Stephen Manortey Signature Date

(Head of Academic Programme)

DEDICATION

I dedicate this work to my family for their unflinching support and encouragement throughout the journey.

ACKNOWLEDGEMENT

I am truly grateful to my supervisor, Dr. Sandra Boatemaa Kushitor, for her immense patience, mentorship, kind assistance, and guidance throughout the entire journey to complete my thesis successfully. You broadened and improved my knowledge and skills in research design and methodology. I appreciate it all.

To Professor Agyemang Badu Akosa, a renowned and seasoned pathologist in Ghana, and the head of the histopathology laboratory of the Ghana Standards Authority (GSA), and the laboratory manager, Mr. Felix Manu, I appreciate your immense support. This project would not be possible without your good works and support.

I am also grateful to my friends and family for their encouraging words and support. A special thanks goes to Mr. Fiifi Asuma-Perprem, a student of the Ensign Global University for his contribution and kind assistance during the project. You really came through for me, Fiifi.

My colleague and brother, Dr. Samuel Adjei Antwi, the specialist obstetrician-gynaecologist and medical director, St. Martin De Porres Catholic Hospital, Agormanya, thank you so much for responding to all my WhatsApp messages. I appreciate the explanations you gave me on gynaecological pathologies whenever we bumped into each other on the corridor at the maternity ward. Thanks to you, I now like two “unexciting” branches of medicine, pathology and gynaecology.

Finally, to everyone else who supported me in one way or the other, I say a big thank you to you all.

DEFINITION OF TERMS

Abnormal Uterine Bleeding	A change in the volume, regularity, or timing of uterine bleeding present for 6 months or more
Cervix	The lower, narrow end of the uterus, that connects the uterus to the vagina
Clinico-Histopathological Assessment	A form of assessment that involves patients' clinical history in conjunction with the examination of their tissue samples under a microscope for diagnosis
Fallopian Tube	A tubular structure in the female reproductive system that transports fertilised eggs to the uterus
Histopathology	The diagnosis and study of diseases of tissues through microscopic examinations
Hysterectomy	The surgical removal of the uterus, in part or in whole
Laparoscopic procedure	A surgical procedure performed through small incisions in the abdomen or pelvis, using a thin, lighted instrument with a camera
Myomectomy	The surgical removal of uterine fibroids
Oophorectomy	The surgical removal of the ovary
Ovary	A structure in the female reproductive system responsible for the production of eggs and sex hormone, specifically oestrogen
Reproductive Tract Tumours	Abnormal growths on any part of the reproductive tract that can be non-cancerous (benign) or cancerous (malignant)
Specimen	A biological sample extracted from a living or deceased organism for analysis
Uterus	A pear-shaped muscular structure of the female reproductive tract that accommodates a fertilised egg(s) until birth. It has a body comprising the myometrium (the muscular layer) and the endometrium (the inner lining). Also known as the womb

ABBREVIATIONS/ACRONYMS

APC	Age-Period Cohort
AUB	Abnormal Uterine Bleeding
BMI	Body Mass Index
CCTH	Cape Coast Teaching Hospital
CI	Confidence Interval
CIN	Cervical Intraepithelial Neoplasia
CT	Computed Tomography
DNA	Deoxyribonucleic Acid
EDCs	Endocrine-Disrupting Chemicals
FRT	Female Reproductive Tract
GBD	Global Burden of Disease
GCT	Granulosa Cell Tumour
GHS	Ghana Health Service
GnRH	Gonadotropin-Releasing Hormone
GSA	Ghana Standards Authority
HIFU	High-Intensity Focused Ultrasound
HPV	Human Papillomavirus
IUD	Intrauterine Device
IUFD	Intrauterine Foetal Death
MOU	Memorandum of Understanding
MRI	Magnetic Resonance Imaging
NCDs	Non-Communicable Diseases
NHIS	National Health Insurance Scheme
OTC	Over-the-counter
PHC	Population and Housing Census
PID	Pelvic Inflammatory Disease
PMB	Postmenopausal Bleeding
POP	Pelvic Organ Prolapse
PPH	Postpartum Haemorrhage
PPROM	Preterm Premature Rupture of Membranes
SCC	Squamous Cell Carcinoma
SDI	Socio-Demographic Index
SES	Socio-Economic Status
SSA	sub-Saharan Africa
STIs	Sexually Transmitted Infections
UAE	Uterine Artery Embolization
UFs	Uterine Fibroids
UHC	Universal Health Coverage
USA	United States of America
WHO	World Health Organisation

ABSTRACT

Background: Uterine fibroids (UFs), also known as uterine leiomyomas or myomas, are benign tumours of the smooth muscle layer of the uterus. Globally, the incidence and prevalence rates of fibroids obtained from the Global Burden of Disease (GBD) 2019 were very high. UFs are associated with considerable hospitalisations of women affected, and also have a negative impact on their quality of life. The aim of this study was to conduct a clinico-histopathological assessment of uterine fibroid cases examined at the Ghana Standards Authority (GSA) from the year 2013 to the year 2021.

Methods: A repeated cross-sectional study was employed to identify the pattern of UFs in Ghana, the symptoms presented by women with UFs, and other reproductive tract lesions commonly reported with UFs from February, 2013 to December, 2021. Data were obtained from the histopathology laboratory of the GSA. A negative binomial regression was used to assess the pattern of increase of UF cases, and descriptive statistics for the symptoms experienced by participants using STATA 18. Descriptive statistics and binary logistic regression were employed to identify the lesions co-existing with UFs and the relationship with participants' age respectively.

Results: The total number of UF cases was 6,753, out of which 1,816 had co-existing reproductive tract tumours/lesions. The overall mean age was 41±8.23 years, with an age range of 17-88 years. 3, 358 (49.73%) UF cases were in the age group of 37-47 years, and the age group 15-25 years had the least number of cases. Pelvic mass was the most dominant symptom presented by 6, 234 (92.31%) participants. For co-existing lesions, adenomyosis was the most preponderant followed by ovarian and cervical lesions. Malignant tumours of the uterus, cervix, and ovary were also identified. There was a limited association between the age and these co-existing lesions.

Conclusion: The fibroid cases demonstrated an increasing pattern by 22.2% for every additional year from 2013 to 2021. The clinical presentations and the presence of both benign and malignant pathologies of the female reproductive tract in addition to uterine fibroids among Ghanaian women call for the provision of screening programmes for women aged above 30 years.

Keywords: Uterine Fibroids, Female Reproductive Tract Pathologies, Clinico-Histopathological Assessment

Table of Contents

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

CHAPTER ONE
INTRODUCTION

1.1 Background of the Study

Uterine fibroids (UFs), also known as uterine leiomyomas or myomas, are benign tumours of the smooth muscle layer of the uterus (Edzie et al., 2023). They are composed of fibrous connective tissue and smooth muscle cells and have a rich blood supply (Edzie et al., 2023). They can arise from any part of the uterus and are the commonest indications for gynaecological surgeries in premenopausal women (Sarkodie *et al.*, 2016). The aetiology of UFs is unknown (Quarshie *et al.*, 2021). Anatomically, UFs can be classified as submucosal, intramural, subserosal or cervical (Quarshie *et al.*, 2021). Though they are benign, they are a major source of morbidity, can have a negative impact on the quality of life of the women affected (Sarkodie *et al.*, 2016). In very rare cases, fibroids can undergo malignant transformation (leiomyosarcoma) (Adawe et al., 2022).

Globally, per an age-period-cohort (APC) analysis conducted in 204 countries and territories from 1990 to 2019, prevalence rates of fibroids are 67.07% and 78.82%, respectively (Lou *et al.*, 2023a). These figures were estimated from the Global Burden of Disease (GBD) 2019 by utilising an APC model. The model was also used to determine the annual percentage changes in the incidence and prevalence rates. In the United States of America (USA), the reported incidence ranges from 217 to 3,745 per 100, 000, and the prevalence of UFs across North and South America, Africa, Europe and Asia range from 4.5 to 68.6% depending on the study population and diagnostic methodology (Edzie et al., 2023).

Women of black ancestry are commonly affected by UFs. Majority of these women constituting 70-80% are located in the sub-Saharan Africa (SSA) region (Morhason-Bello and Adebamowo, 2022). The overall incidence, prevalence, genomic and epidemiological risk factors of UFs in the SSA have been difficult to determine due to the lack of robust studies. Studies on UFs in the SSA region have been conducted in radiology and pathology departments of hospitals, and selected gynaecology clinics in tertiary hospitals. A study conducted in a gynaecology clinic in Uganda revealed a UF prevalence of 28.2% of a total of 319 participants (Adawe *et al.*, 2022). A retrospective study in a gynaecology unit in Enugu, Nigeria, revealed UFs accounted for 16.4% of 1,680 gynaecological cases, with 300 cases identified (Ezeome, 2019).

In Ghana, there are limited studies on the prevalence of UFs. The few available studies that have been conducted on UFs involve data collected during ultrasound imaging, and patient records from tertiary hospitals. A study conducted using ultrasound findings of UFs in 2016 in 3 major diagnostic centres in Ghana revealed the age range and average age for UFs as 14-54 and 31.89±7.92 years respectively (Sarkodie *et al.*, 2016). A retrospective cohort study using patient records from 2018 to 2021 conducted in the Cape Coast Teaching Hospital (CCTH) to determine the age of first diagnosis and incidence rate of UFs revealed an age range and mean age for UFs as 17-61 and 36.26±8.08 years respectively, with increasing trend of incidence rate per 100,000 population (Edzie et al., 2023).

Common risk factors associated with UFs include nulliparity, premenopausal age, Black race, family history, and comorbid conditions such as hypertension (Millien et al., 2021). Conversely, the use of oral contraceptives and parity serve as protective factors against the development of UFs (Sarkodie *et al.*, 2016).

A prospective cohort, multisite cohort study conducted among 2, 570 women in the United States (US) revealed the risk of new diagnosis of UFs varied by hypertension status and treatment (Mitro *et al.*, 2024). In this study, the following observations were made: newly diagnosed hypertensive participants had a 45% greater risk of developing UFs, those with untreated hypertension had a 19% increased risk, while participants on antihypertensive treatment demonstrated a 20% lower risk of developing UFs, all as compared to participants without hypertension (Mitro *et al.*, 2024). The exact underlying mechanisms were not investigated during the study.

Dietary factors have also been shown to have some associated risk for developing uterine fibroids. Deficiency of vitamin D, low intake of fruits and vegetables, and consumption of foods contaminated with chemicals within the environment are associated with the risk of developing UFs (Tinelli *et al.*, 2021). Caffeine consumption has also been found to be associated with the development of UFs (Adawe *et al.*, 2022).

The clinical presentation of UFs can range from asymptomatic to more severe manifestations such as dysmenorrhoea, infertility, non-cyclical pain, severe anaemia resulting from abnormal uterine bleeding (AUB), and pressure symptoms leading to bladder and bowel dysfunction (Vercellini and Frattaruolo, 2017). Other complications include painful sexual intercourse, adverse obstetric outcomes like preterm labour and delivery, recurrent pregnancy losses, antepartum and postpartum haemorrhages (Sefah *et al.*, 2023).

There is a need to understand the high burden of UFs, age patterns, and determinants among Ghanaian women over a long duration with available data. This can provide evidence that can be used to inform reproductive health policy, which should consider UFs and all tumours of

the reproductive tract of males and females. The existing policy covers UFs, breast, cervical and prostate cancers only (Ministry of Health and Ghana Health Service, 2014). This study can also inform decision-making about including other reproductive tract tumours in the reproductive health policy.

Again, the study can inform policymakers to offer a wider scope of treatment options for UFs on the National Health Insurance Scheme (NHIS). In terms of the management of UFs, there are hormonal medications to block the effect of the female hormones (oestrogen and progesterone), thereby shrinking UFs, and open myomectomy (the surgical removal of UFs) and hysterectomy (the surgical removal of the uterus). Other treatments options are laparoscopic procedures, and other minimally invasive procedures like uterine artery embolization (UAE), magnetic resonance- and ultrasound-guided surgeries, radiofrequency ablation could be employed, and financed by the NHIS as a means of ensuring universal health coverage (UHC) for women with UFs.

1.2 Problem Statement

Uterine fibroids are the commonest benign gynaecological tumours among black women. About 70 to 80% of women of the black race are affected (Edzie, et al., 2023), with an unknown aetiology. A recent study at the Cape Coast Teaching Hospital (CCTH) revealed an annual increasing trend in the incidence of uterine fibroids (UFs), rising from 85.6 per 100, 000 in 2020 to 92.4 per 100, 000 in 2021, particularly among women aged 35-39 years, as well as highlighting the complications of UFs (Edzie et al., 2023).

Studies in Ghana available have been from a radiological perspective, and review of health records. This is due to limited data available on UFs, their overall prevalence and incidence,

age-specific prevalence and incidence, and the determinants of UFs in Ghana. There is, however, an available study conducted on the anatomical profile of UFs, from a histopathological perspective at a tertiary hospital in Accra (Quarshie *et al.*, 2021). There is still a significant gap in understanding the disease burden of UFs at a national level, in spite of the knowledge of affecting 70-80% of women of African descent, with the majority located in the SSA (sub-Saharan Africa) region.

More studies are needed to understand the genetic, environmental, and lifestyle factors potentially associated with UFs in Ghana. The role of the exposure to endocrine-disrupting chemicals (EDCs) in personal care products, food, and pesticides, possibly accelerated by globalisation, merit the need to conduct further studies, and put preventive measures in place. Like breast cancer, UFs depend on oestrogen for growth and development. The exposure to EDCs alters physiologic activity of oestrogen potentially leading to hormone-dependent disorders like breast cancer and UFs. The use of hair-straightening chemicals among black women has been found to be closely associated with the development of UFs (Ogunsina *et al.*, 2025). Recently, the Ghana Breast Health Study (GBHS) indicated that the use of hair relaxers is associated with a 60% risk of breast cancer. There was evidence of alteration in the metabolism of oestrogen among users, suggesting a possible hormonal mechanism of the disease (White *et al.*, 2024).

The impact of UFs on maternal and child health, and its socio-economic burden cannot be excluded. UFs negatively impact the health of women in general, but the health effects become more profound in pregnant women. This further proves it as a public health concern. Apart from causing pelvic pain, prolonged menstrual bleeding and infertility (Sarkodie *et al.*, 2016),

UFs have also been shown to cause recurrent pregnancy losses, antepartum haemorrhage, foetal malposition, and preterm labour (Kaushal, Gupta and Kumar, 2020). These lead to poor maternal and neonatal health outcomes, causing a lag towards the achievement of a reduced maternal and neonatal mortality. The high costs of care, limited treatment options for UFs, and access to care are other factors that can impact maternal health (Ofori-Dankwa et al., 2019).

Again, women affected by UFs are faced with loss of productivity at work, missing social events as well as mental and emotional distress (Ghant *et al.*, 2016). Like women affected by gynaecological malignancies like cervical and breast cancer, those who will experience the symptoms of UFs may succumb to the emotional and psychological distress (Ginindza *et al.*, 2024). This will affect their livelihoods negatively and disempower them.

1.3 Rationale of the Study

The purpose of this study is to contribute significantly to scientific research by providing insights into the increasing patterns of UFs, the clinical presentation, and the presence of co-existing pathologies among Ghanaian women with UFs. Knowledge of these patterns will help fill a research gap, and stimulate other researchers to conduct further studies using the findings from this study as a foundation. A clinico-histopathological approach helps in the synthesis of patient symptoms and pathological diagnoses better, thereby improving the clinical acumen and practice of clinicians. Clinicians will also adopt best practices by providing adequate clinical histories on histopathological request forms when submitting samples for examinations.

Also, with the high burden of disease caused by UFs in SSA, this study can contribute to the literature that can be cited and/or compared to other studies that are carried out on the continent

of Africa. This can help to understand national and regional variations, and challenges encountered in the management of UFs, and identify areas to improve and focus on.

Furthermore, the findings from this study can be used to enhance the knowledge of Ghanaian women, especially, and the general public about all the risk factors, symptoms, complications, prevention, and management of UFs. They will also be educated on the types of pathologies that can co-exist with UFs, and make positive, healthy decisions and choices from evidence-based research. Individuals will also embrace the interaction of factors and health determinants that may be associated with UFs and clear all their misconceptions.

Moreover, in the field of public health, reproductive health is a very crucial component not only affecting women but also the entire country and the world at large. This implies the need for policies to guide reproductive health globally and nationally. A characteristic of good policy lies in its ability address vital aspects of a subject at the level of an institution, country or the world. In Ghana, the reproductive health policy revised in 2014 considers UFs, breast, cervical, and prostate cancers. There is the need to expand the scope to cover other reproductive tract pathologies, which could have adverse effects on patients affected. By investing in research into UFs, policies can be formulated to guide its screening and treatment for every Ghanaian woman to have equal and equitable access to care, thereby improving their quality of life.

Finally, UFs can negatively affect the quality of life of symptomatic women, and can also incur a high cost for treatment (Ofori-Dankwa et al., 2019). This research can be used as evidence to attract government interventions to subsidise the cost involved in treating UFs and co-existing

pathologies of the reproductive tract, and to help improve the overall reproductive health of Ghanaian women.

1.4 Conceptual Framework

The conceptual framework was designed by the researcher. (**Figure 1.1**). The framework illustrates the variables studied in this descriptive study. It begins with the demographic characteristics, namely, the age of participants, categories and regional location of the hospitals, and how they contribute to the disease burden of UFs. The disease burden is reflected in the clinical symptoms experienced by participants, such as pelvic mass, abnormal uterine bleeding, and pelvic pain, as well as the additional pathologies like adenomyosis, cervical, and ovarian pathologies. these findings guide the proposed recommended interventions, such as screening programmes, health promotion activities and proper clinical documentation, designed to improve patient outcomes and reduce the negative impacts of UFs.

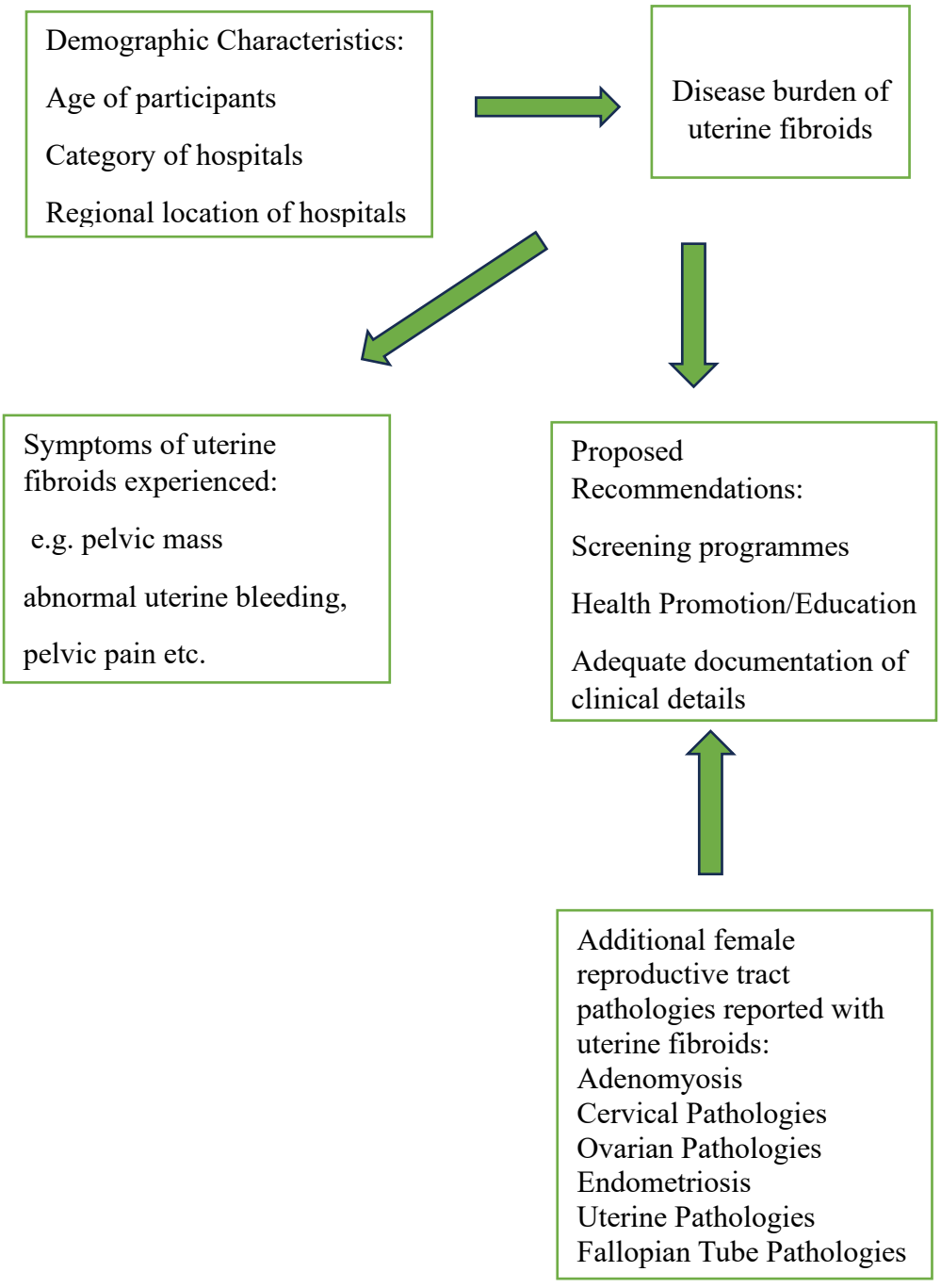

Figure 1.1 *Conceptual Framework (Author's Own Construct)*

1.5 Research Questions

The research questions for this study are:

1. What is the pattern of uterine fibroid cases examined at the Ghana Standards Authority (GSA)?
2. What symptoms are experienced by patients with fibroids examined at the GSA?
3. What other types of reproductive tract lesions/tumours are commonly reported in addition to uterine fibroids?
4. Is there an association between the age and the other types of reproductive tract lesions/tumours are commonly reported in addition to uterine fibroids?

1.6 General Objective

The general objective for this research is to conduct a clinico-pathological assessment of uterine fibroid specimens examined at the GSA from 2013 to 2021.

1.7 Specific Objectives

The specific objectives of this research are:

1. To identify the pattern of uterine fibroid cases at the GSA
2. To identify the symptoms of patients whose uterine fibroid specimens have been examined at the GSA
3. To examine the types of reproductive tract tumours/lesions that are commonly reported in addition to uterine fibroids
4. To identify an association between the age and the other types of reproductive tract lesions/tumours commonly reported in addition to uterine fibroids

1.8 Profile of Study Area

Gynaecological health forms an integral part of the overall health and wellbeing of women globally. In Ghana, there is a wide range of gynaecological disorders reported. Examples of these disorders include benign tumours (with UFs topping the list with 34.2%), pelvic floor disorders, endometriosis, cystocele, endocrine and menstrual disorders, and malignant tumours

(Oppong *et al.*, 2021). Generally, gynaecological disorders are associated with stress, and can have adverse impacts on the quality of life and the psychological wellbeing of women affected (Oppong *et al.*, 2021).

Of these disorders, cervical cancer has been studied using qualitative and quantitative research methods in Ghana to understand the disease burden. Cervical cancer is the number one cause of death in women diagnosed with gynaecological cancers in Ghana (Asakitogum et al., 2023). Its incidence is as high as 18.3 cases per 100, 000 women in Ghana (Asakitogum et al., 2023). These results indicate a significant disease burden of gynaecological disorders and demand equal and equitable access to health.

Various studies conducted in Ghana on breast cancer have also demonstrated an increasing pattern. In Ghana, there are 8.57 million women aged 25 years and older at risk of breast cancer, and reports indicate it to be the leading cause of cancer deaths in 2020 (Boamah Mensah et al., 2022). The risk factors of breast cancer highlight need to create more awareness, conduct screening programmes to address health disparities by ensuring equitable access to quality healthcare (Naku Ghartey Jnr et al., 2016). The availability of cancer registries at district, regional, or national levels can assist in follow-up care of all patients. These are also applicable to UF cases in Ghana.

The public health implications of gynaecological disorders in Ghana can be centred around the access to healthcare, socioeconomic factors directly linked to the costs of care and the available policies and awareness of these disorders. In Ghana, the NHIS is a strong determinant of the access to healthcare. It provides financing for a relatively wide range of health services such as

antenatal care and the care for diabetes and hypertension (Browne *et al.*, 2016). Though the NHIS has made remarkable achievements towards achieving universal health coverage (UHC), it does not cover for the management of some diseases due to challenges like long-standing financial deficits and frequent out-of-pocket payments (Vellekoop et al., 2022). This is applicable to some gynaecological disorders in Ghana.

As of 2023, the total population of Ghana was 32 million. The Population and Housing Census (PHC) in 2021 revealed that women make up 50.7% of the population and men constitute 49.3%. The men-to-women ratio is 97:100 (Ghana Statistical Services, 2021). The population of Ghana is made up of different ethnic groups such as the Akan, Ewe and Ga-Dangme among others. In addition to being the home of diverse rich culture, Ghana houses the Volta Lake which is the largest man-made lake in the world by surface area. The lake was created after the Akosombo Dam was constructed and serves as the source of hydroelectric power to the country. The Lake Bosomtwi is also the only natural lake in the country and is located in the Ashanti Region. Natural resources such as gold, diamond, bauxite, timber and oil can be found in Ghana (Ghana Statistical Service, 2023).

Figure 1.2 *The Map of Ghana*

1.9 Organisation of Report

This thesis comprises six main chapters. Chapter One introduces the research topic. It outlines the background information, problem statement, rationale of the study, conceptual framework, research questions, general objective, specific objectives, and the profile of study area. Chapter Two covers the review of relevant literature pertaining to the study. Chapter Three provides details on the methodology used in carrying out the study. It includes the research methods and design, source of data, study population, study variables, inclusion and exclusion criteria, data handling, statistical analysis, ethical considerations, study limitations and assumptions. Chapter Four covers data analysis and presentations of the results of the study with respect to the research objectives. Chapter Five presents the discussions and implications of the research findings. Chapter Six provides the conclusions and recommendations made from the study.

CHAPTER TWO
LITERATURE REVIEW

2.0 Introduction

This chapter reviews available and relevant literature that informs the study with respect to the research objectives. It discusses the epidemiological trends of UFs, female reproductive tract tumours co-existing with UFs, the clinical presentation, prevention and management of UFs and the public health implications of UFs and co-existing lesions of the female reproductive tract (FRT).

2.1 The Epidemiological Trends of Uterine Fibroids

It is well established that UFs are the most common benign tumours of the FRT of premenopausal women. There is, however, an existing variation in the epidemiological trends of fibroids based on ethnicity and race. The incidence and prevalence of UFs can also vary significantly by the age distribution of study participants, study design utilised, and methods of diagnosis (Morhason-Bello and Adebamowo, 2022). Methods of diagnosis include self-reporting, ultrasound, magnetic resonance imaging (MRI) and histopathological analysis. The prevalence rates of UFs are mostly underestimated as a result of studies focusing on symptomatic women (Giuliani et al., 2020). Approximately 25% of women with UFs present with clinical symptoms, and the majority go undetected (Sefah *et al.*, 2023). This makes the incidence rates of fibroids difficult to determine.

Globally, the prevalence and incidence rates of UFs have seen a significant increase, indicating its high disease burden. From 1990 to 2019, the prevalence increased by 78.82%, that is, from 126.41 million to 226.05 million cases (Lou *et al.*, 2023b) according to an age-period-cohort analysis for the GBD report in 2019. Also, from the GBD report published on UFs for the same 30-year period, the incidence increased by 67.07%, that is, from 5.77 million to 9.64 million

cases (Lou *et al.*, 2023b). The socio-demographic index (SDI) has also been shown to be a strong determinant of the prevalence and incidence rates of UFs globally. High and high-middle SDI regions showed decreasing incidence and prevalence whereas middle, low-middle and low SDI regions showcased increasing rates (Li *et al.*, 2023). In terms of age distribution, globally, UFs are commonest in women aged 35-39 years (Li *et al.*, 2023).

African populations, particularly, women of Black ancestry have the highest burden of UFs, with more than 80% women diagnosed in their lifetime compared to lower rates among Caucasians (Musa *et al.*, 2023). In Africa, the prevalence rates for UFs vary among countries. For instance, a 5-year study conducted in a teaching hospital in Kano, Nigeria, revealed a prevalence rate of 3.1% for over 12,000 women screened. Another study involving 4,500 women found the prevalence to be 67% (Sefah *et al.*, 2023). This could be explained by difference in study designs and diagnostic tools.

Women in the SSA region face barriers including poverty, cultural beliefs, limitations in health insurance and transportation, and a lack of awareness on UFs, all contributing to delays in seeking healthcare (Millien *et al.*, 2021). Also, the fear of surgery is a deterrent to seeking early care for UFs (Ezeome, 2019). These factors underscore the challenges in determining the overall prevalence of UFs among countries in Africa.

In Ghana, studies conducted on UFs have been mainly based on ultrasound findings, review of electronic health records and histopathological profiles in selected hospitals and diagnostic centres. A study conducted from November, 2011 to February, 2012 reveals the mean age of women with UFs to be 31.89±7.92 years (Sarkodie *et al.*, 2016). Another study conducted from 2015 to 2019 to document the anatomical profile of histologically diagnosed UFs in a tertiary hospital found the mean age of women to be 40.66 ± 8.85 years (Quarshie *et al.*, 2021). A

retrospective study conducted in a teaching hospital in the south-central Ghana revealed the mean age of women with UFs to be 36.29 ± 8.08 years (Edzie et al., 2023). The age ranges with the highest records of UFs in descending order were 35-39, 30-34 and 40-44 years (Edzie et al., 2023). The increasing incidence rates determined in the studies are consistent with the findings in the GBD report for 2019.

2.3 Clinical Presentation of Uterine Fibroids

It is established that UFs are considered a public health concern and associated with an extensive morbidity (Sarkodie *et al.*, 2016). There is a myriad of clinical presentations of UFs. The symptoms can range from asymptomatic to debilitating (Ezeome, 2019). The severity of symptoms experienced by women with UFs depend on the size, location, and hormonal effects (Kaushal, Gupta and Kumar, 2020). A pelvic mass is a common symptom experienced, as UFs are benign growths arising from the muscular layer of the uterus (Adawe *et al.*, 2022). These symptoms can include AUB complicated by anaemia, pelvic pain, infertility, and pressure symptoms including constipation, urinary frequency and back pain (Giuliani, As-Sanie and Marsh, 2020). Other symptoms include dyspareunia, abdominal bloating, urinary incontinence and retention (Wise and Laughlin-Tommaso, 2016; Adawe et al., 2022). Adverse obstetric outcomes caused by UFs include recurrent pregnancy losses/spontaneous abortions, preterm labour, and postpartum haemorrhage (PPH) (Sefah *et al.*, 2023). Fibroids discovered in pregnancy grow bigger in size due to the hormonal effects of pregnancy and shrink after delivery of the placenta (Sefah *et al.*, 2023). The increase in size of fibroids in pregnancy are associated with the adverse obstetric outcomes.

2.4 Prevention of Uterine Fibroids

The development of UFs is dependent on oestrogen and progesterone, which are female sex hormones predominant in premenopausal women (Yang *et al.*, 2022). Although the aetiology of UFs is unknown, there are some risk factors associated with their growth and development.

These include non-modifiable risk factors such as premenopausal age, African ancestry, and early age at menarche (Wise and Laughlin-Tommaso, 2016). Genetic factors such as chromosomal abnormalities and mutations in genes like the *MED 12*, have also been implicated in the pathogenesis of UFs (Sefah *et al.*, 2023).

Modifiable risk factors include diets lacking vitamin D, fruits and vegetables (Tinelli *et al.*, 2021), nulliparity, obesity, cigarette smoking, and alcohol or coffee consumption (Edzie et al., 2023). Additional risk factors such as hypertension, lack of physical activity, stress, and exposure to endocrine-disrupting chemicals (EDCs) have also been identified (Vafaei *et al.*, 2023). The use of tamoxifen, a drug for treating breast cancer, is another documented risk factor (Tambunan, Fahriatni and Hasanuddin, 2021). Tamoxifen can cause endometrial hyperplasia which can present as abnormal uterine bleeding (AUB) or postmenopausal bleeding (PMB) (Tambunan, Fahriatni and Hasanuddin, 2021).

Currently, there are no primary prevention strategies for UFs. However, effective management of the modifiable risk factors have been shown to decrease the risk of developing UFs (Wise and Laughlin-Tommaso, 2016). Strategies in managing these risk factors include diets rich in vitamin D, exposure to morning sunshine for vitamin D, and avoiding alcohol and cigarette smoking (Vafaei *et al.*, 2023). Vitamin D has been shown to reduce the size of UFs, but studies have not been conclusive, hence, it has not been officially approved as a treatment option for UFs (Vafaei *et al.*, 2023). Secondary prevention strategies, such as watchful waiting, are used for monitoring women with UFs to prevent disease progression and complications. Additionally, women who have undergone myomectomy (surgical removal of UFs) are at a higher risk of UF recurrence. Diagnosis typically requires a combination of patient history, physical examination, and imaging techniques, including, ultrasonography, magnetic

resonance imaging (MRI), and occasionally computed tomography (CT) scans (Vafaei *et al.*, 2023).

2.5 Management of Uterine Fibroids

There are various definitive treatment and management modalities of UFs which include medical and surgical approaches. Medical approaches could be hormonal or non-hormonal. Medical management also includes administration of medications for immediate relief of symptoms until surgery is performed.

The surgical approaches include myomectomy and hysterectomy. Of these 2 surgical interventions, myomectomies are more common because of the preservation of the uterus to allow for future pregnancies (Sefah *et al.*, 2023). Myomectomy could be performed by an open technique through an abdominal incision, or minimally invasive techniques through the vagina based on the location, and by laparoscopy (Liu *et al.*, 2021). The choice of technique depends on the anatomical location of the fibroid (Krishnan *et al.*, 2024). Other common minimally invasive procedures to manage UFs are uterine artery embolization (UAE), endometrial ablation, hysteroscopic resections, high-intensity focused ultrasound (HIFU) ablation among others (Krishnan *et al.*, 2024). The use of robots has also been explored in these techniques (Vafaei *et al.*, 2023).

The hormonal medical therapy for managing UFs include gonadotropin-releasing hormone (GnRH) agonists and antagonists, selective progesterone receptor modulators, aromatase inhibitors, and progestin-releasing intrauterine device (IUD) (Vafaei *et al.*, 2023). The non-hormonal treatments include vitamin D supplementation with close monitoring (Sefah *et al.*, 2023). Supplementation of vitamin D is still being studies, and has not been declared as a standard medical treatment for UFs.

2.2 Female Reproductive Tract Disorders Co-Existing with Uterine Fibroids

The vulnerable female reproductive tract (FRT) is made up of the uterus, ovaries, and external genitalia. There are a myriad of lesions/tumours that can affect its structure and function, and the overall quality of life of the women affected. They can present as abnormal uterine bleeding (AUB), pelvic masses, and infertility (Minh Duc et al., 2018). These lesions can be benign or malignant. Women diagnosed with UFs can have additional reproductive tract disorders including adenomyosis, endometriosis, ovarian tumours, and endometrial disorders (Chaturvedi et al., 2017).

2.2.1 Adenomyosis

Adenomyosis is a benign gynaecologic condition in which endometrial tissue is found in the muscular layer of the uterus (Gunther and Walker, 2023). It can affect women in both pre- and post-menopausal ages. This disorder can co-exist with endometriosis and uterine fibroids. (Struble et al., 2016). The prevalence of adenomyosis is difficult to determine because it requires histopathological analysis after hysterectomy, and may also be missed when symptomatic women are not managed by hysterectomy (Upson and Missmer, 2020). This could be due to the affected women's inability to afford this treatment or their fertility desires. Estimated prevalence of adenomyosis in the US ranges from 20% to 35% (Gunther and Walker, 2023).

2.2.2 Endometriosis

Endometriosis is a chronic oestrogen-dependent benign disorder of the FRT characterised by the presence of endometrial tissue outside the uterine cavity (Brüggmann *et al.*, 2016). The endometrial tissue is mostly deposited within the pelvic cavity, but on rare occasions can be deposited in the brain, lungs, and the pericardium (Giudice *et al.*, 2023). Three types of endometrioses have been described based on physiopathology and localisation, namely, superficial peritoneal endometriosis (SPE), ovarian endometrioma (OMA) and deep infiltrating

endometriosis (DIE) (Imperiale et al., 2023). Globally, approximately 190 million pre-menopausal women are affected by this debilitating condition (Giudice et al., 2023). It results in inflammatory reactions which lead to pelvic pain, dyspareunia, dysmenorrhoea, and infertility (Ellis et al., 2022).

2.2.3 Ovarian Tumours

Ovarian tumours are either benign or malignant. Benign ovarian masses include functional ovarian cysts (which normally resolve over days to weeks in the menstrual cycle), and benign ovarian tumours. Examples of benign ovarian tumours are benign teratomas, fibromas, and cystadenomas (Kilpatrick, 2023). Globally, ovarian cancers are the seventh commonest gynaecological cancers and the eighth cause of cancer mortality among women (Gaona-Luviano et al., 2020). The incidence of ovarian cancer varies by ethnicity, with rate of 12 per 100, 000 among Caucasians, 10.3 per 100, 000 among Hispanics, and 0.4 per 100, 000 among African-Americans (Gaona-Luviano et al., 2020). There are various types of ovarian cancers based on histopathological examination findings.

2.2.4 Cervical Pathologies

Cervical pathologies could be benign, pre-malignant, or malignant. Examples include cervicitis, cervical polyps, and cervical leiomyomas. Cervicitis refers to the acute or chronic inflammation of the cervix (Johns Hopkins Medicine, 2025). It can be caused by infective or non-infective agents, such as chemical irritations (Iqbal, Carlson and Wills, 2025). Infective causes include chlamydia, gonorrhoea, and human papillomavirus (HPV), which are sexually transmitted (Young and Argáez, 2017). Untreated cervicitis results in an ascending infection of the uterus, fallopian tubes and ovaries, that is, pelvic inflammatory disease (PID) (Iqbal, Carlson and Wills, 2025). Cervical polyps are benign cervical lesions that protrude from the surface of the cervical canal, and is commonly reported in the reproductive years (Alkilani and Apodaca-Ramos, 2025). About 0.2 to 1.5% of cervical polyps are malignant, and this is

common among postmenopausal women (Alkilani and Apodaca-Ramos, 2025). Among pregnant women, cervical polyps are strongly associated with spontaneous preterm births (Wakimoto *et al.*, 2022). Premalignant cervical lesions are closely linked to HPV infections left untreated. This may progress to cervical intraepithelial neoplasia (CIN), which may also progress to cervical cancer (Bowden *et al.*, 2023). There are 3 grades of CIN, namely low (CINI), moderate (CINII), and high (CINIII) grades. This is based on the extent of abnormal cells noted in the cervix on histopathological examination (Bowden *et al.*, 2023). There are various strategies such as thermal ablation and cryotherapy to manage CIN upon diagnosis (World Health Organisation, 2025). According to the World Health Organisation (WHO), cervical cancer is the fourth commonest gynaecological. Its incidence is as high as 18.3 per 100, 000 women in Ghana (Asakitogum, Aziato and Ohene, 2023). Majority of cases are due to untreated HPV infections and CIN. Cervical cancer can be prevented through vaccination programmes, screening, and self-reporting of symptoms of concern (World Health Organisation, 2025).

2.2.5 Uterine Pathologies

The uterus is the muscular structure of the female reproductive tract that accommodates a fertilised egg till birth. It has a body made up of smooth muscle, and an inner lining, known as the myometrium and endometrium, respectively. The pathologies of the uterus can be benign or malignant. Examples of benign uterine disorders are uterine fibroids, endometrial polyps, adenomyosis, endometrial hyperplasia, and endometritis. Endometrial polyps are benign endometrial growths that protrude anywhere within the uterine cavity (Clark and Stevenson, 2017). These benign lesions occur in 8-12% of women (Munro, 2019). Malignant tumours of the uterus are classified as endometrial carcinoma and uterine sarcoma, affecting the endometrium and the myometrium, respectively (Hanley, Birdsong and Mosunjac, 2017). Each of these has subtypes based on histopathological examinations. Endometrial carcinomas

constitute the majority of all uterine cancers, and the endometrioid adenocarcinomas are the commonest (Hanley, Birdsong and Mosunjac, 2017). Uterine cancers are more common among black women who use chemical hair relaxers (Bertrand *et al.*, 2023).

2.2.6 Fallopian Tube Pathologies

The fallopian tubes are the tubular structures of the uterus that transmit fertilised eggs to be implanted in the uterus. Pathologies of the fallopian tubes are benign or malignant. Benign pathologies include hydrosalpinx, salpingitis, and tubo-ovarian abscess. Benign disorders are more common compared to malignant disorders (Stasenko, Fillipova and Tew, 2019). Hydrosalpinx refers to the distension of the fallopian tube in the presence of distal occlusion, commonly caused by pelvic inflammatory disease (PID) (Ng and Cheong, 2019). It constitutes 10-30% of diseases of the fallopian tubes, and accounts for 25% of cases of infertility (Ng and Cheong, 2019). Malignancies originating from the fallopian tubes are extremely rare, and are mostly grouped together with cancers of ovarian origin (Stasenko, Fillipova and Tew, 2019).

2.6 Public Health Implications of Uterine Fibroids and Co-existing Tumours/Lesions

The rising prevalence and incidence of UFs and all gynaecological tumours need consideration because of the impact the symptoms have on the quality of life, productivity, reproductive and the overall health status of women across the globe. Regions with low SDI, such as the SSA, are often plagued with inequalities in healthcare which often delays diagnosis, incurs high cost for treatment and results in adverse outcomes. The role of public health is beneficial in promoting strategies to aid in the addressing healthcare disparities, early detection of gynaecological disorders, and the research into aetiology, biomarkers, and less invasive and affordable treatment options to improve health outcomes of women affected (Adzigbli *et al.*, 2025).

Although the aetiology of UFs is incompletely understood, studies have demonstrated their strong dependence on the hormones, oestrogen and progesterone, for growth (Yang *et al.*, 2022). In addition to hormonal influences, environmental risk factors play a significant role in the development of UFs. An important risk factor is the exposure to endocrine-disrupting chemicals (EDCs), which are found in the environment, personal care products, food, water, and manufactured products, such as phthalates. (Endocrine Society, 2025). These chemicals disrupt the normal function of the endocrine system. They have become a global concern as they are linked to many non-communicable diseases (NCDs) (United Nations Environment Programme, 2025). Among women of black descent, a potential source of EDCs are hair straightening creams (Ogunsina *et al.*, 2025). They contain chemicals which can be rapidly absorbed through the scalp and inhalation. On exposure to EDCs, they can mimic oestrogen and progesterone in the body, or produce harmful forms and compete for receptor binding sites, thereby promoting the growth of UFs (Yang *et al.*, 2022). This is also true for hormone-dependent gynaecological disorders. To be able to curb this, public health policies can be formulated to control and/or abolish the use of EDCs during manufacturing of products for human consumption.

Access to healthcare is greatly influenced by socioeconomic status (SES) including income, place of residence, employment, and education (Evans and Jones, 2024). This can affect the incidence, management and diagnosis of UFs. Women with a low SES face challenges in gaining access to healthcare. Some of these barriers include limited financial resources and inability to afford health insurance plans. Women with a higher income have an increased odds

of diagnosis of UFs as compared to those in the lower income brackets (Ndebele *et al.*, 2024). They are most likely to receive quality care and have an improved quality of life.

Also, women with lower SES with UFs tend to seek healthcare at very late stages when complications have set in. Reasons for delay, not limited to low SES, include the lack of education and involvement in the care of women with UFs, and the perceptions of women about UFs, fuelled by the lack of awareness by health professionals (Ginindza *et al.*, 2024). The symptoms of UFs become more severe and debilitating, thereby having a negative impact on their quality of life. Such women are more likely to have hysterectomies than myomectomies or less invasive procedures (Evans and Jones, 2024). Policy formulation and reforms could be a stepping stone to bridge the gap in healthcare disparity to ensure equity and equality of care.

Chapter Summary

This chapter summarised key findings of existing literature on UFs to guide the study. Highlights were provided on the epidemiological trend on a global, regional and national levels. The clinical presentations of UFs, incidence and types of co-existing reproductive tract pathologies were also discussed. Strategies to prevent and manage UFs as well as the public health implications of UFs and co-existing reproductive tract tumours were also discussed.

CHAPTER THREE
METHODOLOGY

3.0 Introduction

This chapter discusses the various methods and techniques that were employed in the research. It describes the research methods and design, source of the data, study population, inclusion and exclusion criteria, data handling, data security and confidentiality, statistical analysis, ethical considerations, assumptions, and limitations for the project.

3.1 Research Methods and Design/Data Collection Techniques and Tools

A descriptive repeated cross-sectional study was employed in this research. A quantitative method was used to determine the patterns of uterine fibroids among Ghanaian women whose uterine fibroid samples were analysed at the Ghana Standards Authority (GSA) for the time of study. The research method was considered quantitative because of the types of variables that were investigated. Data were continuous, interval, or ratio. The repeated cross-sectional study is very advantageous as it helps in the identification of trends and patterns of diseases or outcomes. The study design provides comprehensive insights on changes over time and different snapshots at different points in time.

3.2 Source of Data

The data for this project were from the histopathology laboratory of the Ghana Standards Authority (GSA). The GSA is a government agency in Ghana that is responsible for developing, publishing and promoting standards in Ghana through metrology, standardisation and conformity assessment activities. The agency was established in August, 1967 after it was segregated from the Institute of Industrial Research (IIR) under the Council for Scientific and Industrial Research and was first known as the National Standards Board. The current name was officially adopted in 2011. The histopathology laboratory is headed by Professor Agyemang Badu Akosa, a former Director-General of the Ghana Health Service (GHS) and a

renowned pathologist. The laboratory is a hub for the analysis of specimens of various conditions, including uterine fibroids, obtained from major public and private hospitals in Accra and beyond.

3.3 Study Population

The study population comprised Ghanaian women whose uterine fibroid samples were analysed at the GSA from 2013, 2014, 2015, 2018, 2019, and 2021. The data on the age and regional location and category of hospital where the women had the specimens obtained surgically were extracted. Other characteristics were the presenting symptoms of the women whose samples were examined as documented, histopathological diagnosis of UFs, and the presence of additional female reproductive tract lesions.

3.4 Study Variables

The study variables were the age groups of participants, hospital category, regional location of the hospitals, year of assessment, the symptoms experienced by participants, the categories of UFs, and the pathologies co-existing with UFs. The categories of UFs were intramural (UFs within the uterine wall), submucosal (UFs within the uterine cavity), subserosal (UFs on the outer surface of the uterus), and pedunculated (UFs with a stalk attached to it on their specific site of uterus), and multiple (a combination of these categories, or more than one uterine fibroid specimen examined). Other categories included cervical UFs (located in the cervix, which is the lowest part of the uterus), broad ligament UFs (a rare type of UFs located on the supporting covering of the uterus, ovaries, and all their blood vessels), and leiomyosarcoma, a cancerous UF.

The participants presented with a wide range of symptoms attributed to UFs. The clinical presentations included abnormal uterine bleeding (AUB; changes in the volume, regularity, or

timing of uterine bleeding persisting for 6 months or more), pelvic mass (a palpable mass in the lower abdominal region), pelvic pain (pain within the lower abdominal region), dysmenorrhoea (painful menstruation), amenorrhoea (absence of menses for 6 months or more), dyspareunia (painful sexual intercourse), infertility, pelvic organ prolapse (POP; complete herniation of pelvic organs, such as the uterus, through the vagina), postpartum haemorrhage (PPH; excessive bleeding following childbirth), and postmenopausal bleeding (PMB; subsequent vaginal bleeding experienced by a woman with 12 consecutive months of amenorrhoea). Others presented with UFs discovered in their index pregnancy, and adverse obstetric outcomes including preterm premature rupture of membranes (PPROM; the loss of amniotic fluid before the onset of labour before 37 weeks of gestation), intrauterine foetal death (IUFD), and a previous history of recurrent spontaneous abortions/pregnancy losses. There were records of pressure symptoms (including retention of urine, back pain, and deep vein thrombosis), abdominal pain, abdominal distention, vaginal discharge, and vaginal mass (resulting from POP). Breast cancer patients receiving treatments were also identified.

All the types of reproductive tract lesions that were commonly reported in addition to uterine fibroids (UFs) were also identified to be present or absent among the participants. The lesions included adenomyosis (the presence of endometrial tissues in the muscular layer of the uterus), endometriosis (presence of endometrial tissue outside the uterus), and other specified uterine lesions. The remaining reproductive tract lesions identified originated from the cervix, ovaries, and fallopian tubes.

3.5 Sampling

The available datasets from 2013, 2014, 2015, 2018, 2019, and 2021 were analysed, and as such no sampling was required. The data from the years 2016, 2017 and 2020 were excluded due to time constraints in the curation process. The dataset contained 6,753 entries of the age of participants with their age groups, the hospital categories and their regional locations,

symptoms experienced by participants, histopathological examination findings of UF specimens, and that of co-existing reproductive tract lesions where applicable.

3.6 Pre-testing

Pre-testing was not conducted as the study relied on secondary data.

3.7 Inclusion criteria:

- The participants captured in the dataset must be women with UFs, and/or additional female reproductive tract lesions analysed at the GSA.
- The participants must have surgery in Ghana to obtain specimens originating from the female reproductive tract for histopathological examination.

3.8 Exclusion criteria:

- Participants whose uterine fibroid specimens were not analysed at the GSA
- Participants with missing data on the histopathological diagnosis
- Specimens which do not originate from the female reproductive tract
- Participants without uterine fibroids and/or co-existing reproductive tract lesions/tumours

3.9 Data Handling

The received data in Microsoft Excel format were examined for completeness and errors (**Appendix 1**). Thorough cleaning was done to enhance its integrity further. In the extraction process, a new Microsoft Excel spreadsheet was designed by the researcher. The spreadsheet included the sociodemographic characteristics, the year of assessment of the uterine fibroid specimens, the symptoms experienced by participants with UFs, the types of uterine fibroids, and specified co-existing pathologies for each participant.

The sociodemographic characteristics included the age and the respective age groups, categories and regional locations of hospitals where surgeries were performed to obtain uterine fibroid specimens. The categories and regional locations of the hospitals were coded appropriately to facilitate data entry for each participant. The researcher consulted the websites of unfamiliar hospitals to correctly categorise them and identify their regional locations. The websites of the agencies of the Ministry of Health were also consulted for appropriate categorisations.

The symptoms experienced by participants were either present, absent, or concurrent in each participant. These were thoroughly deduced and extracted from the datasets by reading through the clinical history column of the datasets for each participant. Some symptoms in the form of medical diagnoses, surgical procedures, and types of specimens excised from participants were appropriately decoded by the researcher and translated appropriately into symptoms in simple terms. A specialist gynaecologist was consulted for clarification when deemed necessary.

The specified co-existing pathologies included adenomyosis, endometriosis, myometrial, endometrial, ovarian, cervical, and fallopian tube lesions. These were also present, absent, or concurrent in each participant. They were documented clearly in the respective columns in the dataset. For pathologies whose final diagnoses were excluded, the researcher, thoroughly read through the gross and microscopic descriptions of the specimens to conclude on the diagnoses. A specialist gynaecologist was consulted by the researcher to ascertain the clinical histories provided matched with the final pathological diagnoses before entry into the spreadsheet when necessary. A pathologist was not consulted during the study because the detailed histopathological descriptions correlated well with the final pathological diagnoses, which clarified and confirmed the actual diagnoses of the participants who had surgery.

The cleaned dataset was exported to STATA version 18 subsequently. The dataset was stored on a password-protected computer with advanced firewall settings on the computer to protect the data from being accessed by hackers. A non-shareable backup was created on Google Drive. It was also ensured that the information in the dataset was used only for academic and research purposes.

3.10 Statistical Analysis

The data were analysed using Microsoft Excel and STATA version 18. Descriptive statistics was used to summarise data on the sociodemographic characteristics in the form of tables. To determine the increasing patterns of fibroid cases, measures of central tendency and a negative binomial regression analysis were employed. Descriptive statistics using frequencies and computed percentages were used to analyse the presenting symptoms of women with UFs. For the identification of additional reproductive tract lesions, tables with frequencies and computed percentages were used to summarise the data. Binary logistic regression analysis was carried out to test for the relationships between the presence of these co-existing pathologies and the age groups of the participants.

3.11 Ethical Consideration

Ethical approval was obtained from the Ensign Global University Institutional Review Board (reference number ENSIGN/IRB/EL/SN-283/01) before the study commenced (**Appendix 2**). The existing memorandum of understanding (MOU) between the Ensign Global University and the GSA allowed the researcher to have access to the dataset for research and academic purposes. The data was deanonymised to ensure confidentiality and respect to the participants. The names of the healthcare facilities were also omitted to ensure anonymity and confidentiality.

3.12 Limitations

The voluminous nature of this secondary dataset had entries with missing ages of women whose uterine fibroid specimens were analysed. The mean imputation method used to address this could lead to underestimation of variability of the ages in the data. It should be ensured that the histopathology request forms from health facilities providing the specimens are filled adequately and legibly by the clinicians.

Furthermore, there was inadequate socio-demographic characteristics of the study participants. There was no information on the marital status, level of education, employment status, parity, and body mass index (BMI), which could have strengthened the association of UFs and participants' characteristics.

3.13 Assumptions

The study assumed that all the entries in the entire dataset were correct, accurate and represented a true reflection of the patients' presenting symptoms and the histopathological diagnoses provided.

The history provided as "myomectomy" or "uterine fibroids" or "myomatous uterus" was assumed as a pelvic mass which will necessitate surgery due to the symptoms and pressure effects of the mass on surrounding pelvic organs. Also, the symptoms documented were assumed to be the only ones presented by the patients whose samples were analysed.

Histopathological findings for UFs whose anatomical sites were not explicitly provided, but were stated as "leiomyomata" or "leiomyomas" were assumed to be multiple UFs present. In describing uterine fibroid nodules in patients who did not undergo a hysterectomy to identify the exact anatomical site, the fibroids were classified as "intramural" because that is the

commonest site of UFs (Quarshie *et al.*, 2021). Also, fibroids classified as "recurrent" were deduced from patients with history of previous myomectomy provided in the clinical history.

Patients without cervical, endometrial, ovarian or fallopian tube lesions reported either had no abnormal findings or did not undergo a hysterectomy or oophorectomy to assess their uteri and ovaries in whole, respectively. The lesions excised from these parts of the FRT were provided for histopathological analysis.

Chapter Summary

In summary, the study involved longitudinal study with repeated a cross-sectional data from the Ghana Standards Authority to conduct a clinico-histopathological assessment of uterine fibroid cases for 2013, 2014, 2015, 2018, 2019, and 2021. Descriptive and analytical studies were employed to identify the pattern of increase, the symptoms experienced by participants with uterine fibroids, co-existing female reproductive tract pathologies, and relationships. Secondary data was extracted to suit the objectives of the study. There was no sampling technique employed. A total of 6,753 uterine fibroid with 1,816 co-existing pathologies were analysed from various regions in the country under certain assumptions.

The inclusion and exclusion criteria ensured accurate selection of the participants whose specimens were analysed at the GSA. Ethical approval and strict adherence to ethical guidelines were employed in the study. The limitations of the study included inadequate sociodemographic characteristics, and missing ages of participants which was addressed using the mean imputation method. In spite of these limitations, some assumptions were made to ensure the most appropriate and standard identification of symptoms and histopathological examination findings with clarity.

CHAPTER FOUR
RESULTS

4.0 Introduction

This chapter presents the results obtained from the study. They have been grouped and presented according to the objectives of the study: (i) To identify the pattern of increase of uterine fibroid cases, (ii) To identify the symptoms of patients whose fibroid specimen have been examined at the GSA, (iii) To examine the types of reproductive tract tumours/lesions that are commonly reported in addition to uterine fibroids, and (iv) To identify the association between the age of participants and the other types of reproductive tract lesions/tumours commonly reported in addition to uterine fibroids.

4.1 General Overview of Data

A total of 6,573 UF specimens were analysed in the study for the year 2013, 2014, 2015, 2018, 2019, and 2021. The sociodemographic characteristics of the participants whose samples were analysed included their ages, categories of hospitals where the surgeries were performed to obtain specimens and the regional locations of the various hospitals.

There were 17 different symptoms experienced by the participants, with an identified comorbidity, that is, breast cancer with treatment. The treatment modalities were tamoxifen (an oestrogen antagonist) and chemotherapy.

The tumours/lesions of the reproductive tract that co-existed with UFs included adenomyosis, endometriosis, uterine tumours and infections, specified endometrial, cervical, ovarian and fallopian tube lesions.

The age of the participants was the only variable with missing entries constituting 1.24% of the total number. Mean imputation was used to address the missing ages. The mean age determined with the missing ages was 41.7±10.44 years (95% CI=41.45,41.95). After the mean imputation

method was used to address the missing ages in the dataset, the mean age of the study population was 41±8.23 (95% CI=40.79, 41.19) years. Below is a tabular display of the missing variables of the study.

Table 4.1 *Variables with Missing Entries*

Variables	Number of missing entries, n (%)
Age	84 (1.24)
Category of Hospital	0 (0.00)
Location of Hospital by Region	0 (0.00)
Uterine Fibroid Cases	0 (0.00)
Clinical Presentation of UFs	0 (0.00)
Breast Cancer Treatment	0 (0.00)
Lesions Co-Existing with UFs	
Uterine Tumours and Infections	0 (0.00)
Specified Endometrial Lesions	0 (0.00)
Adenomyosis	0 (0.00)
Endometriosis	0 (0.00)
Specified Cervical Lesions	0 (0.00)
Specified Ovarian Lesions	0 (0.00)
Specified Fallopian Tube Lesions	0 (0.00)
Total	**84 (1.24)**

4.2 Sociodemographic Characteristics of Participants and the Annual Distribution of Fibroid Cases

The sociodemographic characteristics covered in this study are the age, category and regional location of hospitals where all the participants had surgeries performed to obtain the tissue samples. The highest and lowest ages of participants were 18 and 88 years, whereas the modal age was 40 years, constituting 5.18%. The age group with the overall highest number of fibroid cases was 37-47 (49.73%), followed by 26-36 (29.23%), and the least populated age group was 15-25 (1.04%) years. The mean age of the study population was 41±8.23 (95% CI=40.79, 41.19) years.

Most of the participants had surgeries in public hospitals (67.05%) compared to private (23.17%) and quasi-government hospitals (9.77%). The regional location of the hospitals where participants received care were in the Volta Region (49.10%), followed by the Greater Accra Region with 47.13%. Hospitals from the Eastern Region of Ghana provided 3.4% of the uterine fibroid specimens analysed. Other regions included the Upper West, Central and Western Regions, provided specimens constituting 0.30% of the total. **Table 4.2** summarises the sociodemographic characteristics covered in the study.

Table 4.2 *Sociodemographic Characteristics of Participants and the Annual Distribution*

Sociodemographic Characteristics	**Total N=6753 (100%)**	**2013 n=200 (2.96%)**	**2014 n=926 (13.71%)**	**2015 n=638 (9.45%)**	**2018 n=1627 (24.09%)**	**2019 n=1535 (22.73%)**	**2021 n=1827 (27.05%)**
Age (years)							
15-25	70(1.04)	2(1.00)	8(0.86)	8(1.25)	14(0.86)	20(1.30)	18(0.99)
26-36	1,974(29.23)	65(32.50)	244(26.35)	176(27.59)	804(49.12)	452(29.45)	566(30.98)
37-47	3,358(49.73)	99(49.50)	479(48.50)	328(51.41)	280(17.21)	785(51.14)	863(48.50)
48-59	1,110(16.44)	27(13.50)	161(51.73)	100(15.67)	46(2.83)	225(14.66)	317(47.24)
≥ 60	157(2.32)	4(2.00)	25(2.70)	15(2.35)	12(0.74)	34(2.21)	33(1.81)
Missing ages replaced by mean age 41.7	84(1.24)	3(1.50)	9(0.97)	11(1.72)	471(28.95)	19(1.24)	30(1.64)
Category of Hospital							
Private	1,565(23.17)	97(48.50)	176(19.01)	123(19.28)	521(32.02)	289(18.83)	359(19.65)
Public	4,528(67.05)	97(48.50)	719(77.65)	362(45674)	1,105(67.92)	1,033(67.30)	1,212(66.34)
Quasi-Government	660(9.77)	6(3.00)	31(3.35)	153(23.98)	1(0.06)	213(13.88)	256(14.01)
Regional Location of Hospital							
Eastern	234(3.47)	2(1.00)	5(0.54)	24(3.76)	83(5.10)	63(4.10)	57(3.12)
Greater Accra	3,183(47.13)	125(62.50)	330(35.64)	294(46.08)	741(45.54)	736(47.95)	957(52.38)
Volta	3,316(49.10)	70(35.00)	582(62.85)	314(49.22)	802(49.29)	736(47.95)	812(44.44)
Others	20(0.30)	3(1.50)	9(0.97)	6(0.94)	1(0.06)	0(0.00)	1(0.05)

4.3 Pattern of Uterine Fibroid Cases

For the entire 6-year period from 2013 to 2021, the overall mean number of fibroid cases was 1,125.5±639.58 (95% CI=454.3, 1796.7). The year with the highest number of cases was 2021 (n=1,827, 27.05%) and that of the lowest was 2013 (n=200, 2.96%). **Figure 4.1** represents the entire trend of the fibroid cases for the years under study.

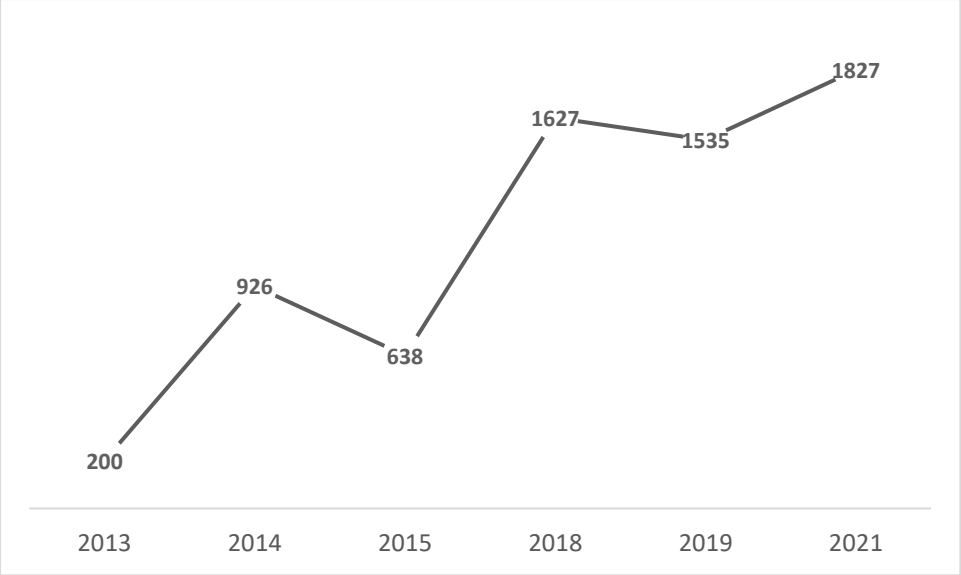

Figure 4.1 *Trend of Uterine Fibroid Cases from 2013 to 2021*

Due to overdispersion in the data (variance > mean), a negative binomial regression was conducted to understand the pattern of the number of fibroid cases over the years. From the analysis, the year of assessment demonstrated statistical significance in predicting the number of fibroid cases (Incidence Rate Ratio (IRR) 1.2217, p=0.001). This indicates that each additional year was associated with a 22.2% increase in the incidence rate of fibroid cases, calculated as (1.2217-1) x 100%. This trend highlights a notable increase in the disease burden of UFs over the study period. **Table 4.3** shows a negative binomial regression analysis of the trend of fibroid cases from 2013 to 2021.

Table 4.3 *A Negative Binomial Regression Analysis for Fibroid Cases Trend from 2013 to 2021*

Variables	**Co-efficient**	**Std. Error**	**Z**	**p-value**	**95% CI**	
Years	.2001164	.0603384	3.32	0.001	.0818554	.3183775
Constant	-396.6835	121.6831	-3.26	0.001	-635.178	-158.189

4.4 Age Distribution and the Categories of Uterine Fibroids

Majority of the fibroid cases occurred in participants within the 37–47-year age group (49.73%). This was followed by those aged 26-36 years (29.23%). Multiple fibroids were the

most predominant category, and accounted for 76.85% of cases. This dominance was observed across all the age groups. The second commonest category of fibroids was the intramural fibroids, which constituted 17.19%, and the 37-47-year age group demonstrated the highest prevalence. Other fibroid categories, including submucosal (2.95%), subserosal (0.86%), pedunculated (0.61%), cervical (0.84%), and recurrent fibroids (0.67%), were less frequent. Very rare categories of fibroids, namely broad ligament and leiomyosarcoma contributed a case each (0.01%) of the total number of cases analysed. **Table 4.4** contains the summary of the age distribution of fibroid cases.

Table 4.4 *Age Distribution of Uterine Fibroid Cases Among Participants*

Category of Fibroids	**Age (years)**						
	15-25 n (%)	**26-36 n (%)**	**37-47 n (%)**	**48-59 n (%)**	**≥ 60 n (%)**	**Missing Ages Replaced by Mean Age 41.7 n (%)**	**Total**
Intramural	9(0.13)	201(2.98)	598(8.86)	309(4.57)	36(0.53)	8(0.12)	1,161 (17.19)
Multiple	53(0.78)	1,683(24.9)	2,551(37.78)	721(10.68)	107(1.5)	72(1.07)	5,190 (76.85)
Submucosal	4(0.06)	35(0.52)	101(1.5)	50(0.74)	6(0.09)	3(0.06)	199 (2.95)
Subserosal	1(0.01)	20(0.06)	23(0.34)	10(0.15)	4(0.06)	0(0.0)	58 (0.86)
Pedunculated	1(0.01)	19(0.3)	18(0.27)	2(0.03)	0(0.0)	1(0.01)	41 (0.61)
Cervical	2(0.03)	8(0.12)	33(0.06)	10(0.15)	4(0.06)	0(0.0)	57 (0.84)
Recurrent	0 (0.0)	8(0.12)	30(0.49)	7(0.1)	0(0.0)	0(0.0)	45 (0.67)
Leiomyosarcoma	0 (0.0)	0(0.0)	0(0.0)	1(0.01)	0(0.0)	0(0.0)	1 (0.01)
Broad Ligament	0(0.0)	0(0.0)	1(0.01)	0(0.0)	0(0.0)	0(0.0)	1 (0.01)
Total	**70(1.04)**	**1,974(29.23)**	**3,358(49.73)**	**1,110(16.44)**	**157(2.32)**	**84(1.24)**	**6,753 (100)**

4.5 Symptoms Experienced by Participants with Uterine Fibroids

The commonest symptom was pelvic mass, which was observed in 6,234 participants (92.31%), while only 519 participants (7.69%) did not have this presentation. The second commonest symptom was AUB, affecting 2,581 participants (38.22%). Pelvic pain was the third commonest symptom of fibroids and this was experienced by 638 (9.45%). There were

232 participants (3.44%) who presented with infertility, and 222 (3.29%) participants who experienced abdominal pain. Dysmenorrhoea was found in 219 (3.24%) patients, whereas 6,534 (96.76%) did not experience it. There were 123 (1.82%) participants with abdominal distention. Out of the 17 clinical presentations, there were rarer symptoms experienced by the participants. They included amenorrhoea, found in 18 participants (0.27%), and dyspareunia, which was observed in 8 participants (0.12%).

Participants with a previous history of spontaneous abortions were 17 (0.25%). A total of 95 participants with an index (intrauterine) pregnancy recorded IUFD in 2 participants (0.03%), and PPROM in 1 participant (0.01%). Primary PPH was reported in 4 participants (0.06%) and secondary PPH in 1 participant (0.01%). Also, there were 8 participants (0.12%) with ectopic pregnancies who had UFs.

Pressure symptoms, comprising retention of urine (22 participants, 0.33%) and others (11 participants, 0.16%), were also identified. Other symptoms experienced included vaginal discharge with 50 (0.74%) participants, and vaginal mass 46 (0.68%) participants. There were 2 (0.03%) participants with breast cancer, with 1 of them on tamoxifen, and the other (0.01%) on chemotherapy. The symptoms experienced by participants have been summarised in **Table 4.5**.

Table 4.5 *Symptoms Experienced by Participants*

Symptoms Experienced by Participants	Frequency Present, n (%)	Frequency Absent, n (%)
AUB	2,581 (38.22)	4,172 (61.78)
Pelvic Mass	6,234 (92.31)	519 (7.69)
Pelvic Pain	638 (9.45)	6,115 (90.55)
Dysmenorrhoea	219 (3.24)	6,534 (96.76)
Amenorrhoea	18 (0.27)	6,735 (99.73)
Dyspareunia	8 (0.12)	6,745 (99.88)
Infertility	232 (3.44)	6,521 (96.56)
POP	30 (0.44)	6,723 (99.56)
PMB	110 (1.63)	6,643 (98.37)

Adverse Obstetric Outcomes:		
Spontaneous Abortions	17 (0.25)	6,736 (99.74)
IUFD	2 (0.03)	6,751 (99.97)
PPROM	1 (0.01)	6,752 (99.99)
Primary PPH	4 (0.06)	6,749 (99.94)
Secondary PPH	1 (0.01)	6,752 (99.99)
Fibroids in Index Pregnancy		
Normal	95 (1.41)	6,658 (99.59)
Ectopic	8 (0.12)	6,745 (99.88)
Pressure Symptoms		
Retention of Urine	22 (0.33)	6,731 (99.67)
Others	11 (0.16)	6,742 (99.84)
Vaginal Discharge	50 (0.74)	6,703 (99.26)
Vaginal Mass	46 (0.68)	6,707 (99.32)
Abdominal Pain	222 (3.29)	6,531 (96.71)
Abdominal Distention	123 (1.82)	6,630 (98.18)

4.6 Reproductive Tract Tumours/Lesions Co-Existing with Uterine Fibroids

There was a total of 1,816 (26.89%) different tumours/lesions of the reproductive tract present in participants with UFs. They were categorised as benign, malignant, premalignant, infectious, inflammatory, and other specified lesions. There were also records of combined pathology and metastatic tumours.

4.6.1 Uterine Tumours/Lesions Co-Existing with Uterine Fibroids

The uterine lesions were located on the muscular layer of the uterus (myometrial lesions) and the inner lining (endometrial lesions). There was a total of 114 endometrial and 800 myometrial lesions. They were categorised as benign, premalignant, infectious, malignant and other specified lesions. The commonest benign conditions in the respective locations on the uterus were endometrial polyps, making up 62 (0.92%), and adenomyosis, constituting 11.33% of cases. For the infectious lesions, 5 cases (0.07%) were due to chronic endometritis, with rare infections, namely, pyometra (0.03%), pyomyoma (0.01%) and suppurative myometritis (0.01%). There were 29 cases (0.43%) of simple endometrial hyperplasia without atypia, with 3 cases (0.04%) of complex endometrial hyperplasia without atypia. Malignant uterine tumours were 25 cases (0.37%) of endometrioid adenocarcinoma and 3 cases (0.04%) of

carcinosarcoma. A single case of metastatic endometrioid adenocarcinoma of the ovary was identified. The uterine pathologies have been summarised in **Table 4.6.**

Table 4.6 *Uterine Tumours/Lesions Co-Existing with Uterine Fibroids*

Site of Tumour/Lesion	**Type of Tumour/Lesion**	**Name of Tumour/Lesion**	**Frequency, n (%)**
Uterine Lesions	Benign	Endometrial Polyp	62 (0.92)
Endometrial lesions (n-114)		Pill Effect	10 (0.15)
	Infectious	Chronic Endometritis	5 (0.07)
		Postpartum Endometritis	1 (0.01)
	Premalignant	Simple hyperplasia without atypia	29 (0.43)
		Complex hyperplasia with atypia	3 (0.04)
	Combined	Endometrial Polyp + Pill Effect	1 (0.01)
		Endometrial Polyp + Chronic Endometritis	1 (0.01)
	Others	Leiomyomatous Polyp	1 (0.01)
Myometrial lesions other than fibroids (n-800)	Benign	Adenomyosis	765 (11.33)
	Infectious	Pyomyoma	1 (0.01)
		Pyometra	2 (0/03)
		Suppurative Myometritis	1 (0.01)
	Malignant	Carcinosarcoma	3 (0.04)
		Endometrioid Adenocarcinoma	25 (0.37)
	Others	Angiolipoma	1 (0.01)
		Haematometra	1 (0.01)
Metastasis to the body of the uterus	Metastatic Endometrioid Adenocarcinoma of the Ovary		1 (0.01)

4.6.2 Cervical Tumours/Lesions Co-Existing with Uterine Fibroids

Out of the total of 261 cervical lesions, cervical polyps were the most typical benign cervical lesions that co-existed with UFs, making up 47 cases (0.7%), followed by 7 cases (0.1%) of cervical prolapse. The most prevalent infectious pathology of the cervix was chronic cervicitis

making up 168 cases (2.49%) followed by human papilloma virus (HPV) infections, with 10 (0.15%) documented cases. For the premalignant cervical lesions, the various grades of cervical intraepithelial neoplasia (CIN) were represented. There were 2 cases (0.03%) each for CIN I and CIN II and 13 cases (0.19%) of CIN III. Malignant cervical lesions included 9 cases (0.13%) and 2 cases (0.03%) of squamous cell carcinoma (SCC) and adenocarcinoma respectively. There were 4 cases of cervical polyp with chronic cervicitis, and a single case of metastatic endometrioid adenocarcinoma of the endometrium. **Table 4.7** has the summary of cervical lesions that co-existed with UFs.

Table 4.7 *Cervical Tumours/Lesions Co-Existing with Uterine Fibroids*

Site of Tumour/Lesion	**Type of Tumour/Lesion**	**Name of Tumour/Lesion**	**Frequency, n (%)**
Cervical Lesions (n-261)	Benign	Cervical Polyp	47 (0.7)
		Cervical Prolapse	7 (0.1)
	Infectious	Chronic Cervicitis	168 (2.49)
		HPV	10 (0.15)
	Premalignant	CIN I	2 (0.03)
		CIN II	2 (0.03)
		CIN III	13 (0.19)
	Malignant	Squamous Cell Carcinoma	9 (0.13)
		Adenocarcinoma	2 (0.03)
	Combined	Cervical Polyp + Chronic Cervicitis	4 (0.06)
	Others	Leiomyomatous Polyp	2 (0.03)
Metastasis to the cervix	Metastatic Endometrioid Adenocarcinoma of the Endometrium		1 (0.01)

4.6.3 Fallopian Tube Tumours/Lesions Co-Existing with Uterine Fibroids

A total of 109 fallopian tube lesions were identified. The majority of the lesions were of infectious origin. Of this total, hydrosalpinx was the commonest lesion with 56 cases (0.83%). The less common infections that co-existed with UFs were salpingitis (0.41%), tubo-ovarian abscess (0.1%), salpingo-oophoritis (0/06%), genital tuberculosis (0.03%) and schistosomiasis

(0.01%). Salpingitis was unspecified as acute or chronic or its causative pathogen. Genital tuberculosis was a purely histopathological diagnosis. Sputum and serological test results of tuberculosis were not provided. There was a record of a case of metastatic serous cystadenocarcinoma of the ovary. **Table 4.8** displays the lesions of the fallopian tubes co-existing with UFs.

Table 4.8 *Fallopian Tube Tumours/Lesions Co-Existing with Uterine Fibroids*

Site of Tumour/Lesion	**Type of Tumour/Lesion**	**Name of Tumour/Lesion**	**Frequency, n (%)**
Fallopian Tube Lesions (n-109)	Infectious	Hydrosalpinx	56 (0.83)
		Salpingitis	28 (0.41)
		Tubo-Ovarian Abscess	7 (0.1)
		Salpingo-oophoritis	4 (0.06)
		Genital Tuberculosis	2 (0.03)
		Schistosomiasis	1 (0.01)
	Combined	Papillary Adenocarcinoma + Salpingo-oophoritis	1 (0.01)
	Others	Unspecified Granulomatous Salpingitis	1 (0.01)
		Para-Fimbrial Cyst	8 (0.12)
Metastasis to the fallopian tube	Metastatic Serous Cystadenocarcinoma of the Ovary		1 (0.01)

4.6.4 Ovarian Tumours/Lesions Co-Existing with Uterine Fibroids

A total of 429 ovarian pathologies were identified in the histopathological assessment. The lesions were categorised as benign, borderline (those with malignant potential), infectious, inflammatory, metastatic and the combined pathologies. Functional cysts were the commonest benign ovarian lesions forming 3.18% of the total ovarian lesions. This was followed by dermoid cysts constituting 1.21% of cases, and serous cystadenomas contributing to 0.31%. There was a single case of borderline mucinous tumour making up 0.01% of the cases. The most prevalent malignant ovarian tumours co-existing with UFs were granulosa cell tumours

(GCTs), serous papillary cystadenocarcinoma, and endometrioid adenocarcinoma, forming 0.21%, 0.06% and 0.04% of the total cases, respectively. There were several combined pathologies, each constituting 0.01% of the ovarian lesions. There were also records of rare infectious and inflammatory conditions, namely, schistosomiasis and granulomatous tubo-oophoritis, each comprising 0.01% of cases. A single case of metastatic adenocarcinoma of the colon was identified. The identified ovarian lesions that co-existed with UFs have been summarised in **Table 4.9**.

Table 4.9 *Ovarian Tumours/Lesions Co-Existing with Uterine Fibroids*

Site of Tumour/Lesion	**Type of Tumour/Lesion**	**Name of Tumour/Lesion**	**Frequency, n (%)**
Ovarian Lesions (n-429)	Benign	Functional Cyst	215 (3.18)
		Dermoid Cyst	82 (1.21)
		Mucinous Cystadenoma	8 (0.12)
		Serous Cystadenoma	21 (0.31)
		Benign Brenner Tumour	2 (0.03)
		Cystadenofibroma	1 (0.01)
		Fibroma	13 (0.19)
		Fibrothecoma	4 (0.06)
		Haemorrhagic Cyst	1 (0.01)
		Lutein Cyst	3 (0.04)
		Luteinised Thecoma	1 (0.01)
		Mucinous Cystadenoma	8 (0.12)
		Mucinous Cyst	2 (0.03)
		Papillary Cystadenoma	1 (0.01)
		Para-Ovarian Cyst	6 (0.09)
		Simple Sero-Mucinous Cyst	1 (0.01)
		Serous Cyst	15 (0.22)
		Thecoma	2 (0.03)
		Sclerosing Stromal Tumour	1 (0.01)
	Borderline	Borderline Mucinous Tumour	1 (0.01)
	Malignant	Endometrioid Adenocarcinoma	3 (0.04)

		Granulosa Cell Tumour	14 (0.21)
		Malignant Brenner Tumour	1 (0.01)
		Malignant Mixed Sex Cord Stromal Tumour	1 (0.01)
		Non-Hodgkins Lymphoma	1 (0.01)
		Serous Adenocarcinoma	1 (0.01)
		Serous Cystadenocarcinoma	1 (0.01)
		Serous Papillary Cystadenocarcinoma	4 (0.06)
		Yolk Sac Tumour	1 (0.01)
	Combined	Dermoid Cyst + Struma Ovarii	1 (0.01)
		Fibrothecoma + Benign Brenner Tumour	1 (0.01)
		Functional Cyst + Dermoid Cyst	1 (0.01)
		Functional Cyst + Para-Ovarian Cyst	1 (0.01)
		Functional Cyst + Serous Cyst	1 (0.01)
		Metastatic Endometrioid Adenocarcinoma + Dermoid Cyst	1 (0.01)
		Mucinous Cystadenoma + Dermoid Cyst	1 (0.01)
		Mucinous Cystadenoma + Functional Cyst	1 (0.01)
		Serous Cystadenoma + Luteoma	1 (0.01)
	Infectious	Schistosomiasis	1 (0.01)
		Granulomatous Tubo-Oophoritis	1 (0.01)
	Inflammatory	Ovarian Torsion	2 (0.03)
	Others	Stroma Ovarii	2 (0.03)
Metastasis to the ovary	Metastatic Adenocarcinoma of the Colon		1 (0.01)
	Metastatic Endometrioid Adenocarcinoma		1 (0.01)
	Metastatic Uterine Sarcoma		1 (0.01)

4.6.5 Endometriosis as A Co-Existing Pathology with Uterine Fibroids

A total of 103 cases of endometriosis co-existing with UF cases was identified, constituting 1.53% of the overall total number of cases analysed. The remaining 6,650 cases (98.47%) did not have endometriosis co-existing with UFs.

4.7 Age Distribution of the Co-Existing Pathologies

Concerning the age distribution of the co-existing pathologies among the fibroid cases, adenomyosis is the commonest co-existing lesion among the study participants, making up 42.13%. This is followed by ovarian, cervical, endometrial, and fallopian tube pathologies, constituting 23.62%, 14.37%, 6,28%, and 6% of all the pathologies co-existing with UFS. Endometriosis and myometrial lesions constituted 5.67% and 1.93% respectively. The age group of 37-47 years had the highest prevalence of the co-existing pathologies, particularly, adenomyosis and those of ovarian origin. The findings have been summarised in **Table 4.10**.

Table 4.10 *Age Distribution of Reproductive Tract Pathologies Co-Existing with Uterine Fibroids*

Age Group (years)	Co-Existing Reproductive Tract Pathologies							
	Uterine (Myometrial apart from adenomyosis) n (%)	Endometrial n (%)	Ovarian n (%)	Cervical n (%)	Fallopian tube n (%)	Endometriosis n (%)	Adenomyosis n (%)	Total
15-25	0(0.00)	2(22.22)	5(55.56)	0(0.00)	0(0.00)	1(11.11)	1(11.11)	9(0.50)
26-36	1(0.35)	19(6.74)	110(39.00)	17(6.03)	19(6.74)	34(12.06)	82(29.08)	282(15.53)
37-47	7(0.72)	43(4.43)	186(19.16)	158(16.27)	65(6.69)	58(5.97)	454(45.76)	971(53.47)
48-59	12(2.71)	38(8.58)	96(21.67)	69(15.57)	19(4.29)	9(2.03)	200(45.15)	443(24.39)
≥ 60	15(16.48)	11(12.09)	25(27.47)	15(16.48)	6(6.59)	0(0.00)	19(20.88)	91(5.01)
41.7	0(0.00)	1(5.00)	7(35.00)	2(10.00)	0(0/00)	1(5.00)	9(45.00)	20(1.10)
Total	**35(1.93)**	**114(6.28)**	**429(23.62)**	**261(14.37)**	**109(6.00)**	**103(5.67)**	**765(42.13)**	**1,816(100)**

41.7 is the mean age replacing the missing ages

4.8 Associations between Age Groups of Participants and Preponderant Co-Existing Pathologies

A binary logistic regression analysis was conducted to assess the relationship between the age groups of the study participants and the top 3 cases, namely, adenomyosis, ovarian and cervical pathologies, and the likelihood of developing them when diagnosed with UFs.

From the binary logistic regression analysis on participants' age groups and adenomyosis, the model is statistically significant ($p<0.0001$) demonstrating that age is predictor of developing adenomyosis. The pseudo R^2 value of 0.0046 implies that the age group has a limited effect on the likelihood of adenomyosis but other factors could contribute to it but are not captured in the model. Also, the co-efficient for age group 0.0892 (95% CI=0.0548,0.01236) is statistically significant ($p<0.0001$). It also indicates that the odds of developing adenomyosis increases by 9.3% (calculated by the percentage of exponentiating the co-efficient (0.0892) – 1) as age group advances.

The binary logistic regression analysis on participants' age groups and ovarian pathologies revealed the age group as a statistically significant predictor ($p=0.006$) of developing ovarian pathologies as the age group increases. The co-efficient for age group 0.0636 (95% CI=0.0180651, 0.1091874) is statistically significant ($p=0.006$), indicating that the odds of developing ovarian pathologies increases by 6.5% (calculated by the percentage of exponentiating the co-efficient (0.0636) – 1) for each advancement in the age group. Also, the pseudo R^2 value of 0.0046 indicates the limitation in the model, such that other factors capable of predicting ovarian pathologies are excluded from the model.

From the binary logistic regression analysis on age group and cervical pathologies, the age group is a statistically significant predictor of developing cervical lesions ($p=0.001$). A co-efficient of 0.0886 (95% CI=0.0381936, 0.1390003) suggests that as the participants' age

groups advance, the odds of developing the condition increases by 9.3% (calculated by the percentage of exponentiating the co-efficient (0.0886) – 1). The pseudo R^2 value of 0.0042 indicates the limitation in the model, such that other factors capable of predicting cervical pathologies are not inclusive in the model.

Table 4.11 *A Logistic Regression Analysis of Age Group on Preponderant Co-Existing Pathologies*

	Predictor	Co-efficient	Standard Error	Z	p-value	95% CI
Adenomyosis	Age Group	0.0891936	0.0175438	5.08	0.000	0.0548084 to 0.1235787
	Constant	-2.339715	0.06907	-33.87	0.000	-2.47509 to -2.204341
Ovarian Pathologies	Age Group	0.0636263	0.0232459	2.74	0.006	0.0180651 to 0.1091874
	Constant	-2.890842	0.0904629	-31.96	0.000	-3.068145 to -2.713538
Cervical Pathologies	Age Group	0.0885969	0.0257165	3.45	0.001	0.0381936 to 0.1390003
	Constant	-3.49741	0.1074126	-32.56	0.000	-3.707934 to -3.286885

Chapter Summary

This chapter presented the key findings from the study according to the objectives of the study. Data were summarised in the form of tables with frequencies and computed percentages. Applicable inferential statistics were conducted, paying attention to the types of variables and the objectives.

CHAPTER FIVE

DISCUSSION

5.0 Introduction

This chapter throws more light on the results described in the previous chapter. It discusses the key findings of the clinico-histopathological assessment of uterine fibroid cases analysed at the Ghana Standards Authority (GSA). It identifies the pattern of increase of uterine fibroid cases, symptoms experienced by participants whose uterine fibroid samples were analysed, and additional lesions commonly reported in participants with uterine fibroids. The discission compares the results obtained from the study with existing literature.

5.1 Specific Objective 1: Pattern of Uterine Fibroid Cases

Except for declines noted in 2015 and 2019, there was a generally increasing pattern observed in the number of UF cases analysed at the GSA throughout the period of study. There was a 22.2% increase in the number of fibroid cases for every additional year from 2013 to 2021. This finding was consistent with global trends (Li *et al.*, 2023).

Various risk factors that could account for this pattern of increase are age, black race, obesity, and alcohol (Edzie, et al., 2023). Another risk factor is the prolonged exposure to endocrine-disrupting chemicals (EDCs) in personal care products, and the environment (Endocrine Society, 2025). Food is also another source of EDCs (Paterni, Granchi and Minutolo, 2017). The exposures to EDCs at an early age in life causes a reprogramming of the myometrial stem cells, culminating in an increased risk of UFs as one ages (Yang *et al.*, 2022). This could be true as the participant with the least age in the study was 17, and the oldest 88 years old. The manufacturers of these products must clearly list all the chemical components used at every stage of processing in these personal care products and foods. National regulatory authorities must also put measures in place to reduce potential exposures to EDCs as a means to ensure

public safety. This will also help prevent UFs, and other hormone-dependent diseases like breast cancer (White *et al.*, 2024).

The mean ages for 2013 to 2015 demonstrated a relatively stable trend with a slight increase in 2014. For 2018 to 2021, there was a slight decrease in the mean age of UF cases. Comparing these means to the overall average age of the participants, there was no much variation. At these mean ages, the implication is that awareness creation must be enhanced early for women aged 30 years and above, to ensure early diagnosis, and monitoring to permit risk factor management when indicated. From the study, women in the 37-47 year-age group had the highest number of UF cases and co-existing reproductive tract pathologies. This was similar to mean age of the study conducted in the Cape Coast Teaching Hospital (CCTH) to determine the age at first diagnosis of UFs (Edzie et al., 2023). This justifies the need to provide screening services for women aged 30 years and above. In the bid to achieve this, the researcher is of the view that healthcare providers should be adequately trained to offer counselling to patients in order to reduce anxiety from the effects of overdiagnosis.

Having the knowledge of the pattern of increase in UF cases in Ghana is essential for identifying the possible risk factors and their management, and public health planning, specifically on health promotion, policy and resource allocation for managing the disease. Other benefits of the assessment of the patterns of increase in UF cases include identifying and devising various strategies to improve healthcare services and reduce the economic burden of patients (Ofori-Dankwa, Ibine and Ganyaglo, 2019).

From the study, it was observed that 67.05% of the cases were from hospitals in the public sector, whereas 23.17% and 9.77% were from private and quasi-government hospitals respectively. This could give an idea of the health-seeking behaviours of the participants, when it comes to the categories of health facilities patronised. In terms of the regional locations of

these hospitals, 49.1% of the total uterine fibroid specimens were provided by the Volta Region. Majority were from the Catholic Hospital, Battor, which is a public hospital known for women's health. Private and quasi-government hospitals are likely to have a wider range of resources, but at higher costs. An example is the availability of specialist gynaecologists with competencies in laparoscopic procedures. From the work experience of the researcher, these resources are only available in few public hospitals, such as the tertiary hospitals in the country, and other few public hospitals like the Catholic Hospital, Battor in the Volta Region. Having adequate numbers of these resources in public facilities can prevent the delay in seeking healthcare and ease economic burden on patients.

5.2 Specific Objective 2: To identify the symptoms of patients whose fibroid specimens have been examined at the GSA

The study revealed 17 different symptoms and a comorbidity presented by women with UFs. The top 3 symptoms were pelvic mass, AUB, and pelvic pain, which either occurred independently or concomitantly. These symptoms were reported by women with UFs in a study conducted in a tertiary hospital in Uganda (Adawe *et al.*, 2022). The prominence of pelvic mass indicates its clinical importance as a diagnostic sign for UFs. A pelvic mass progressively increasing in size, accompanied by other symptoms like AUB, infertility, pressure symptoms or recurrent spontaneous abortions often warrants surgery. Without surgery, these could potentially reduce the quality of life of the participants, hence, it is the most prevalent symptom.

The next prominent symptom, AUB, which could result in anaemia and may necessitate blood transfusions if very severe. Anaemia could not be assessed because majority of the participants that presented with AUB did not have records of their haemoglobin levels. This highlights a gap in clinical data that could provide more insight in the health impacts of UFs. The need for blood transfusions becomes an additional cost to the women already experiencing a poor quality of life resulting from their excessively bleeding UFs. In addition to these, women with

bleeding UFs, like any other gynaecological disorder, can have mental health issues including depression, and generalised anxiety disorders (Oppong *et al.*, 2021).

Pelvic pain, like dysmenorrhoea and abdominal pain, is not only associated with UFs. It can be associated with other gynaecological disorders like endometriosis (Ellis, Munro and Clarke, 2022). In assessing women with pelvic pain, a detailed clinical history, physical examination, imaging studies, with or without histopathological assessment are required to make the right diagnosis. Comparing these symptoms to AUB and pelvic mass, less participants presented with this possibly due to different individual pain thresholds. It is also possible that this symptom was less common because of patronage of over-the-counter (OTC) analgesics like paracetamol and ibuprofen (Kawuma *et al.*, 2021). The use of secondary data did not allow the researcher to assess the pain management behaviours of the participants.

5.3 Specific Objective 3: To examine the types of reproductive tract tumours/lesions that are commonly reported in addition to uterine fibroids

Out of the 6,753 UF cases, 1,816 participants had co-existing tumours/lesions of the uterus, cervix, ovary, and the fallopian tubes, adenomyosis, and endometriosis. For the ease identification of these specific pathologies, the researcher collected the data on adenomyosis, uterine (myometrial) tumours and infections, and specified endometrial lesions separately, even though the endometrium and myometrium are different parts the uterus. Adenomyosis is also a gynaecological disorder of the uterus capable of co-existing with other disorders of the reproductive tract, often endometriosis and UFs (Struble, Reid and Bedaiwy, 2016).

From the study, the total number of cases of adenomyosis was 765. This was the co-existing lesion with the highest number. It was present in all age groups, with participants aged 37-47 years recording the highest numbers, and those aged 15-25 years had the least number of cases. Adenomyosis commonly affects premenopausal women, and it is classically described as a

disease affecting multiparous women in their 30s to 40s (Gunther and Walker, 2023). This disorder can be elusive to clinicians, and it tends to be underreported and underdiagnosed. In view of this, the diagnosis is mostly made at hysterectomy or myomectomy, and histopathological examination is required to confirm it (Upson and Missmer, 2020).

From the binary logistic regression analysis of the age groups on adenomyosis, age alone is not a strong factor associated with developing the condition. The pseudo R^2 of less than 0.1 implies the presence of other factors are required to further strengthen the association. Other factors missing in the regression model, that could predict the likelihood of adenomyosis are hormonal profiles and parity (Struble, Reid and Bedaiwy, 2016). There were no data on these factors. From these records from the study, adenomyosis should also be considered in policies and funded by the NHIS.

The second highest lesion co-existing with UFs were of ovarian origin. This finding was also observed in a study on female genital tract malignancies at a university hospital in Nigeria (Okeke *et al.*, 2013). They constituted 429 of the total number, of which 387 were benign, 27 malignant, 1 borderline, and 9, a combination of benign and/or malignant tumours. The benign tumours were mostly constituted by functional cysts (considered as tumour-like lesions), which normally resolve days or weeks after in the menstrual cycle (Zamwar and Anjankar, 2022). These constituted 215 of the benign lesions followed by dermoid cyst making up 82.

Ovarian tumours were highest among women aged 37-47 years and the least among those aged 15-25 years. The diagnosis of ovarian cancer is very challenging in the early stages because it presents with non-specific symptoms; hence 52% of cases are diagnosed in the advanced stages (Zamwar and Anjankar, 2022). This is in spite of the availability of imaging studies and biomarker cancer antigen-125 (CA-125).

The commonest type of ovarian cancer in the study was the granulosa cell tumour (GCT) making up 14 of the 429 ovarian pathologies. This cancer can affect both pre- and postmenopausal women (Gaona-Luviano, Medina-Gaona and Magaña-Pérez, 2020). There were 4 cases each in the age groups of 37-47 and 48-59 years. 3 cases each were also recorded in age groups 26-36 and above 60 years. The GCTs, constituting 5% of all ovarian neoplasms, are rare ovarian cancers caused by chromosomal abnormalities (Shamsudeen and Dunton, 2025). In Ghana, genetic testing for diseases is not routinely carried out at birth, which can delay the detection of genetically-associated cancers, such as GCTs. Early knowledge of one's genetic predisposition to any disease can help put preventive measures in place to reduce morbidity and mortality. Further studies are needed to understand the genetic predisposition and environmental factors leading to ovarian and all other cancers in general.

Cervical pathologies constituted the third most common co-existing pathologies with UFs, accounting for 261 cases. Among these, chronic cervicitis was the top on the list, constituting 168. Chronic cervicitis, defined as inflammation of the cervix (the lowest part of the uterus) for a duration of 3 months or longer, can arise from both infective and non-infective aetiologies (Iqbal, Carlson and Wills, 2025). Infective causes include sexually transmitted infections (STIs) such as gonorrhoea, chlamydia, herpes, and trichomoniasis (Johns Hopkins Medicine, 2025). Non-infective causes include mechanical trauma, chemical irritation, and systemic inflammatory diseases (Iqbal, Carlson and Wills, 2025).

In the study, the exact causes of chronic cervicitis were not determined. The specific diagnostic data on STIs were unavailable, hence, it could be attributed to any potential cause. The high prevalence of infective cervical pathologies indicates the significant role of STIs. Chronic cervicitis can culminate in complications such as pelvic inflammatory disease (PID), which may result in fallopian tube infections, hydrosalpinx, and subsequent infertility (Young and Argáez, 2017). Affordable and accessible routine STI screening programmes are recommended

to reduce the disease burden of chronic cervicitis and its complications, ultimately improving gynaecological health outcomes.

Next were cases of premalignant cervical lesions of varying grades. Of these, there were 13 cases of CIN III and 2 cases each of CIN I & II. There were 9 cases of squamous cell carcinoma (SCC). Globally, majority of premalignant cervical lesions and cervical cancer are caused by HPV types 16 and 18 through sexual contact (Emagneneh *et al.*, 2025). These records from the study are vital because cervical cancer is becoming very rare in developed countries, whereas it constitutes 22.2% of gynaecological cancers in SSA (Emagneneh *et al.*, 2025). Cervical cancer is preventable through vaccinations, however, there are behavioural, environmental, or comorbid exposures that could promote it (Bowden *et al.*, 2023). Promoting factors are smoking, immunosuppressive medications, systemic immunosuppressive diseases like HIV/AIDS and altered vaginal microbiome (Bowden *et al.*, 2023). More health promotion, screening and education programmes with research are vital to achieve the records of developed countries when it comes to cervical cancer.

5.4 Specific Objective 4: To identify an association between the age of participants and the other types of reproductive tract lesions/tumours are commonly reported in addition to uterine fibroids

From the binary logistic regression analysis on participants' age groups and adenomyosis, the model demonstrated that age is predictor of developing adenomyosis. The pseudo R^2 value of 0.0046 implies that the age group has a limited effect on the likelihood of adenomyosis but other factors could contribute to it but are not captured in the model. From this study, the odds of developing adenomyosis increases by 9.3% as the age group advances. Adenomyosis commonly affects premenopausal women, and it is classically described as a disease affecting multiparous women in their 30s to 40s (Gunther and Walker, 2023). In the premenopausal years, there are substantial amounts of the female sex hormones. The findings above could be

strengthened if there were available hormonal profiles and parity of the participants. Access to this laboratory investigation could be a reason for its unavailability.

The binary logistic regression analysis on participants' age groups and ovarian pathologies revealed the age group as a statistically significant predictor (p=0.006) of developing ovarian pathologies as the age group increases. Also, the odds of developing ovarian pathologies increases by 6.5% for each advancement in the age group. Also, the pseudo R^2 value of 0.0046 indicates the limitation in the model, such that other factors capable of predicting ovarian pathologies are excluded from the model. A study conducted in China to develop prediction models to estimate future ovarian lesions, using machine learning techniques, revealed tumour markers and age as strong predictive factors for both benign and malignant ovarian diseases (Jing *et al.*, 2023). In this study, there were no laboratory investigations of biomarkers for ovarian diseases. Access to these investigations could be a reason why they were not carried out, hence, not provided in the data extracted.

From the binary logistic regression analysis on age group and cervical pathologies, the age group is a statistically significant predictor of developing cervical lesions (p=0.001). As the participants' age groups advance, the odds of developing the condition increases by 9.3%. The pseudo R^2 value of 0.0042 indicates the limitation in the model, such that other factors capable of predicting cervical pathologies are not inclusive in the model. A study conducted in Sudan revealed the predictors of advanced cervical cancer disease in elderly women to be a lack of health insurance, African descent, and living in a rural setting (Ibrahim *et al.*, 2011). These variables were not available in the dataset. Also, in the rural setting, women had a lower of odds of being screened for cervical cancer due to the limited availability of the services (Adzigbli *et al.*, 2025).

Chapter Summary

This chapter underscores a significant increase in UF cases (22.2% annually) linked to age and potentially to EDCs. Key symptoms including pelvic mass, AUB, and pelvic pain are associated with negative impact on the quality of life of women affected. Co-existing pathologies- adenomyosis, ovarian and cervical lesions- point to the need for early detection and improved healthcare policies for better risk management. Age was an identified predictor of adenomyosis, ovarian, and cervical pathologies.

CHAPTER SIX
CONCLUSION AND RECOMMENDATIONS

6.0 Introduction

This chapter sums the whole study on the clinico-histopathological assessment of uterine fibroid cases at the Ghana Standards Authority (GSA) from 2013 to 2021. It contains a summary of the major findings from the study, conclusions from the findings and recommendations to improve on reducing the disease burden of UFs and co-existing female reproductive tract (FRT) pathologies.

6.1 Conclusion

Based on the findings of the study conducted, the following conclusions can be made:

The UF cases examined at the GSA from 2013 to 2021 shows a 22.2% annual increase in UF cases. The top 3 symptoms experienced by participants are pelvic mass, AUB, and pelvic pain.

Participants aged 37-47 years have the highest number of uterine fibroid cases and co-existing FRT pathologies.

Approximately 27% of the participants have co-existing FRT pathologies, of which the top 3 are adenomyosis, ovarian, and cervical pathologies.

There is an association between the age groups and the occurrence of co-existing pathologies in women diagnosed with UFs, however, the age groups alone are not enough to make these predictions. Other factors like hormonal profile, parity, and lifestyle could further strengthen the prediction of these pathologies.

6.2 Recommendations

In relation to the findings and conclusions drawn from the study, the following recommendations have been made:

1. An important recommendation is the need to provide screening services for UFs and gynaecological pathologies to women, especially, those aged 30 years and above. This, coupled with education by health professionals can prevent delay in seeking treatments for UFs, minimise cost of treatments, and improve the quality of life of women affected.
2. There is the need for the formulation of policies to ensure equitable and equal access to care for women with UFs and other gynaecological tumours, and to reduce the economic burden on women affected.
3. It is recommended that more awareness is created on UFs and gynaecological tumours by health professionals to allow for early detection to ensure positive treatment outcomes and minimise mortality. This could be achieved by health promotion activities in English and local dialects in antenatal clinics, on the traditional media, social media, and public announcement systems of waiting areas of hospitals and clinics.
4. Clinicians providing specimens to be analysed at the histopathology laboratory must fill the request forms with adequate clinical histories, examination findings, and sociodemographic characteristics to guide the pathologists.

Chapter Summary

This chapter summarises the findings of the study, highlighting a 22.2% annual increase in uterine fibroid cases for 2013, 2014, 2015, 2018, 2019, and 2021. The highest number of uterine fibroid cases and co-existing female reproductive tract pathologies were among women aged 37-47 years. The commonest co-existing pathologies were adenomyosis, ovarian, and cervical conditions. Age was found to be a predictor for these conditions, but, however, factors like hormonal profile and lifestyle factors could further strengthen these predictions.

Recommendations focus on improved clinical documentation, increasing awareness, promoting equitable access to care, and the provision of screening services for women aged 30 years and above for early detection, reduction in cost, and improved health outcomes.

REFERENCES

Adawe, M., Sezalio, M., Kanyesigye, H., Kajabwangu, R., Okello, S., Bajunirwe, F. and Ngonzi, J. (2022) 'Prevalence, clinical presentation and factors associated with Uterine fibroids among women attending the Gynecology Outpatient Department at a large Referral Hospital in Southwestern Uganda', *East Africa Science*, 4(1), pp. 38–53. Available at: https://doi.org/10.24248/easci.v4i1.58.

Adawe, M., Sezalio, M., Kanyesigye, H., Kajabwangu, R., Okello, S., Bajunirwe, F. and Ngonzi, J. (no date) *Prevalence, Clinical Presentation and Factors Associated with Uterine Fibroids Among Women Attending the Gynecology Outpatient Department at a Large Referral Hospital in Southwestern Uganda*. Available at: www.eahealth.org.

Adzigbli, L.A., Aboagye, R.G., Adeleye, K., Osborne, A. and Ahinkorah, B.O. (2025) 'Cervical cancer screening uptake and its predictors among women aged 30–49 in Ghana: Providing evidence to support the World Health Organization's cervical cancer elimination initiative', *BMC Infectious Diseases*, 25(1), p. 246. Available at: https://doi.org/10.1186/s12879-025-10485-6.

Alkilani, Y.G. and Apodaca-Ramos, I. (2025) *Cervical Polyps*.

Asakitogum, D.A., Aziato, L. and Ohene, L.A. (2023) 'Ghanaian women beliefs on the causes, prevention and treatment of cervical cancer: A qualitative Study', *International Journal of Africa Nursing Sciences*, 18, p. 100538. Available at: https://doi.org/10.1016/j.ijans.2023.100538.

Bertrand, K.A., Delp, L., Coogan, P.F., Cozier, Y.C., Lenzy, Y.M., Rosenberg, L. and Palmer, J.R. (2023) 'Hair relaxer use and risk of uterine cancer in the Black Women's Health Study', *Environmental Research*, 239, p. 117228. Available at: https://doi.org/10.1016/j.envres.2023.117228.

Bowden, S.J., Doulgeraki, T., Bouras, E., Markozannes, G., Athanasiou, A., Grout-Smith, H., Kechagias, K.S., Ellis, L.B., Zuber, V., Chadeau-Hyam, M., Flanagan, J.M., Tsilidis, K.K., Kalliala, I. and Kyrgiou, M. (2023) 'Risk factors for human papillomavirus infection, cervical intraepithelial neoplasia and cervical cancer: an umbrella review and follow-up Mendelian randomisation studies.', *BMC medicine*, 21(1), p. 274. Available at: https://doi.org/10.1186/s12916-023-02965-w.

Browne, J.L., Kayode, G.A., Arhinful, D., Fidder, S.A.J., Grobbee, D.E. and Klipstein-Grobusch, K. (2016) 'Health insurance determines antenatal, delivery and postnatal care utilisation: evidence from the Ghana Demographic and Health Surveillance data', *BMJ Open*, 6(3), p. e008175. Available at: https://doi.org/10.1136/bmjopen-2015-008175.

Brüggmann, D., Elizabeth-Martinez, A., Klingelhöfer, D., Quarcoo, D., Jaque, J.M. and Groneberg, D.A. (2016) 'Endometriosis and its global research architecture: an in-depth density-equalizing mapping analysis', *BMC Women's Health*, 16(1), p. 64. Available at: https://doi.org/10.1186/s12905-016-0336-0.

Chaturvedi, M., Margam, S. and Azad, S. (2017) 'Organic causes of abnormal uterine bleeding-A clinico- pathological study based on PALM category of FIGO classification ', *Indian Journal of Pathology and Oncology*, 4(2), pp. 247–253.

Clark, T.J. and Stevenson, H. (2017) 'Endometrial Polyps and Abnormal Uterine Bleeding (AUB-P): What is the relationship, how are they diagnosed and how are they treated?', *Best Practice & Research Clinical Obstetrics & Gynaecology*, 40, pp. 89–104. Available at: https://doi.org/10.1016/j.bpobgyn.2016.09.005.

Edzie, E.K.M., Dzefi-Tettey, K., Brakohiapa, E.K., Gorleku, P.N., Aidoo, E., Amoah, S.K., Asiamah, S., Quarshie, F., Nimo, O., Raj, A., Kpobi, J.M., Boadi, E., Edzie, R.A., Turkson, V., Kusodzi, H. and Asemah, A.R. (2023) 'Evaluation of the anatomical locations and sizes of uterine fibroids from

ultrasound examination in Ghana', *African Health Sciences*, 23(4), pp. 438–450. Available at: https://doi.org/10.4314/ahs.v23i4.48.

Edzie, E.K.M., Dzefi-Tettey, K., Brakohiapa, E.K., Quarshie, F., Ken-Amoah, S., Cudjoe, O., Boadi, E., Kpobi, J.M., Edzie, R.A., Kusodzi, H., Dziwornu, P. and Asemah, A.R. (2023) 'Age of first diagnosis and incidence rate of uterine fibroids in Ghana. A retrospective cohort study', *PLoS ONE*, 18(3 March). Available at: https://doi.org/10.1371/journal.pone.0283201.

Ellis, K., Munro, D. and Clarke, J. (2022) 'Endometriosis Is Undervalued: A Call to Action', *Frontiers in Global Women's Health*, 3. Available at: https://doi.org/10.3389/fgwh.2022.902371.

Emagneneh, T., Mulugeta, C., Ejigu, B., Alamrew, A., Hiwot, A.Y. and Feleke, S.F. (2025) 'Survival status of women with cervical cancer in Sub-Saharan Africa: a systematic review and meta-analysis, 2024', *Frontiers in Oncology*, 14. Available at: https://doi.org/10.3389/fonc.2024.1491840.

Endocrine Society (2025) *Endocrine-Disrupting Chemicals (EDCs)*. Available at: https://www.endocrine.org/patient-engagement/endocrine-library/edcs (Accessed: 21 February 2025).

Evans, J. and Jones, K. (2024) 'The role of socioeconomic status in uterine fibroid awareness and treatment: a narrative review', *Therapeutic Advances in Reproductive Health*, 18. Available at: https://doi.org/10.1177/26334941241297634.

Ezeome, I. (2019) 'A 15-year Review (2001-2015) of Surgically-Treated Uterine Fibroids in a Gynecology Unit in Enugu, Southeast, Nigeria: A Descriptive Retrospective Study', *Women's Health and Reproductive Medicine*, 3(2). Available at: https://www.researchgate.net/publication/352680291 (Accessed: 16 February 2025).

Gaona-Luviano, P., Medina-Gaona, L.A. and Magaña-Pérez, K. (2020) 'Epidemiology of ovarian cancer', *Chinese Clinical Oncology*, 9(4), pp. 47–47. Available at: https://doi.org/10.21037/cco-20-34.

Ghana Statistical Service (2023) *Ghana FactSheet*. Available at: https://statsghana.gov.gh/ghfactsheet.php (Accessed: 16 August 2024).

Ghana Statistical Services (2021) *2021 Population and Housing Census Press Release on Provisional Results*.

Ghant, M.S., Sengoba, K.S., Vogelzang, R., Lawson, A.K. and Marsh, E.E. (2016) 'An Altered Perception of Normal: Understanding Causes for Treatment Delay in Women with Symptomatic Uterine Fibroids', *Journal of Women's Health*, 25(8), pp. 846–852. Available at: https://doi.org/10.1089/jwh.2015.5531.

Ginindza, V.J., Shabalala, F.S., Nsibandze, B.S., Nyirenda, M. and Ginindza, T.G. (2024) 'The experiences of women diagnosed with uterine fibroids in the Kingdom of Eswatini', *Health SA Gesondheid*, 29. Available at: https://doi.org/10.4102/hsag.v29i0.2724.

Giudice, L.C., Horne, A.W. and Missmer, S.A. (2023) 'Time for global health policy and research leaders to prioritize endometriosis', *Nature Communications*, 14(1), p. 8028. Available at: https://doi.org/10.1038/s41467-023-43913-9.

Giudice, L.C., Oskotsky, T.T., Falako, S., Opoku-Anane, J. and Sirota, M. (2023) 'Endometriosis in the era of precision medicine and impact on sexual and reproductive health across the lifespan and in diverse populations', *The FASEB Journal*, 37(9). Available at: https://doi.org/10.1096/fj.202300907.

Giuliani, E., As-Sanie, S. and Marsh, E.E. (2020) 'Epidemiology and management of uterine fibroids', *International Journal of Gynecology & Obstetrics*, 149(1), pp. 3–9. Available at: https://doi.org/10.1002/ijgo.13102.

Gunther, R. and Walker, C. (2023) *Adenomyosis*. StatPearls Publishing LLC. Available at: https://www.ncbi.nlm.nih.gov/books/NBK539868/ (Accessed: 20 February 2025).

Hanley, K.Z., Birdsong, G.G. and Mosunjac, M.B. (2017) 'Recent Developments in Surgical Pathology of the Uterine Corpus', *Archives of Pathology & Laboratory Medicine*, 141(4), pp. 528–541. Available at: https://doi.org/10.5858/arpa.2016-0284-SA.

Ibrahim, A., Rask, Pukkala, E. and Aro, A.R. (2011) 'Predictors of cervical cancer being at an advanced stage at diagnosis in Sudan', *International Journal of Women's Health*, p. 385. Available at: https://doi.org/10.2147/IJWH.S21063.

Imperiale, L., Nisolle, M., Noël, J.-C. and Fastrez, M. (2023) 'Three Types of Endometriosis: Pathogenesis, Diagnosis and Treatment. State of the Art', *Journal of Clinical Medicine*, 12(3), p. 994. Available at: https://doi.org/10.3390/jcm12030994.

Iqbal, U., Carlson, K. and Wills, C. (2025) *Cervicitis*.

Jing, B., Chen, G., Yang, M., Zhang, Z., Zhang, Y., Zhang, J., Xie, J., Hou, W., Xie, Y., Huang, Y., Zhao, L., Yuan, H., Liao, W. and Wang, Y. (2023) 'Development of prediction model to estimate future risk of ovarian lesions: A multi-center retrospective study', *Preventive Medicine Reports*, 35, p. 102296. Available at: https://doi.org/10.1016/j.pmedr.2023.102296.

Johns Hopkins Medicine (2025) *Cervicitis*. Available at: https://www.hopkinsmedicine.org/health/conditions-and-diseases/cervicitis (Accessed: 18 April 2025).

Kaushal, D.A., Gupta, Dr.D.P. Das and Kumar, D.A. (2020) 'Clinicopathological profile of uterine fibroid at a medical college hospital', *Tropical Journal of Pathology and Microbiology*, 6(2), pp. 155–160. Available at: https://doi.org/10.17511/jopm.2020.i02.07.

Kawuma, R., Chimukuche, R.S., Francis, S.C., Seeley, J. and Weiss, H.A. (2021) 'Knowledge, use (misuse) and perceptions of over-the-counter analgesics in sub-Saharan Africa: a scoping review', *Global Health Action*, 14(1). Available at: https://doi.org/10.1080/16549716.2021.1955476.

Kilpatrick, C. (2023) *Benign Ovarian Masses*, *MSD Manual Professional Version*. Available at: https://www.msdmanuals.com/professional/gynecology-and-obstetrics/miscellaneous-gynecologic-disorders/benign-ovarian-masses#Key-Points_v12504169 (Accessed: 4 June 2025).

Krishnan, M., Narice, B., Cheong, Y.C., Lumsden, M.A., Daniels, J.P., Hickey, M., Gupta, J.K. and Metwally, M. (2024) 'Surgery and minimally invasive treatments for uterine fibroids', *Cochrane Database of Systematic Reviews*, 2024(6). Available at: https://doi.org/10.1002/14651858.CD015650.

Li, B., Wang, F., Chen, L. and Tong, H. (2023) 'Global epidemiological characteristics of uterine fibroids', *Archives of Medical Science*, 19(6), pp. 1802–1810. Available at: https://doi.org/10.5114/aoms/171786.

Liu, Y.-H., Qiu, Y.-H., Ru, Y., Liu, Y.-Q., Wang, D. and Zhang, P.-A. (2021) 'Selection of different surgical methods for uterine fibroids', *Medicine*, 100(51), p. e28378. Available at: https://doi.org/10.1097/MD.0000000000028378.

Lou, Z., Huang, Y., Li, S., Luo, Z., Li, C., Chu, K., Zhang, T., Song, P. and Zhou, J. (2023a) 'Global, regional, and national time trends in incidence, prevalence, years lived with disability for uterine fibroids, 1990–2019: an age-period-cohort analysis for the global burden of disease 2019 study', *BMC Public Health*, 23(1). Available at: https://doi.org/10.1186/s12889-023-15765-x.

Lou, Z., Huang, Y., Li, S., Luo, Z., Li, C., Chu, K., Zhang, T., Song, P. and Zhou, J. (2023b) 'Global, regional, and national time trends in incidence, prevalence, years lived with disability for uterine fibroids, 1990–2019: an age-period-cohort analysis for the global burden of disease 2019 study', *BMC Public Health*, 23(1). Available at: https://doi.org/10.1186/s12889-023-15765-x.

Millien, C., Manzi, A., Katz, A.M., Gilbert, H., Smith Fawzi, M.C., Farmer, P.E. and Mukherjee, J. (2021) 'Assessing burden, risk factors, and perceived impact of uterine fibroids on women's lives in rural Haiti: implications for advancing a health equity agenda, a mixed methods study', *International Journal for Equity in Health*, 20(1). Available at: https://doi.org/10.1186/s12939-020-01327-9.

Minh Duc, N., Huy, H.Q. and Keserci, B. (2018) 'Adverse events of focused ultrasound surgery for uterine fibroids and adenomyosis', *Reports in Medical Imaging*, Volume 11, pp. 15–26. Available at: https://doi.org/10.2147/RMI.S166580.

Ministry of Health and Ghana Health Service (2014) *National Reproductive Health Service Policy and Standards*. Accra. Available at: https://platform.who.int/docs/default-source/mca-documents/policy-documents/policy/gha-cc-10-01-policy-2014-eng-national-reproductive-health-service-policy-and-standards.pdf (Accessed: 26 April 2025).

Mitro, S.D., Wise, L.A., Waetjen, L.E., Lee, C., Zaritsky, E., Harlow, S.D., Solomon, D.H., Thurston, R.C., El Khoudary, S.R., Santoro, N. and Hedderson, M.M. (2024) 'Hypertension, Cardiovascular Risk Factors, and Uterine Fibroid Diagnosis in Midlife', *JAMA Network Open*, 7(4), p. e246832. Available at: https://doi.org/10.1001/jamanetworkopen.2024.6832.

Morhason-Bello, I.O. and Adebamowo, C.A. (2022) 'Epidemiology of uterine fibroid in black African women: a systematic scoping review', *BMJ Open*. BMJ Publishing Group. Available at: https://doi.org/10.1136/bmjopen-2021-052053.

Munro, M.G. (2019) 'Uterine polyps, adenomyosis, leiomyomas, and endometrial receptivity', *Fertility and Sterility*, 111(4), pp. 629–640. Available at: https://doi.org/10.1016/j.fertnstert.2019.02.008.

Musa, B., Alswang, J.M., Di Ioia, R., Grubic, L., Naif, A., Mbuguje, E.M., Vuong, V., Newsome, J., Shaygi, B., Ramalingam, V. and Gaupp, F.M.L. (2023) 'Uterine artery embolization in Tanzania: a procedure with major public health implications', *CVIR Endovascular*, 6(1), p. 40. Available at: https://doi.org/10.1186/s42155-023-00384-9.

Ndebele, S., Turner, T., Liao, C., Aschebrook-Kilfoy, B., Randorf, N., Ahsan, H., Odunsi, K. and Madueke-Laveaux, O.S. (2024) 'Uterine Fibroid Prevalence in a Predominantly Black, Chicago-Based Cohort', *International Journal of Environmental Research and Public Health*, 21(2), p. 222. Available at: https://doi.org/10.3390/ijerph21020222.

Ng, K.Y.B. and Cheong, Y. (2019) 'Hydrosalpinx – Salpingostomy, salpingectomy or tubal occlusion', *Best Practice & Research Clinical Obstetrics & Gynaecology*, 59, pp. 41–47. Available at: https://doi.org/10.1016/j.bpobgyn.2019.01.011.

Ofori-Dankwa, Z., Ibine, B. and Ganyaglo, G.Y.K. (2019) 'The Uterine Fibroid Disease Burden in a Tertiary Care Setting in Ghana: Prevalence, Cost, and Policy Implications [7C]', *Obstetrics & Gynecology*, 133(1), pp. 33S-33S. Available at: https://doi.org/10.1097/01.AOG.0000559428.84633.12.

Ogunsina, K., O'Brien, K.M., White, A.J., Chang, C.-J., Gaston, S.A., Jackson, C.L. and Sandler, D.P. (2025) 'Hair Straightener Use in Relation to Prevalent and Incident Fibroids in the Sister Study with a Focus on Black Women', *Environmental Health Perspectives*, 133(1). Available at: https://doi.org/10.1289/EHP14493.

Okeke, T., Onah, N., Ikeako, L. and Ezenyeaku, C. (2013) 'The frequency and pattern of female genital tract malignancies at the university of Nigeria teaching hospital, enugu, Nigeria.', *Annals of medical and health sciences research*, 3(3), pp. 345–8. Available at: https://doi.org/10.4103/2141-9248.117938.

Oppong, E.E., Obese, E., Biney, R.P., Agbalekpor, P., Hanson, P.A., Aboagye, M.Y.A., Adakudugu, E.A., Adanusa, M., Pinkrah, R., Adomah, A.O., Osei, S.A., Oge, E.N., Agbenyeku, M.A. and Ameyaw, E.O. (2021) 'Spectrum of anxiety and depression reported in reproductive-aged women diagnosed with gynaecological disorders at a tertiary healthcare facility in Ghana', *International Journal of Basic & Clinical Pharmacology*, 10(9), p. 1056. Available at: https://doi.org/10.18203/2319-2003.ijbcp20213358.

Paterni, I., Granchi, C. and Minutolo, F. (2017) 'Risks and benefits related to alimentary exposure to xenoestrogens', *Critical Reviews in Food Science and Nutrition*, 57(16), pp. 3384–3404. Available at: https://doi.org/10.1080/10408398.2015.1126547.

Quarshie, J.T., Tettey, W., Narh, K., Kwablah Teye, A., Cofie, J.K., Gyening-Yeboah, A. and Attoh, S. (2021) 'Anatomical Profile of Uterine Fibroids in Accra, Ghana: A Retrospective Review', *Science and Development*, 5(2).

Sarkodie, B.D., Botwe, B.O., Adjei, D.N. and Ofori, E. (2016) 'Factors associated with uterine fibroid in Ghanaian women undergoing pelvic scans with suspected uterine fibroid', *Fertility Research and Practice*, 2(1). Available at: https://doi.org/10.1186/s40738-016-0022-9.

Sefah, N., Ndebele, S., Prince, L., Korasare, E., Agbleke, M., Nkansah, A., Thompson, H., Al-Hendy, A. and Agbleke, A.A. (2023) 'Uterine fibroids — Causes, impact, treatment, and lens to the African perspective', *Frontiers in Pharmacology*, 13. Available at: https://doi.org/10.3389/fphar.2022.1045783.

Shamsudeen, S. and Dunton, C.J. (2025) *Granulosa Theca Cell Tumors of the Ovary*. StatPearls Publishing.

Stasenko, M., Fillipova, O. and Tew, W.P. (2019) 'Fallopian Tube Carcinoma', *Journal of Oncology Practice*, 15(7), pp. 375–382. Available at: https://doi.org/10.1200/JOP.18.00662.

Struble, J., Reid, S. and Bedaiwy, M.A. (2016) 'Adenomyosis: A Clinical Review of a Challenging Gynecologic Condition', *Journal of Minimally Invasive Gynecology*, 23(2), pp. 164–185. Available at: https://doi.org/10.1016/j.jmig.2015.09.018.

Tambunan, R., Fahriatni and Hasanuddin (2021) 'Uterine Fibroid in Breast Cancer Patients receiving Tamoxifen Therapy', *Indonesian Journal of Obstetrics and Gynecology*, pp. 59–62. Available at: https://doi.org/10.32771/inajog.v9i1.1260.

Tinelli, A., Vinciguerra, M., Malvasi, A., Andjić, M., Babović, I. and Sparić, R. (2021) 'Uterine Fibroids and Diet', *International Journal of Environmental Research and Public Health*, 18(3), p. 1066. Available at: https://doi.org/10.3390/ijerph18031066.

United Nations Environment Programme (2025) *Endocrine Disrupting Chemicals*. Available at: https://www.unep.org/topics/chemicals-and-pollution-action/pollution-and-health/endocrine-disrupting-chemicals (Accessed: 21 February 2025).

Upson, K. and Missmer, S.A. (2020) 'Epidemiology of Adenomyosis', *Seminars in Reproductive Medicine*, 38(02/03), pp. 089–107. Available at: https://doi.org/10.1055/s-0040-1718920.

Vafaei, S., Ciebiera, M., Omran, M.M., Ghasroldasht, M.M., Yang, Q., Leake, T., Wolfe, R., Ali, M. and Al-Hendy, A. (2023) 'Evidence-Based Approach for Secondary Prevention of Uterine Fibroids

(The ESCAPE Approach)', *International Journal of Molecular Sciences*, 24(21), p. 15972. Available at: https://doi.org/10.3390/ijms242115972.

Vellekoop, H., Odame, E. and Ochalek, J. (2022) 'Supporting a review of the benefits package of the National Health Insurance Scheme in Ghana', *Cost Effectiveness and Resource Allocation*, 20(1), p. 32. Available at: https://doi.org/10.1186/s12962-022-00365-0.

Vercellini, P. and Frattaruolo, M.P. (2017) 'Uterine fibroids: from observational epidemiology to clinical management', *BJOG: An International Journal of Obstetrics and Gynaecology*. Blackwell Publishing Ltd, p. 1513. Available at: https://doi.org/10.1111/1471-0528.14730.

Wakimoto, T., Hayashi, S., Koh, I., Yamamoto, R. and Ishii, K. (2022) 'Relationship between unremoved cervical polyp in pregnancy and spontaneous preterm birth', *American Journal of Obstetrics and Gynecology*, 227(6), pp. 899.e1-899.e6. Available at: https://doi.org/10.1016/j.ajog.2022.06.064.

White, K.E., Booker, Q., Titiloye, N., Edusei, L., Brinton, L., Wiafe, B., Adjei, E. and Figueroa, J. (2024) 'Abstract A036: Hair relaxers use and breast cancer risk by tumor estrogen receptor status: Results from the Ghana Breast Health study', *Cancer Epidemiology, Biomarkers & Prevention*, 33(9_Supplement), pp. A036–A036. Available at: https://doi.org/10.1158/1538-7755.DISP24-A036.

WISE, L.A. and LAUGHLIN-TOMMASO, S.K. (2016) 'Epidemiology of Uterine Fibroids', *Clinical Obstetrics & Gynecology*, 59(1), pp. 2–24. Available at: https://doi.org/10.1097/GRF.0000000000000164.

World Health Organisation (2025) *Cervical Cancer*. Available at: https://www.who.int/news-room/fact-sheets/detail/cervical-cancer (Accessed: 26 April 2025).

Yang, Q., Ciebiera, M., Bariani, M.V., Ali, M., Elkafas, H., Boyer, T.G. and Al-Hendy, A. (2022) 'Comprehensive Review of Uterine Fibroids: Developmental Origin, Pathogenesis, and Treatment', *Endocrine Reviews*, 43(4), pp. 678–719. Available at: https://doi.org/10.1210/endrev/bnab039.

Young, C. and Argáez, C. (2017) *Management and Treatment of Cervicitis: A Review of Clinical Effectiveness and Guidelines*. Ottawa. Available at: https://www.ncbi.nlm.nih.gov/books/NBK525875/#:~:text=Microbiologic%20Cure&text=Included%20patients%20were%20diagnosed%20with,and%201.5%20g%20azithromycin%2C%20respectively. (Accessed: 20 April 2025).

Zamwar, U.M. and Anjankar, A.P. (2022) 'Aetiology, Epidemiology, Histopathology, Classification, Detailed Evaluation, and Treatment of Ovarian Cancer', *Cureus* [Preprint]. Available at: https://doi.org/10.7759/cureus.30561.

APPENDIX I

Spreadsheet for Data Extraction

ID				
AGE				
AGE GROUP				
YEAR OF ASSESSMENT				
HOSPITAL				
TYPE OF HOSPITAL				
HOSPITAL LOCATION				
LOCATION BY REGION				
ABNORMAL UTERINE BLEEDING				
PELVIC MASS				
PELVIC PAIN				
DYSMENORRHOEA				
AMENORRHOEA				
DYSPAREUNIA				
INFERTILITY				
PELVIC ORGAN PROLAPSE				
POSTMENOPAUSAL BLEEDING				
ADVERSE OBSTETRIC OUTCOME				
PPH				
FIBROIDS IN PREGNANCY				
RETENTION OF URINE				
RECTAL BLEEDING				
VAGINAL DISCHARGE				
VAGINAL MASS				
ABDOMINAL PAIN				
ABDOMINAL DISTENTION				
OTHER PRESSURE SYMPTOMS				
TYPES OF FIBROIDS				
OTHER UTERINE LESIONS				
SPECIFIED ENDOMETRIAL LESIONS				
ENDOMETRIOSIS				
ADENOMYOSIS				
SPECIFIED CERVICAL LESIONS				
OVARIAN TUMOURS				
SPECIFIED FALLOPIAN TUBE LESIONS				
BREAST CA TREATMENT				

APPENDIX II

Ethical Clearance

ENSIGN GLOBAL
COLLEGE

OUR REF: ENSIGN/IRB/EL/SN-283/01
YOUR REF:

January 8, 2025

INSTITUTIONAL REVIEW BOARD SECRETARIAT

Abena Adobea Adjapong
Ensign Global College
Kpong.

Dear Abena,

ETHICAL CLEARANCE TO UNDERTAKE POSTGRADUATE RESEARCH

At the General Research Proposals Review Meeting of the *INSTITUTIONAL REVIEW BOARD (IRB)* of Ensign Global College held on Wednesday, January 8, 2025, your research proposal entitled **"A Clinico-Histopathological Assessment of Uterine Fibroid Cases at the Ghana Standards Authority"** was considered.

You have been granted Ethical Clearance to collect data for the said research under academic supervision within the IRB's frameworks and guidelines.

We wish you all the best.

Sincerely,

Dr. (Mrs.) Rebecca Acquaah-Arhin
IRB Chairperson

P.O. Box AK 136 | Tema-Akosombo Highway, Kpong, Eastern Region, Ghana|
https://www.ensign.edu.gh |+233 245 762 229