



**ASSESSING THE EFFECTIVENESS OF X-RAY REPORTS IN DIAGNOSING
CHEST RELATED DISEASES IN ELDERLY PATIENTS**

BY

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CERTIFICATION

This is to certify that the research work for this project and the subsequent write up by Obaizamomwan Osamagbe, with matriculation number BMS1907345 were carried out under my supervision.

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DEDICATION

This research project is lovingly dedicated to my beautiful mother, Mrs. Obaizamomwan Ekinadoese Betty, whose passing just a few weeks before the completion of my final year and this work left a void words cannot fill. Her love, prayers, and sacrifices remain the driving force behind all that I am and all that I strive to become.

To my ever supportive father, Mr. Obaizamomwan Efosa, your strength, love, and unshakable belief in me have carried me through my toughest moments. You have been my earthly pillar of courage and wisdom.

To my lovely and soul siblings; Osaruese, Osaniga, and Osahuemwenmwen, thank you for being my heart's comfort and my source of laughter and peace during this journey.

Above all, I dedicate this work to God Almighty, my El-Roi; the God who sees me, who carried me through the storm, held me through every tear, and gave me grace and strength to finish strong.

This project stands as a tribute of love, faith, and perseverance to the woman who gave me wings, and to the God who taught me how to fly.

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ABSTRACT

Chest radiography is an important diagnostic method in evaluating thoracic diseases, especially among elderly patients where cardiovascular and pulmonary disorders are prevalent. However, the extent to which radiological findings correspond with clinicians' preliminary diagnoses varies. This study assessed the correspondence between clinical and radiological diagnoses in chest X-ray examinations among elderly patients at the University of Benin Teaching Hospital. A retrospective descriptive study was conducted using 204 chest X-ray records of patients aged 60 years and above. Data on age, gender, clinical diagnosis, radiological findings, and correspondence (Yes/No) were extracted and analyzed using SPSS version 29. Descriptive statistics summarized the data, while chi-square and independent-samples t-tests determined associations at a significance level of $p < 0.05$. The mean age of patients was 64.98 ± 5.20 years, with 138 (69.3%) females and 61 (30.7%) males. The most frequent clinical diagnosis was hypertension 37 (18.1%), while normal chest 65 (31.9%) was the commonest radiological finding. 130 (65.7%) of cases showed correspondence between clinical and radiological diagnoses. A significant association existed between clinical and radiological correspondence ($\chi^2 = 122.77$, $df = 83$, $p = 0.003$). The t-test showed a significant difference in mean age between corresponding and non-corresponding groups ($t(192) = -2.20$, $p = 0.029$). A moderate to high diagnostic correspondence (65.7%) was observed, indicating that chest radiography remains valuable in confirming or excluding thoracic pathology among elderly patients. Diagnostic accuracy was higher among younger elderly patients (60–65 years) compared to those above 70 years.

Keywords: Chest radiography, Clinical-radiological correspondence, Elderly patients, Diagnostic accuracy, Hypertension, University of Benin Teaching Hospital.

CHAPTER ONE

INTRODUCTION

1.1 Background of the study

In recent years, there has been a growing recognition of the critical role radiographic imaging plays in modern medicine, particularly in diagnosing diseases of the chest. Among elderly patients, the significance of accurate chest imaging becomes even more pronounced due to the physiological and pathological changes associated with aging. The lungs, as dynamic and delicate structures, undergo changes in compliance, elasticity, and cellular makeup as individuals grow older. These transformations, although considered part of normal aging, often create interpretative challenges during radiologic examinations (Baratella *et al.*, 2023).

Chest X-ray remains one of the most common and accessible diagnostic tools used worldwide, not only because of its affordability and widespread availability, but also due to its effectiveness in quickly identifying a wide range of chest-related pathologies. For the elderly, chest X-ray is particularly indispensable because it helps detect life-threatening conditions such as pneumonia, heart failure, chronic obstructive pulmonary disease (COPD), tuberculosis, and malignancies. However, these diseases may present atypically in older adults, and the radiographic signs may be subtle or easily mistaken for age-related changes (Gossner & Nau, 2013).

The importance of evaluating the effectiveness of X-ray reports lies in the need for precise and timely diagnosis. In geriatric wards, delays in diagnosis can lead to rapid clinical deterioration due to the often fragile state of elderly patients. As shown in the study by Ticinesi *et al.* (2016), lung ultrasound has been gaining attention as a complementary tool to chest X-ray in detecting pneumonia in older adults. However, chest radiography remains the frontline imaging modality,

especially in acute settings, due to its rapidity and practicality. This makes the reliability and interpretative accuracy of X-ray reports crucial to patient care and outcomes.

Moreover, in developing countries like Nigeria, chest X-ray continues to serve as a primary investigative tool in both urban and rural healthcare facilities. Abacha et al. (2020) examined radiographic findings among adults in a tertiary hospital in Sokoto, revealing a wide spectrum of chest pathologies that X-ray imaging was able to detect. These findings reflect the continued reliance on this modality for diagnosing respiratory conditions in adult populations, including the elderly. Even in pediatric populations, as noted by Abacha and Bello (2022), chest X-ray findings have proven essential in identifying various lung conditions, showing the modality's cross-generational utility.

Beyond localized studies, the global COVID-19 pandemic highlighted the critical role of chest imaging in public health emergencies. As Inui et al. (2021) documented, chest radiography became an essential part of the diagnostic toolkit during the early stages of COVID-19, especially in high-risk populations such as the elderly. While CT scans offered greater sensitivity, the portability and speed of X-ray units made them ideal for bedside imaging and initial triage in overwhelmed hospitals. The practical role of chest X-rays during this period reemphasized the modality's enduring clinical relevance. Nonetheless, the effectiveness of X-ray reports depends not only on image acquisition but also on interpretation and reporting. The competence of the radiologist, availability of clinical context, quality of radiographic images, and existing workload are just a few factors that can influence report accuracy. According to Mace and Kowalczyk (1988), radiographic pathology demands a high level of interpretative acumen and must be supported by continuous training and adequate experience. In geriatric

patients, where diseases often manifest in atypical ways, this interpretative skill becomes even more essential.

At the University of Benin Teaching Hospital (UBTH), as in other tertiary institutions, radiologists are frequently tasked with interpreting chest X-rays for a diverse patient population that increasingly includes elderly individuals. Given the central role that radiographic findings play in medical decision-making, the effectiveness of these reports warrants thorough examination. Are the reports comprehensive enough? Do they reflect the true nature of the pathologies present? Are they consistent with clinical outcomes? These are the pressing questions that this study seeks to address. By evaluating the quality and clinical impact of chest X-ray reports on elderly patients within a real-world hospital setting, the research hopes to identify areas of strength and gaps in current practice. Ultimately, such an assessment could inform policy recommendations, training curricula, and institutional protocols aimed at improving diagnostic accuracy and patient outcomes among the aging population.

This study is, therefore, not merely an academic exercise but a vital investigation into a key aspect of geriatric care with far-reaching implications for patients, clinicians, and the healthcare system at large.

1.2 Statement of the problem

Chest-related diseases, such as pneumonia, chronic obstructive pulmonary disease (COPD), lung cancer, and heart failure, are increasingly prevalent among elderly populations. The diagnostic accuracy of these conditions often hinges on radiographic imaging, with X-ray reports playing a crucial role in the detection and management of these diseases. However, the effectiveness of X-ray reports in diagnosing chest-related diseases in elderly patients remains

a subject of concern. Despite the availability of advanced radiological technology, there is a growing need to assess the reliability and diagnostic value of X-ray reports in this demographic. Elderly patients, due to the complexity of aging physiology and the presence of comorbidities, may present unique challenges in interpretation. Subtle signs, atypical presentations, and overlapping symptoms often complicate diagnoses, making it imperative to evaluate how accurately X-ray reports reflect the true nature of chest-related diseases in this age group. Given that these conditions can manifest differently in older adults, it is vital to investigate whether current diagnostic practices, specifically X-ray reports, are effective in identifying these diseases in a timely and accurate manner. This study seeks to examine the adequacy, reliability, and diagnostic precision of X-ray reports for chest-related diseases in elderly patients, with a focus on understanding the extent to which these reports influence clinical outcomes and treatment decisions. It will explore the potential gaps in diagnostic effectiveness, which may affect the quality of care elderly patients receive, ultimately contributing to the understanding of whether improvements in radiographic practices or reporting are necessary for enhancing patient outcomes in this vulnerable population.

1.3 Research questions

1. What is the demographic distribution (age and gender) of elderly patients undergoing chest X-rays?
2. What are the most common clinical diagnoses of chest-related diseases among elderly patients?
3. What is the level of correspondence between clinical diagnoses and chest X-ray reports in elderly patients?

4. How effective are chest X-ray reports in supporting clinical diagnoses among elderly patients?

1.4 Research Hypotheses

Null Hypothesis (H₀): X-ray reports do not significantly improve the diagnosis of chest-related diseases in elderly patients compared to clinical diagnosis alone.

Nul Hypothesis (H₀): There are no significant challenges or discrepancies in the interpretation of X-ray reports for chest-related diseases in elderly patients.

1.5 Aim of the Study

The aim of this study is to assess the effectiveness of X-ray reports in diagnosing chest-related diseases in elderly patients.

1.6 Specific objectives

1. To describe the demographic distribution (age, gender) of elderly patients undergoing chest X-rays.
2. To identify the most common clinical diagnoses of chest-related diseases in elderly patients.
3. To determine the correspondence between clinical diagnoses and chest X-ray reports.
4. To assess the effectiveness of chest X-ray reports in supporting clinical diagnoses among elderly patients.

1.7 Significance of the Study

This study holds significant value for various stakeholders, including policymakers in health, radiography, and society at large. By assessing the effectiveness of X-ray reports in diagnosing chest-related diseases in elderly patients, it provides essential insights that can influence policy development, healthcare practices, and societal health outcomes.

Health Policymakers: For health policymakers, the study offers valuable data to assess the adequacy of current diagnostic protocols, particularly in relation to the elderly population. Understanding the limitations of X-ray reports in diagnosing chest-related diseases can prompt the review and improvement of diagnostic guidelines. This could lead to the formulation of more accurate and efficient diagnostic standards, ensuring that elderly patients receive timely and effective care. Furthermore, the study could influence the allocation of resources towards better training, equipment, or technology to enhance diagnostic capabilities in geriatric care.

Radiography Professionals: Radiography policymakers and practitioners stand to gain from the findings of this study, which could inform the development of more targeted training programs and continuing education for radiographers. By evaluating the effectiveness of X-ray reports, the study may highlight areas where radiographers need further expertise or specialized knowledge to accurately interpret X-ray images in elderly patients. This can lead to improvements in radiographic practice, ensuring that reports reflect the true clinical picture and that radiographers are better equipped to address the unique diagnostic challenges posed by aging populations.

Societal Impact: On a broader societal level, the study emphasizes the importance of accurate diagnostics in safeguarding the health of elderly individuals. Chest-related diseases, if misdiagnosed or overlooked, can significantly impact the quality of life of older adults, leading to complications, prolonged hospitalizations, or even fatalities. By ensuring that diagnostic practices are fine-tuned to meet the needs of the elderly, this study can help reduce healthcare disparities and improve overall public health outcomes. Moreover, improved diagnostic accuracy can lessen the economic burden of incorrect treatments, unnecessary procedures, and

prolonged care, contributing to the efficient use of healthcare resources.

Clinical Policymakers and Healthcare Institutions: The findings of this research will provide healthcare administrators with evidence to advocate for necessary changes in clinical protocols. It may prompt the integration of additional diagnostic tools or techniques alongside X-rays to enhance diagnostic accuracy, especially in elderly patients. By encouraging evidence-based decision-making, healthcare institutions can improve patient care standards, reduce misdiagnosis, and ensure that elderly patients receive appropriate treatment in a timely manner. The significance of this study extends across various levels of policy-making, influencing the improvement of diagnostic practices, healthcare delivery, and the overall well-being of elderly patients in society. The insights garnered could lead to enhanced policies, better healthcare infrastructure, and more informed decision-making in radiographic and geriatric care.

1.7 Scope of the Study

This study is delimited to the University of Benin Teaching Hospital (UBTH), focusing exclusively on elderly patients aged 65 years and above who have undergone chest X-ray examinations within a period of June 2024 to June 2025. It will not include patients from private hospitals, secondary healthcare centres, or those below the age threshold. Furthermore, the study is delimited to evaluating chest-related diseases only such as pneumonia, tuberculosis, chronic obstructive pulmonary disease (COPD), and cardiomegaly as diagnosed through X-ray imaging. It will not cover X-ray diagnoses related to other body systems or advanced imaging modalities like CT or MRI. The study will also rely on existing patient records and X-ray reports for its analysis, thus excluding real-time diagnostic follow-ups or prospective imaging studies.

1.8 Operational Definition of Terms

Chest-Related Diseases: This refers to a range of medical conditions affecting the lungs and other structures within the thoracic cavity. In this study, it includes but is not limited to pneumonia, chronic obstructive pulmonary disease (COPD), tuberculosis, pulmonary fibrosis, and cardiomegaly, as diagnosed through radiographic imaging.

X-Ray Reports: These are formal written interpretations provided by radiologists after reviewing chest radiographs. They detail observed abnormalities, impressions, and possible diagnoses. In this study, the focus is on how accurate, clear, and clinically useful these reports are for elderly patient management.

Elderly Patients: Individuals aged 65 years and above, in line with the commonly accepted threshold for defining the aging population in clinical and public health settings. These individuals are considered due to their unique physiological changes and increased vulnerability to chest-related illnesses.

Effectiveness: Within the context of this study, effectiveness refers to the degree to which chest X-ray reports contribute to accurate diagnosis and appropriate management of chest diseases in elderly patients. This includes timeliness, diagnostic relevance, and alignment with clinical findings.

CHAPTER TWO

LITERATURE REVIEW

2.1 Conceptual review

Even in a global perspective, societies are getting older (United Nations, 2022). We think that diagnostic lung imaging of older patients requires special knowledge, and imaging strategies have to be adjusted to the needs of frail patients, for example, immobility, impossibility for long breath holds, renal insufficiency, or poor peripheral venous access (Hatabu et al., 2020; Rubin et al., 2015). Beside conventional radiography, modern multislice computed tomography is the method of choice in lung imaging, and it is especially important to separate the process of ageing from the disease itself (MacMahon *et al.*, 2017; Webb *et al.*, 2015). Pathologies with a special relevance for the elderly patient are discussed in detail: pneumonia, aspiration pneumonia, congestive heart failure, chronic obstructive pulmonary disease, the problem of overlapping heart failure and chronic obstructive pulmonary disease, pulmonary drug toxicity, incidental pulmonary embolism pulmonary nodules, and thoracic trauma (Metlay et al., 2019; Global Initiative for Chronic Obstructive Lung Disease, 2024; McDonagh et al., 2021; Konstantinides et al., 2019).

2.1.1 Anatomy and physiology of the chest.

The human thorax (Fig 1.0) includes the thoracic cavity and the thoracic wall (Standring, 2021). It contains organs including the heart, lungs, and thymus gland, as well as muscles and various other internal structures (Standring, 2021). Many diseases may affect the chest, and one of the most common symptoms is chest pain (Jameson *et al.*, 2022).

In the human body, the region of the thorax between the neck and diaphragm in the front of the

body is called the chest (Standring, 2021). The corresponding area in an animal can also be referred to as the chest (Standring, 2021).

The shape of the chest does not correspond to that part of the thoracic skeleton that encloses the heart and lungs (Moore, Dalley, & Agur, 2022). All the breadth of the shoulders is due to the shoulder girdle, and contains the axillae and the heads of the humeri (Standring, 2021). In the middle line the suprasternal notch is seen above, while about three fingers' breadth below it a transverse ridge can be felt, which is known as the sternal angle and this marks the junction between the manubrium and body of the sternum (Snell, 2019). Level with this line the second ribs join the sternum, and when these are found the lower ribs can often be counted (Snell, 2019). At the lower part of the sternum, where the seventh or last true ribs join it, the ensiform cartilage begins, and above this there is often a depression known as the pit of the stomach (Standring, 2021).

The bones of the thorax, called the "thoracic skeleton" is a component of the axial skeleton (Moore et al., 2022).

It consists of the ribs and sternum (Standring, 2021). The ribs of the thorax are numbered in ascending order from 1–12 (Moore et al., 2022). 11 and 12 are known as floating ribs because they have no anterior attachment point in particular the cartilage attached to the sternum, as 1 through 7 are, and therefore are termed "floating" (Standring, 2021). Whereas ribs 8 through 10 are termed false ribs as their costal cartilage articulates with the costal cartilage of the rib above (Moore et al., 2022). The thorax bones also have the main function of protecting the heart, lungs, and major blood vessels in the thorax area, such as the aorta (Standring, 2021).

The anatomy of the chest can also be described through the use of anatomical landmarks (Snell,

2019). The nipple in the male is situated in front of the fourth rib or a little below; vertically it lies a little external to a line drawn down from the middle of the clavicle; in the female it is not so constant (Standring, 2021). A little below it the lower limit of the great pectoral muscle is seen running upward and outward to the axilla; in the female this is obscured by the breast, which extends from the second to the sixth rib vertically and from the edge of the sternum to the mid-axillary line laterally (Snell, 2019). The female nipple is surrounded for half an inch by a more or less pigmented disc, the areola (Standring, 2021). The apex of a normal heart is in the fifth left intercostal space, three and a half inches from the mid-line (Moore et al., 2022).

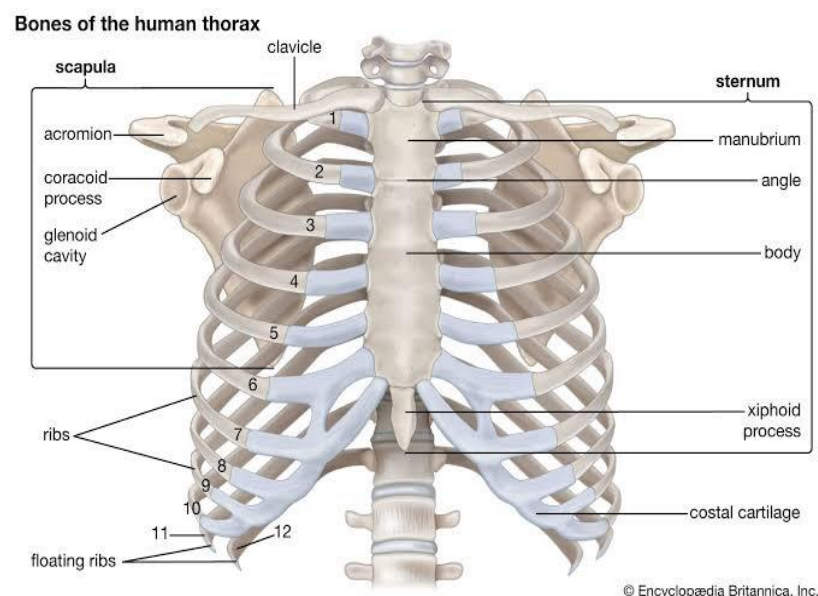


Fig1.1 showing image of the human bony thorax adapted from teachmeanatomy.info.

The thorax is the area of the body situated between the neck and the abdomen (Standring, 2021). The thorax itself can be split up into various areas that contain important structures (Moore, Dalley, & Agur, 2022). The muscles of the thorax are also important for the vital actions of breathing and muscles that attach to the thoracic wall may also contribute to the general

movement of the trunk, upper limbs and the neck (Snell, 2019).

The thoracic cavity is home to many vital organs (fig 1.1), notably the lungs/pleurae and the heart, but also includes the thymus gland and the breasts (Standring, 2021). As the heart is found here, the great vessels associated with it are also found including the pulmonary arteries/veins, the superior vena cava and the aorta (as well as some of its proximal branches) (Moore et al., 2022).

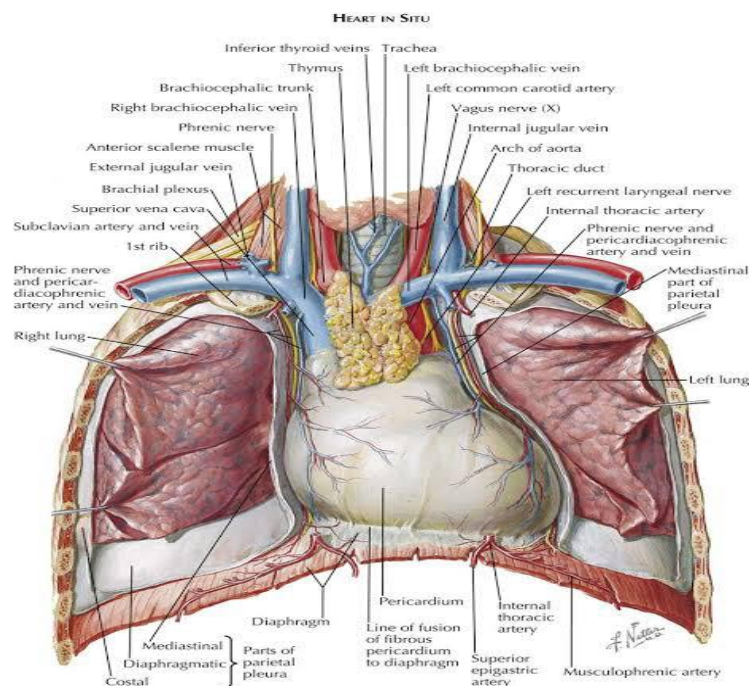


Fig 1.2 showing image of the contents of the thorax adapted from teachmeanatomy.info.

2.1.2 The Respiratory System within the Thorax

The respiratory system is responsible for two major functions (Guyton & Hall, 2021). Ventilation involves the movement of air in and out of the lungs, and diffusion relates to the gas exchange between the lungs and the circulatory system (Guyton & Hall, 2021). This system is usually subdivided into the upper respiratory tract—the nose, mouth, pharynx, and larynx—and the lower respiratory tract—the trachea, bronchi, alveoli, and lungs (Fig. 1.2) (Standring,

2021). The thoracic cavity consists of the right and left pleural cavities and the mediastinum (Standring, 2021). The parietal pleura lines the thoracic cavity, and the visceral pleura adheres directly to lung tissue (Moore, Dalley, & Agur, 2022). Anatomically, the mediastinum is divided into the anterior, middle, and posterior portions (Snell, 2019). The anterior mediastinum contains the thyroid and thymus glands (Standring, 2021). The middle mediastinum contains the heart and great vessels, esophagus, and trachea (Standring, 2021). The posterior mediastinum contains the descending aorta and the spine (Moore et al., 2022). The anatomic bony structures of the thorax assist in both inspiration and expiration (Snell, 2019). These bony structures include the ribs, sternum, and thoracic vertebrae (Standring, 2021). The paranasal sinuses are lined with respiratory epithelium and communicate with the nasal cavities, hence their inclusion in this chapter (Standring, 2021). The maxillary and ethmoid sinuses are the only paranasal sinuses present at birth (Moore et al., 2022). The frontal sinuses generally develop shortly after birth and are fully developed by the age of 10 years (Snell, 2019). The sphenoid sinus begins to develop around the age of 2 or 3 years and is fully developed by the late adolescence (Standring, 2021).

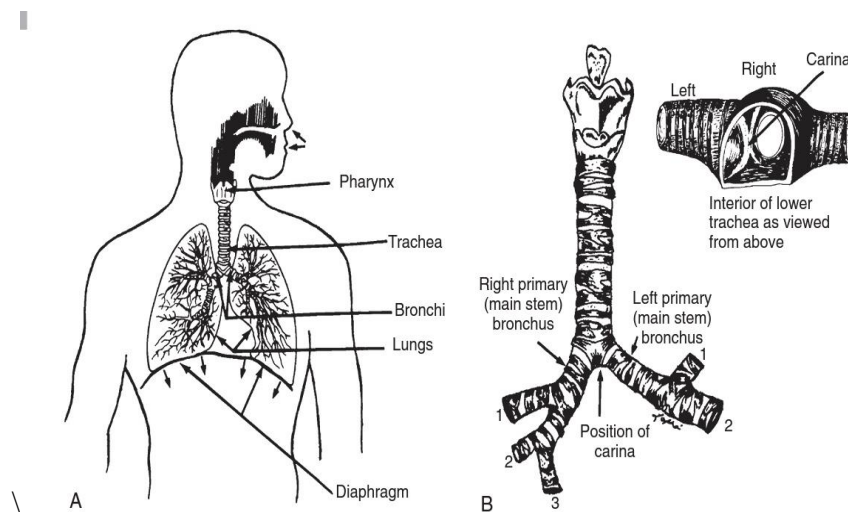


Fig 1.3 showing the image of the respiratory system(A) and the trachea and it's bifurcation (B) adapted from teachmeanatomy.info.

2.1.3 The Heart and its Physiology

The cardiovascular system consists of the heart, arteries, capillaries, and veins and may be further divided into two subsystems of circulation: (1) The pulmonary circulation transports blood between the heart and lungs for exchange of blood gases, and (2) the systemic circulation transports blood between the heart and the rest of the body (Guyton & Hall, 2021). Heart The heart acts as a pump to propel the blood throughout the body via the circulatory vessels (Standring, 2021). It lies in the anterior chest within the mediastinum and is generally readily visible on a chest radiograph (Moore, Dalley, & Agur, 2022). The interior of the heart is divided into two upper chambers, termed the right and left atria, and two lower chambers, termed the right and left ventricles (Standring, 2021).

The heart contains three tissue layers (Moore et al., 2022). The innermost layer, termed the endocardium, is smooth (Standring, 2021). The valves located within and between the various chambers are also composed of endocardium (Standring, 2021). Although the valve tissue is relatively thin, in a normal heart, it is able to prevent the backflow and passage of blood when the valve is closed (Guyton & Hall, 2021). The middle layer is muscular and is termed the myocardium (Snell, 2019). This is the thickest layer of heart tissue, and the cardiac muscle receives blood supply from the right and left coronary arteries, which arise directly from the aorta, just superior to the aortic valve (Moore et al., 2022). When the myocardium contracts (systole), blood is pumped out of the heart (Guyton & Hall, 2021). The outermost layer is a protective covering termed the epicardium (Standring, 2021). The entire heart is enclosed

within a pericardial sac, which contains a small amount of fluid to lubricate the heart as it contracts and relaxes, thus reducing friction between the heart and other mediastinal structures (Snell, 2019). In the normal heart, the right atrium receives deoxygenated blood from the body via the superior and inferior venae cavae (Guyton & Hall, 2021). The deoxygenated blood passes through the right atrioventricular or tricuspid valve into the right ventricle (Standring, 2021). The right ventricle contracts during systole, thus propelling blood to the lungs through the pulmonary valve and pulmonary trunk, which bifurcates into the right and left main pulmonary arteries, respectively (Moore et al., 2022). Approximately 60% of deoxygenated blood enters the right lung, and approximately 40% enters the left lung (Guyton and Hall, 2021).

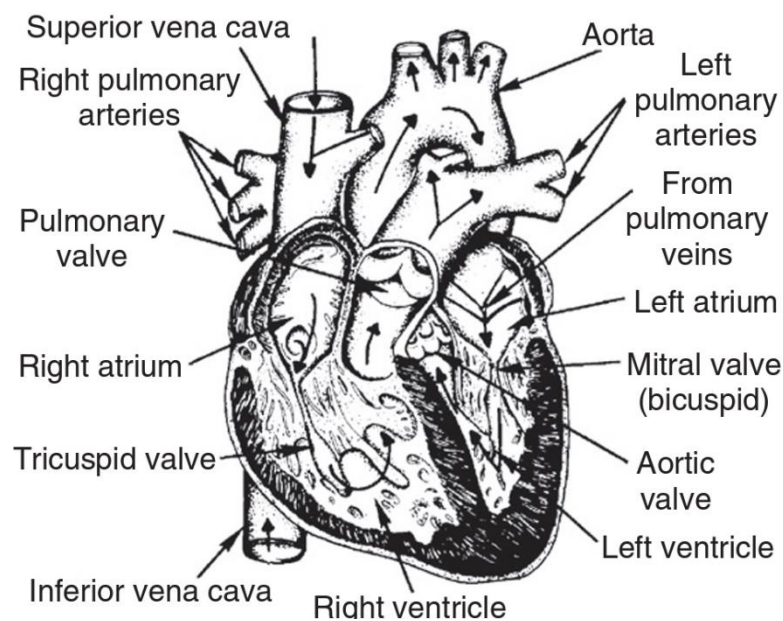


Fig 1.4 showing image of the heart adapted from teachmeanatomy.info.

2.1.4 Radiography of the Chest.

The examination most frequently performed in any radiology department is chest radiography.

Although this examination may seem routine, chest radiography provides important information about soft tissues, bones, the pleura, the mediastinum, and lung tissue.

Exposure Factor Conditions

Correct exposure factor selection is critical because an incorrect exposure factor may hide or appear to create pathologic findings (Bontrager & Lampignano, 2020). This is particularly true for serial mobile radiographs because the interpreting physician relies heavily on consistent exposure conditions to analyze the change in pathology after treatment (Bushong, 2021). Institutions may record exposure techniques for mobile chest images so that different technologists can use similar exposure factors to maintain consistency among the radiographs (Bontrager & Lampignano, 2020). Photostimulable phosphor-computed tomography (CT) imaging plates and direct readout (DR) image receptors are commonly used for mobile chest radiography to eliminate exposure repeats caused by the inadequacy or inconsistency of technical factors (Seeram, 2019).

Although accurate technical selection is important when using digital radiography systems to ensure that an appropriate exposure indicator is obtained, both systems offer wider latitude of error over conventional film or screen systems because of a wider dynamic range (Bushong, 2021). Some sources describe pathologies, including those in the chest, as additive, that is, they are harder than normal to penetrate or subtractive (destructive), that is, they are easier than normal to penetrate (Bontrager & Lampignano, 2020). In the respiratory system, any condition that adds fluid or tissue to the normally aerated chest (e.g., pneumonia) requires an increase in technical factors to afford proper penetration and exposure (Eisenberg & Johnson, 2021). Similarly, any condition that increases the aeration of the chest (e.g., emphysema) reduces the

amount of radiation required for proper exposure to be achieved (Bontrager & Lampignano, 2020). Most experts agree that when chest radiography is performed using a digital imaging system, the radiographer must use his or her knowledge of pathologic conditions and specific image receptor characteristics to assess whether a change in milliamperere second (mAs) or kilovoltage peak (kVp) is required to adjust the radiographic exposure (Bushong, 2021).

The kilovoltage range should be chosen based on the energy level necessary to penetrate the part of interest, keeping in mind the presence of additive or subtractive pathologies (Bontrager & Lampignano, 2020). The use of automatic exposure control (AEC) in chest radiography facilitates consistent radiographic exposures but requires careful analysis of the clinical history and conscious thought about the type of disease present and its location to ensure truly optimal diagnostic-quality radiographs (Seeram, 2019). Activation of the sensor, for example, over an area of significant aeration or consolidation (tissue or fluid accumulation) may result in excessive or insufficient exposure, respectively (Bushong, 2021). Although the image may look fine on initial visual examination, care must be taken to always utilize an exposure indicator to assess proper technique selection (Seeram, 2019). Experience with AEC, combined with careful thought in selecting the proper sensor, eliminates these mistakes (Bontrager & Lampignano, 2020).

Chest Radiography

On a normal erect PA chest image, the costophrenic and cardiophrenic angles are demonstrated, with the right hemidiaphragm appearing 1 to 2 cm higher than the left because of the position of the liver (Bontrager & Lampignano, 2020). When a patient is radiographed in the recumbent position, the lower lung fields may be obscured because of abdominal pressure raising the level

of the diaphragm (Bontrager & Lampignano, 2020).

Other projections of the thorax are used less frequently than the erect PA and left lateral projections (Seeram, 2019). The AP projection is the method of choice for mobile radiography when the patient is too ill to tolerate a visit to the department and assume an erect position (Bontrager & Lampignano, 2020). As much as possible, it is important that mobile chest radiographs be taken with the patient sitting in bed in the erect position to demonstrate any air–fluid levels present (Seeram, 2019). Maintenance of the beam perpendicular to the plane of the image receptor is essential to avoid any foreshortening of the heart (Bontrager & Lampignano, 2020). Furthermore, use of the 72-inch SID is very important for mobile radiography to minimize magnification of the heart, which is located farther from the image receptor in the AP projection (Seeram, 2019). To improve image quality, many institutions commonly employ a short dimension grid when using a digital imaging system (Seeram, 2019). The AP and PA projections of the patient lying in the lateral decubitus position are useful under specific conditions such as diagnosing free air in the pleural space or pleural fluid (Bontrager & Lampignano, 2020). For example, for a right lateral decubitus chest radiograph, the patient lies on his or her right side (Bontrager & Lampignano, 2020). In this position, any fluid present tends to layer out along the edge of the lung field on the dependent side, which enhances its visibility, whereas the free air rises toward the left side (Bontrager & Lampignano, 2020).

For evaluation of the standard PA chest radiograph, the size and radiolucency of both lungs should be compared (Bontrager & Lampignano, 2020). Criteria for adequate inspiration and penetration of chest radiographs vary from institution to institution; however, a rule of thumb is that adequate inspiration should provide visualization of 10 posterior ribs within the lung

field (Seeram, 2019). In addition, all thoracic vertebrae and intervertebral disk spaces should be faintly visible through the mediastinum on an adequately penetrated chest radiograph (Bontrager & Lampignano, 2020). The average movement of the lungs and diaphragm between inspiration and expiration is approximately 3 cm (Fig 1.5) (Seeram, 2019). Oblique projections of the thorax are useful in separating superimposed structures such as the sternum, esophagus, and thoracic spine (Bontrager & Lampignano, 2020). A lordotic chest radiograph is useful in demonstrating the apical regions of the lung, which are normally obscured by bony structures on the standard PA projection (Fig. 1.6) (Bontrager & Lampignano, 2020). Certain diseases such as tuberculosis (TB) have a predilection for the apices (World Health Organization, 2023).

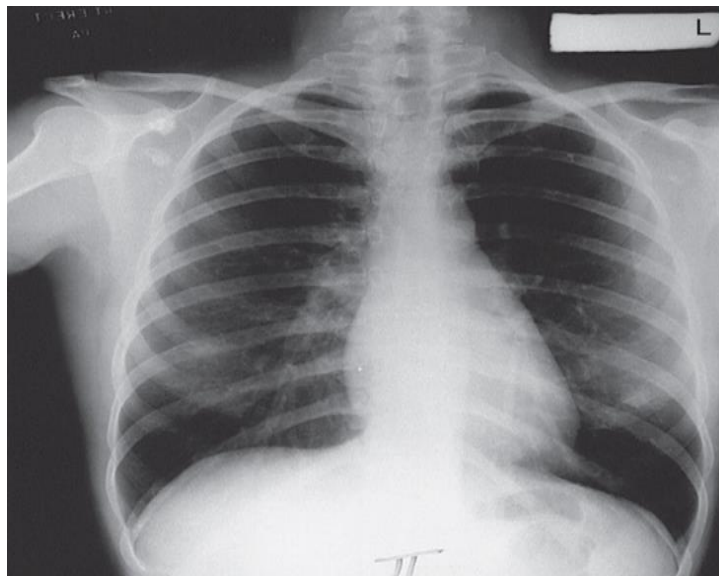


Fig1.5 showing a PA erect chest radiograph on arrested inspiration adapted from radiopaedia.org.

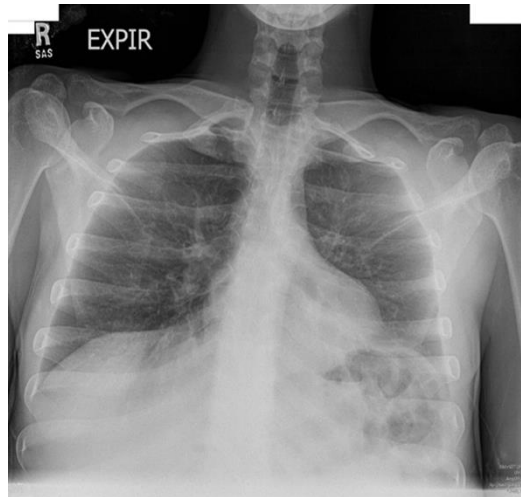


Fig1.6 showing image of a lordotic chest radiograph taken to show the apices of the lungs adapted from radiopaedia.org.

Soft Tissues of the Chest

Various soft tissue densities are present on chest radiographs (Bontrager & Lampignano, 2020). They may vary with patient age, sex, and pathologic conditions (Bushong, 2021). The pectoral muscles are normally demonstrated overlying and extending beyond the lung fields (Seeram, 2019). Radiographs of both men and women demonstrate breast shadows in the midchest region (Bontrager & Lampignano, 2020). These shadows are normally homogeneous in appearance, and female breasts may obscure the costophrenic angles (Seeram, 2019). Elevation of the breasts may be necessary to better demonstrate the bases of the lungs (Bontrager & Lampignano, 2020). Surgical removal of one or both breasts is also evident on chest radiographs; breast prostheses, which appear as well-defined, circular, radiopaque densities, are also evident (Seeram, 2019). Nipple shadows may be visible at the level of the fourth or fifth anterior rib spaces and may occasionally mimic nodules or masses in the chest (Bontrager & Lampignano, 2020). These soft tissue structures may be differentiated with nipple markers

or oblique projections of the chest (Bushong, 2021).

Bony Structures of the Chest

The ribs, sternum, and thoracic spine enclose the thoracic cavity. These structures assist the technologist in the assessment of the technical adequacy of chest radiographs. Congenital anomalies of the ribs may be demonstrated, as well as calcified costal cartilages. This calcification generally occurs in patients in their late 20s and beyond. Rib fractures may be seen, sometimes with an accompanying pneumothorax. A depressed sternum (pectus excavatum) may also be demonstrated, possibly displacing the heart. The thoracic spine may be assessed for scoliosis, which may affect the chest cavity, and kyphosis or compression fractures of the vertebrae.

Mediastinum

The mediastinum contains all thoracic organs except the lungs (Standring, 2021). The heart occupies a large portion of the mediastinum, and the shape of the heart varies with age, degree of respiration, and patient position (Moore, Dalley, & Agur, 2022). Other organs contained within the mediastinum include the thyroid and thymus glands and nervous and lymphatic tissues (Standring, 2021).

Radiographically, the mediastinum is divided into three sections: (1) The anterior mediastinal masses generally arise from the thyroid gland, thymus gland, or lymphatic tissue; (2) the middle mediastinal masses are commonly lymphatic tissue; and (3) the posterior mediastinal masses usually arise from nervous or bony tissue (Bontrager & Lampignano, 2020). In infants, the mediastinum appears wide because the thymus is normally large in a healthy infant (Seeram, 2019). On frontal projections, it may extend beyond the heart borders and caudally to the

diaphragm, and on a lateral projection, it may fill the anterior portion of the mediastinum, which is normally radiolucent later in life (Bontrager & Lampignano, 2020). This radiographic appearance is readily visible on both PA and lateral views and is referred to as the “sail sign” because of its characteristic appearance (Bushong, 2021). Diagnosis is difficult because the width of the upper mediastinum varies greatly with the phase of respiration (Seeram, 2019).

A crying child may present an opportune moment for the technologist to make an exposure, but the resultant Valsalva maneuver adds to the distortion of the thymus (Bontrager & Lampignano, 2020). The Valsalva maneuver increases both the intra-thoracic pressure and the intra-abdominal pressure by asking the patient to inhale deeply and hold the breath to force the diaphragm and chest muscles against a closed glottis (Guyton & Hall, 2021). True mediastinal masses are rare in infants and generally represent congenital malformations or neoplasms (Standring, 2021). In the mediastinum of older adults, the aorta dilates, and the aortic knob becomes much more visible (Moore et al., 2022). Mediastinal emphysema (pneumo-mediastinum) occurs when there has been a disruption in the esophagus or airway and air is trapped in the mediastinum (Bontrager & Lampignano, 2020). It may result from chest trauma, endoscopy, or violent vomiting (Standring, 2021). When unaccompanied by a pneumothorax, spontaneous mediastinal emphysema is usually self-limiting, subsiding in a few days without complication (Bushong, 2021). Air in the mediastinum from rupture of the esophagus (usually from vomiting) or a major bronchus (usually from trauma) is more serious and requires prompt diagnosis and surgical intervention (Seeram, 2019). An esophagogram may be performed with a water-soluble contrast agent to verify that a leak has not occurred (Bontrager & Lampignano, 2020).

When the pneumomediastinum is extensive, air may pass from the mediastinum into the subcutaneous tissues of the chest or neck, resulting in subcutaneous emphysema (Bontrager & Lampignano, 2020). Diagnosis of this may be made by feeling air bubbles in the skin of the chest or neck (Seeram, 2019). Glandular enlargements of the thyroid gland are demonstrated by a displacement or narrowing of the trachea (Standring, 2021). The thyroid gland is usually located superior to the lung apices, but an ectopic thyroid gland may also displace the trachea (Standring, 2021). Clinical manifestations of an ectopic thyroid gland are often absent, and the mass may be discovered accidentally when chest radiography is performed for some other purpose (Bontrager & Lampignano, 2020).

In some instances, a routine chest radiograph may be requested on admission to the hospital, but for stable patients, this must be based on specific clinical indications such as need for cardiac monitoring or the presence of extrathoracic disease (American College of Radiology, 2023). Although many institutions routinely obtain mobile chest radiographs for all patients in the intensive care unit, recent research indicates that the diagnostic and therapeutic value of routine chest radiography is low in this population (Oba & Zaza, 2010). On the basis of current evidence, the American College of Radiology (ACR) suggests that routine mobile chest radiography is only indicated in patients with acute cardiopulmonary conditions and patients in respiratory failure who are on a mechanical ventilator (American College of Radiology, 2023). In cases involving the placement of an endotracheal tube, central venous line, arterial line, and chest tubes, radiographs should only routinely be obtained upon placement of the device (Ganapathy et al., 2012). Follow-up chest radiography should not be routine for these patients and should be performed based on appropriate clinical indications (American College

of Radiology, 2023).

2.2 Empirical review

Several studies have investigated the diagnostic capabilities of chest X-rays in elderly patients, a demographic that frequently presents with complex respiratory pathologies due to age-related anatomical and physiological changes. Chest X-rays (CXR) remain a widely used initial imaging modality, especially in low-resource or acute care settings, owing to their accessibility, affordability, and relatively low radiation exposure.

In a study conducted by Ticinesi et al. (2016) in an acute geriatric ward, 169 multimorbid elderly patients with respiratory symptoms underwent both chest X-ray and lung ultrasound (LUS). The findings demonstrated that while CXR maintained some diagnostic utility, it had a significantly lower accuracy (0.67) compared to LUS (0.90), particularly in frail patients. CXR showed a sensitivity of 47% for pneumonia, whereas LUS demonstrated a much higher sensitivity of 92%. This suggests that although CXR is still in use, its effectiveness in detecting pneumonia and related pathologies in elderly populations is often compromised by factors such as poor cooperation, anatomical changes, and overlapping comorbidities.

Similarly, Gossner and Nau (2013) emphasized that in geriatric imaging, age-related factors like frailty, immobility, and comorbid conditions affect not only image acquisition but also interpretation. Their review highlighted that age-associated structural lung changes—such as senile emphysema, tracheobronchial calcification, and basal fibrosis—can mimic or obscure pathological findings on CXR, often leading to misinterpretation or underreporting. They advocated for careful differentiation between normal aging changes and pathology, noting that in elderly patients, diagnostic imaging strategies must be adapted to their physiological realities.

In a Nigerian setting, Abacha et al. (2020) retrospectively reviewed 190 adult chest X-ray

reports and observed that while the highest frequency of abnormalities occurred in older males, hypertensive heart failure was the most common pathology identified (26.84%), followed by normal findings (38.95%). This finding reinforces the relevance of chest radiography in the detection of cardiopulmonary conditions prevalent in aging populations, especially in settings where advanced imaging may not be readily available.

Further underscoring the contextual challenges, Inui et al. (2021) evaluated chest imaging during the COVID-19 pandemic and reported that while chest CT was the gold standard, CXR played a valuable role in patient triage and monitoring—especially in resource-limited settings or among patients too unstable for CT scans. They also observed that CXR's effectiveness varied with disease stage and symptom severity, making it less useful in early or mild presentations but moderately effective in later or more severe cases.

An additional dimension is provided by Baratella et al. (2023), who reviewed the normal aging changes in chest structures and their implications for imaging interpretation. They noted that physiological changes such as kyphosis, diaphragmatic elevation, sarcopenia, and osteoporotic deformations significantly alter chest anatomy, often mimicking pathological findings like emphysema or pleural effusion on X-rays. This highlights the need for experienced interpretation and possibly complementary imaging, especially in elderly individuals.

Lastly, though not directly focused on the elderly, Abacha et al. (2022) provided supporting evidence on the diagnostic value of X-ray in pediatric cases, noting bronchopneumonia as a predominant finding and reiterating X-ray's role as a frontline tool in respiratory diagnosis. The comparison between pediatric and geriatric imaging demonstrates the diagnostic adaptability of chest radiography across life stages, though each comes with unique challenges.

2.3 Theoretical review

Two complementary bodies of theory underpin radiographic imaging, and especially the interpretation of chest X-rays: one related with the cognitive processes by which those images are read and reported, and another with the safe and optimal production of diagnostic images. Originally proposed by the International Commission on Radiological Protection to guarantee that every radiographic exposure balances diagnostic benefit against radiation risk, the ALARA principle—also known as "As Low As Reasonably Achievable"—lays groundwork here. ALARA offers a practical guide for technologists and radiologists as well as a regulatory mandate by viewing dose management as an optimization problem—minimizing patient exposure while retaining enough image quality (ICRP, 1990). This theoretical framework reminds us in the geriatric context, where tissue composition and respiratory mechanics vary significantly from younger adults, that technical parameters (kVp, mAs, collimation) must be deliberately adjusted to age-related anatomical changes to avoid under- or overexposure that might obscure subtle pathologies (Baratella et al., 2023).

Not less important is knowledge of how radiologists arrive at their diagnostic impressions. Dual-process models of cognition hold that when assessing imaging results, expert readers oscillate between slower, analytical thinking (System 2) and fast, pattern-recognition-based judgments (System 1). While experienced radiologists use a rich repository of visual templates—organized around Gestalt principles of form and density—to make almost instantaneous detections of nodules, effusions, or consolidations, novice readers often rely too much on step-by-step analytic checks (Evans, 2008). However, dual-process theory also suggests—and empirical studies support—that overreliance on intuitive pattern recognition can

result in "satisfaction of search" errors, particularly when age-related changes such as diaphragmatic flattening or calcified costal cartilages mimic disease (Gossner & Nau, 2013). Underlying both these fields is the visual-search model of image perception, which explains how readers scan an X-ray, mark areas of interest, and distribute attentional "dwell time" depending on expectations and prior probability (Kundel & Nodine, 1975). The model clarifies why radiologists sometimes fixate for just fractions of a second on anomalies that fit known patterns, yet may overlook more subtle findings outside of "typical" search paths. It also implies that by means of a methodical review of the whole image, structured reporting templates—which lead the reader through a predefined sequence of anatomical zones—can reduce perceptual oversights (Reiner et al., 2020). Together, ALARA, dual-process thinking, and visual-search theory create a coherent theoretical scaffold for understanding both the production and interpretation of chest X-rays in elderly patients, so highlighting areas where training, technology, and reporting policies might be strengthened to improve diagnosis accuracy.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Research setting

This study was carried out at the University of Benin Teaching Hospital (UBTH), a federal tertiary healthcare institution located in Benin City, Edo State, Nigeria. UBTH provides comprehensive diagnostic and treatment services, including radiographic imaging, to a large and diverse population. The radiology department of UBTH is well equipped with conventional and digital X-ray facilities and handles numerous chest-related imaging requests, especially among the elderly. Given the hospital's reputation and patient base, it offers a suitable environment for assessing the effectiveness of X-ray reports in diagnosing chest-related diseases in elderly patients.

3.2 Research design

A retrospective and prospective descriptive cross-sectional research design was used for this study. This design was appropriate to obtain of X-ray report effectiveness among elderly patients within a defined period. It allowed the researcher to gather data on the diagnostic accuracy of X-ray reports and the perceptions of radiologists through questionnaire responses without manipulating any variables.

3.3 Target population

The target population comprised elderly patients (aged 65 years and above) who have undergone chest X-rays at UBTH within January 2025 to June 2025, which amounted to 385. These patients were typically referred for imaging due to symptoms of chest related conditions such as pneumonia, tuberculosis, COPD, lung cancer, and heart failure.

3.4 Sample technique and sample size

A stratified random sampling technique was used. Elderly patients were stratified based on the type of chest related disease and department of referral (e.g., Emergency, Outpatient, Medical wards). Patient X-ray reports were selected using random sampling within each stratum to ensure adequate representation.

$$n = N/1+N(e^2)$$

n = sample size

N = population size which is 385

e = 0.05, this margin of error was adopted to account for potential gaps or inconsistencies in retrospective documentation.

$$n = 385/1+385 (0.05^2)$$

$$n = 385/1+385 (0.0025)$$

$$n = 385/1+0.9625$$

$$n = 385/1.9625$$

$$n = 196.17$$

Approximately 196 patient record.

3.5 Instrument of data collection

Data extraction form: This was used to collect quantitative data from patient case files and X-ray reports. It will include:

- Patient age and gender
- Clinical diagnosis
- Findings from chest X-ray reports

- Correspondence between clinical and radiological diagnoses

3.6 Validity of instrument

The instruments was subjected to content validation by a panel of experts in radiography, including two consultant radiologists, one senior radiographer and one public health physician, and one medical research. The panel assessed the tool for clarity, comprehensiveness, and relevance. Their feedback was used to revise and refine the instruments to ensure they adequately address the research objectives and are relevant to the study population.

3.7 Reliability of instrument

The reliability of the checklist data was determined using inter-rater reliability and, where applicable, test-retest reliability to ensure consistency and stability of the instrument over time. Inter-rater reliability was assessed by having two independent experts review and score a sample of completed checklists to evaluate the degree of agreement between raters. A high percentage of agreement or a strong correlation coefficient (such as Cohen's kappa or intraclass correlation coefficient) will indicate good reliability of the checklist. In addition, the checklist was subjected to a pilot test where the same items will be used on two different occasions under similar conditions. The consistency of the results provided evidence of its stability over time. This approach ensures that the checklist yields dependable and reproducible data when applied in similar contexts.

3.8 Method of data collection

The data collection followed a systematic step by step process to ensure accuracy and reproducibility. The first step was to attain ethical clearance from UBTH and official permission from the radiology information system, the next step was to use the RIS to generate

a comprehensive list of all patients aged 65 and above who had a chest X-ray within the study period resulting in identification of 385 potential records. The generated list was screened against the inclusion and exclusion criteria. Records that did not meet the inclusion criteria were excluded. The researcher used the validated data extraction sheet to systematically retrieve data from each eligible patient's file. Extracted data were immediately entered into a password-encrypted electronic database (Ms excel). All personal identifiers were removed and replaced with a unique study code to ensure confidentiality. Random checks were performed on 10% of the extracted data to verify accuracy against the source documents.

3.9 Method of data analysis

Data were analyzed using Statistical Package for the Social Sciences (SPSS) version 29.0.

Descriptive statistics (frequencies, percentages, mean, and standard deviation) were used to summarize demographic characteristics, clinical diagnoses, and radiological findings.

Inferential statistics included: Chi-square test to determine the association between clinical and radiological diagnoses. Independent-samples t-test to compare the mean age between patients with corresponding and non-corresponding diagnoses. A p-value < 0.05 was considered statistically significant.

3.10 Ethical considerations

Ethical approval was obtained from the UBTH Health Research Ethics Committee. Informed consent will be sought from participating radiologists, who will be briefed on the purpose and voluntary nature of the study. Confidentiality was ensured by anonymizing patient records and keeping radiologists' responses strictly confidential. Data security was maintained throughout the research. Non-maleficence was upheld by ensuring that patient care is not affected

and that no participant is exposed to harm or risk.

CHAPTER FOUR

RESULTS AND DISCUSSION

4.1 Presentation

The majority of patients, 92 (46.9%), were within the 60-64 year age range, followed by 63 (32.1%) in the 65-69 year group. Fewer participants were aged 70-74 years (29; 14.8%), 75-79 years (9; 4.6%), and ≥ 80 years (3; 1.6%). This distribution shows that most elderly patients undergoing chest radiography were in the younger elderly category (60-69 years).

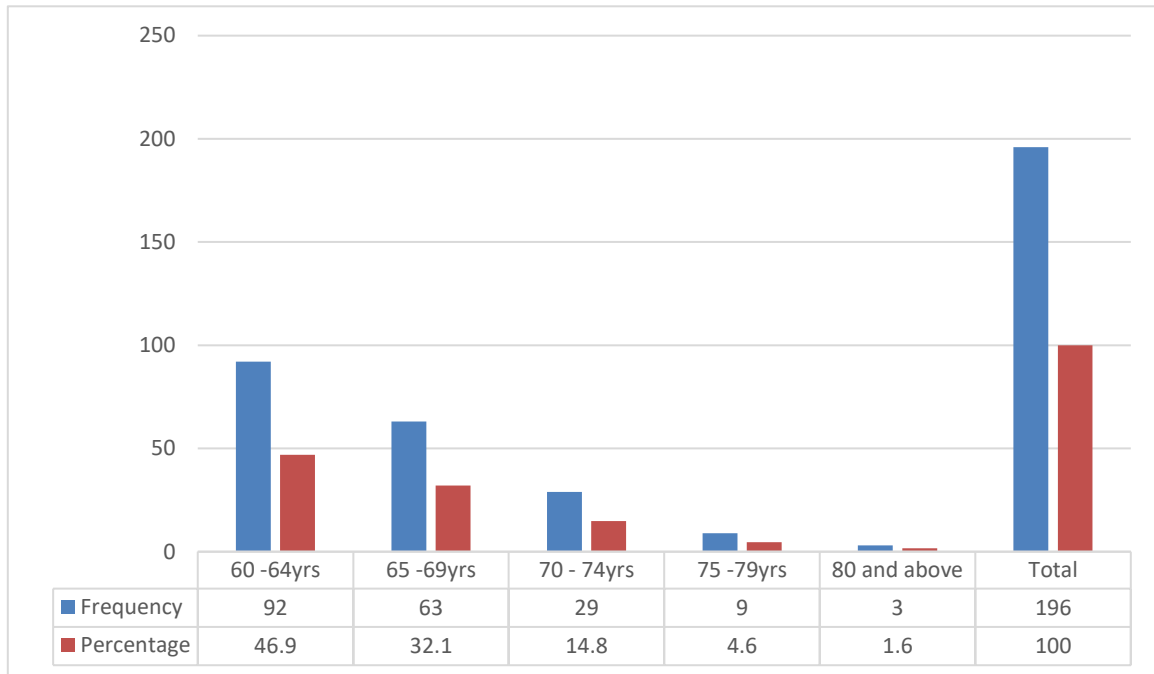


Figure 4.1: Age distribution of patients

A total of 204 chest X-ray cases were reviewed. Valid age data were available for 196 cases, with a mean age of 64.98 ± 5.20 years (n=196). Gender was recorded for 199 cases, consisting of 61 (30.7%) males and 138 (69.3%) females. This indicates that more female patients underwent chest radiography during the study period.

Table 4.1: Socio-demographic characteristics of patients

Variable	Result
Mean age \pm SD (years)	64.98 ± 5.20 (n=196)
Male	61 (30.7%)
Female	138 (69.3%)

Hypertension was the predominant clinical indication, accounting for 37 (18.1%) of all requests. This was followed by chest pain 12 (5.9%), hypertensive heart disease 12 (5.9%), heart failure 10 (4.9%), and chronic cough 6 (2.9%). Other indications included stroke 6 (2.9%), retroviral disease and R/O cough 5 (2.5%), asthma 4 (2.0%), left breast cancer 4 (2.0%), and bronchopneumonia 3 (1.5%).

Table 4.2: Clinical diagnoses for requesting chest X-ray

Clinical diagnosis	Frequency	Percentage (%)
Hypertension	37	18.1
Chest pain	12	5.9
Hypertensive heart disease	12	5.9
Heart failure	10	4.9
Chronic cough	6	2.9
Stroke	6	2.9
Retroviral disease and R/O cough	5	2.5
Asthma	4	2.0
Left breast cancer	4	2.0
Bronchopneumonia	3	1.5

Radiological reports revealed that normal chest radiographs were the most common finding 65 (31.9%), followed by hypertension related changes 27 (13.2%), hypertensive heart disease 22 (10.8%), cardiomegaly due to hypertension 11 (5.4%), and vascular changes 7 (3.4%). Other findings included bilateral pleural effusion 4 (2.0%), tuberculosis 4 (2.0%), heart failure 4 (2.0%), and pleural effusion 3 (1.5%).

Table 4.3: Radiological findings of the Chest X-ray among the patients

Radiological finding	Frequency	Percentage
Normal chest	65	31.9
Hypertension	27	13.2
Hypertensive heart disease	22	10.8
Cardiomegaly due to Hypertension	11	5.4
Vascular changes	7	3.4
Bilateral pleural effusion	4	2.0
Tuberculosis	4	2.0
Heart failure	4	2.0
Pleural effusion	3	1.5

Out of 198 valid cases, 130 (65.7%) showed correspondence between clinical diagnosis and radiological findings, while 68 (34.3%) did not correspond.

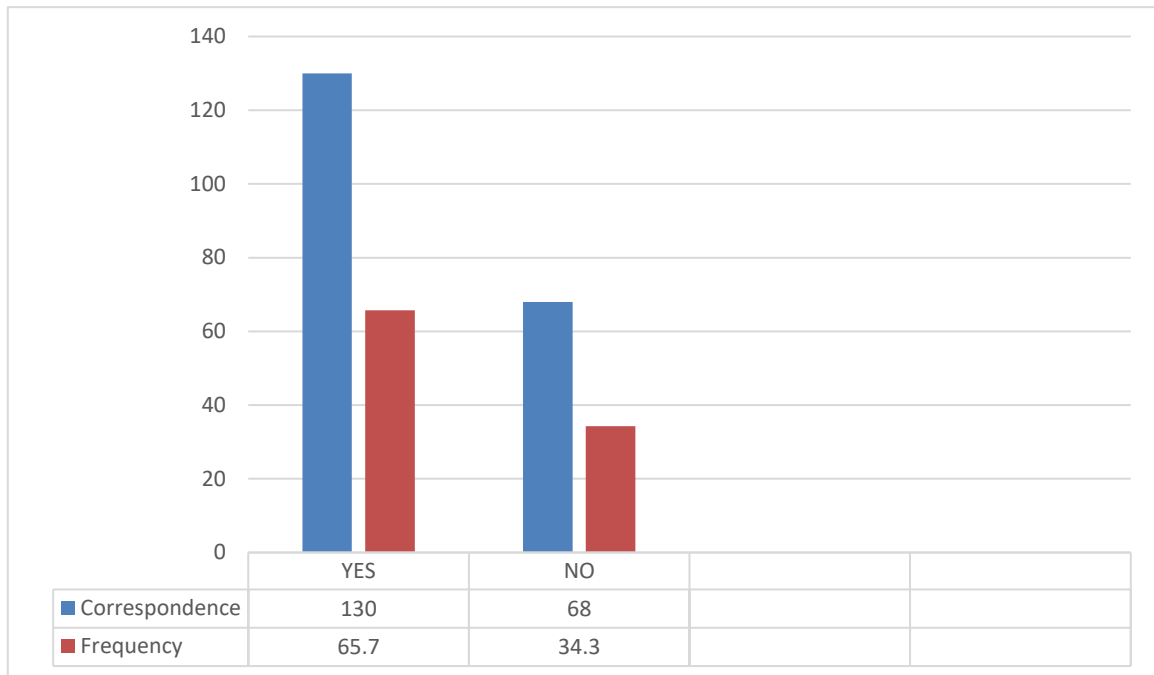


Figure 4.2: Correspondence between clinical and radiological diagnoses

The chi-square test indicated a statistically significant relationship between clinical and radiological diagnoses ($\chi^2 = 122.77$, $df = 83$, $p = 0.003$). Conditions like heart failure and pleural effusion showed perfect correspondence, while malignancies and non-specific chest pain had lower agreement with clinical diagnosis.

Table 4.4: Common clinical diagnosis by correspondence

Clinical diagnoses	No (n)	Yes (n)	p-value
Hypertension	14 (37.8%)	23 (62.2%)	p = 0.003
Chest pain	8 (72.7%)	3 (27.3%)	
Hypertensive heart disease	3 (25.0%)	9 (75.0%)	
Heart failure	0 (0.0%)	10 (100.0%)	
Chronic cough	1 (20%)	4 (80.0%)	
Stroke	5 (83.3%)	11 (6.7%)	
Asthma	1 (25%)	37 (5.0%)	
Left breast cancer	4 (100.0%)	0 (0.0%)	
Bronchopneumonia	0 (0.0%)	3 (100.0%)	
Pleural effusion	0 (0.0%)	3 (100.0%)	

An independent samples t-test showed a significant difference in mean age between those with corresponding and non-corresponding diagnoses ($t(192) = -2.20, p = 0.029$). The difference suggests higher diagnostic agreement among younger elderly (60–65 years) than older groups (>70 years), possibly due to reduced image clarity and age-related structural changes in the lungs and heart.

Table 4.5: Independent samples t-test for age by correspondence

Group	Frequency	Mean Age	SD
Correspond = Yes	126	64.31	4.921
Correspond = No	68	65.99	5.301

4.2: Discussion

This study analyzed 204 elderly chest X-ray cases, patient age was only available for 196 (96.1%). The mean age was 64.98 ± 5.20 years, this shows that most of the patients were within the younger elderly group. The majority, 92 (46.9%), were aged 60-64 years, followed by 63 (32.1%) in the 65-69 year category, while only 3 (1.6%) were aged 80 years and above.

This distribution suggests that elderly individuals in their early sixties are more likely to present for chest radiography, possibly due to the onset of chronic cardiovascular or respiratory diseases at that stage of life. This might be because of weaker immune system, preexisting medical conditions that they have been managing for a long time or even mismanaged conditions. It is common in our locality to see elderly people try to cure health problems by taking herbal concoctions and remedies.

About 138 (69.3%) were females and 61 (30.7%) were males,. This agrees with Ticinesi *et al.* (2016), who reported higher radiographic use among elderly women due to better health seeking behavior and longer life expectancy. Conversely, Abacha *et al.* (2020) in Kano found a male predominance (56%), attributing it to regional cultural factors and occupational exposure. In Edo state and Benin city, women are quick to visit hospitals than men, there could be a general believe among men that whatever health problems they have will go away naturally after a nice meal, traditional herbs and good alcohol or gin.

Clinicians' provisional diagnoses among the elderly patients

The predominant clinical indication for chest radiography was hypertension 37 (18.1%), followed by chest pain 12 (5.9%), hypertensive heart disease 12 (5.9%), and heart failure 10 (4.9%). Other notable diagnoses included stroke (6; 2.9%), chronic cough (6; 2.9%), retroviral

disease and R/O cough (5; 2.5%), asthma (4; 2.0%), left breast cancer (4; 2.0%), and bronchopneumonia (3; 1.5%). This shows that cardiovascular disorders made up the leading reasons for chest X-ray requests among the elderly population. Most of the elderly people in Benin go about their daily activities without having an idea of their blood pressure level. Despite the easy accessibility to check it for free at most pharmacies and drug outlets.

These findings align with Baratella *et al.* (2023), who observed that hypertension and related cardiopulmonary complications were the most common indications for chest imaging among older adults. Similarly, Olatunji *et al.* (2021) noted that heart related conditions accounted for nearly 60% of chest X-rays among elderly Nigerian patients. However, this contrasts with Adekanmi *et al.* (2018), who reported higher frequencies of infectious diseases such as pneumonia and tuberculosis. This difference could be attributed to variations in the patient population, as tertiary facilities like UBTH receive more chronic and referred cases, whereas secondary centres handle more acute infections.

Radiological findings among elderly patients

Radiological interpretation revealed that normal chest radiographs 65 (31.9%) were the most frequent findings, followed by hypertensive changes 27 (13.2%), hypertensive heart disease 22 (10.8%), and cardiomegaly due to hypertension 11 (5.4%). Other less common findings included vascular changes 7 (3.4%), pleural effusion (3; 1.5%), bilateral pleural effusion 4 (2.0%), tuberculosis 4 (2.0%), and heart failure 4 (2.0%). The high proportion of normal radiographs despite strong clinical suspicion indicates that chest X-rays remain a valuable exclusion tool for cardiopulmonary pathology. This observation is consistent with Eze *et al.* (2021), who reported that 30% of elderly hypertensive patients had normal radiographic

findings despite symptoms. The current result slightly exceeds their value, possibly due to improved patient screening and earlier medical intervention. However, Ticinesi *et al.* (2016) emphasized that functional cardiac disorders may present without radiographic changes, explaining the discrepancy between clinical suspicions and imaging findings.

Correspondence between clinical and radiological diagnoses

Out of 198 valid cases, 130 (65.7%) showed correspondence between clinical and radiological diagnoses, while 68 (34.3%) did not. The chi-square test indicated a statistically significant association between clinical and radiological findings ($\chi^2 = 122.77$, $df = 83$, $p = 0.003$).

This moderate to high diagnostic correspondence suggests a generally good level of accuracy in clinicians' preliminary impressions, showing improved communication and understanding of imaging findings. The present finding (65.7%) is comparable to Abacha *et al.* (2020), who recorded a 67% clinical radiological agreement in Northern Nigeria, and higher than Ojo *et al.* (2019), who reported 59% correspondence. The slightly higher rate in the present study may be due to better digital imaging quality, routine image archiving systems, and more consistent interdepartmental communication. However, the remaining 68 (34.3%) non-correspondence could be linked to non-specific symptoms, incomplete clinical history, or radiographic limitations in detecting subtle pathology. Baratella *et al.* (2023) mentioned similar limitations, emphasizing that chest radiographs may fail to detect small lesions, early interstitial disease, or cardiac functional abnormalities, which might be better visualized through CT or echocardiography.

Comparison of clinical and radiological diagnostic agreement

Among selected clinical diagnoses, heart failure 10 (100%), bronchopneumonia 3 (100%), and pleural effusion 3 (100%) had the highest correspondence rates. In contrast, chest pain (8; 72.7%), stroke (5; 83.3%), and left breast cancer (4; 100%) showed low or zero correspondence. The perfect agreement in conditions like heart failure and pleural effusion shows the reliability of chest radiographs in identifying fluid overload and pulmonary congestion. Conversely, poor agreement in non-pulmonary conditions (e.g., breast cancer and stroke) occurs because their clinical manifestations are extra-thoracic and not directly visible on chest X-rays. Our findings agrees with Abacha *et al.* (2020), who observed that radiological confirmation was highest for cardiopulmonary diseases and lowest for systemic conditions. However, the higher sensitivity in the present study may be due to enhanced reporting consistency and image quality. In UBTH, the reporting process is very thorough, residents try report the images and afterwards a review is done again with the attending consultants before the reports are given out.

Relationship between age and correspondence

An independent-samples t-test revealed a statistically significant difference in mean age between patients with corresponding (64.31 ± 4.92 years, $n=126$; 64.9%) and non-corresponding (65.99 ± 5.30 years, $n=68$; 35.1%) diagnoses ($t(192) = -2.20$, $p = 0.029$).

This shows that younger elderly patients (60-65 years) had slightly higher diagnostic agreement than those above 70 years. The result aligns with Baratella *et al.* (2023), who noted reduced correspondence in advanced-age patients due to age-related anatomical alterations, respiratory motion artifacts, and overlapping chronic pathologies that obscure radiological clarity.

The finding also supports Ticinesi *et al.* (2016), who emphasized that physiological changes in lung elasticity and cardiovascular structure with age could affect image interpretation.

Relationship between gender and age

The t-test comparing mean ages by gender showed no significant difference ($t(193) = 0.072$, $p = 0.942$). Males had a mean age of 65.05 ± 5.24 years ($n=61$; 30.7%), while females had 64.99 ± 5.20 years ($n=138$; 69.3%). This finding aligns with Eze *et al.* (2021) and Abacha *et al.* (2020), who both reported similar age distributions across genders. This means that both males and females present for radiographic evaluation at similar stages of aging, indicating no gender bias in disease onset or health seeking behavior among the elderly in this study population.

CHAPTER FIVE

5.1 Conclusion

The study concludes that there is a moderate to high level of diagnostic correspondence (65.7%) between clinicians' provisional diagnoses and radiological findings in chest X-rays among elderly patients at UBTH. Hypertension and other cardiovascular disorders were the predominant indications and radiological findings. The significant association between clinical and imaging outcomes shows the importance of chest radiography in confirming or excluding suspected thoracic pathology. However, the existence of non-correspondence in 68 (34.3%) of cases shows the limitations of plain radiography in detecting subtle or extra-thoracic diseases. The higher diagnostic agreement among the younger elderly group suggests that image quality and interpretive accuracy may reduce with advancing age due to physiological changes and comorbidities.

5.2 Recommendations

1. There should be regular review meetings should be conducted to improve communication between referring clinicians and radiology staff, especially in complex cases.
2. The use of standardized reporting templates can minimize confusion and improve the clarity of radiological interpretations for clinical decision-making.
3. Clinicians should ensure detailed and specific clinical information on X-ray request forms to guide radiographic interpretation effectively.
4. For patients with non-specific or inconclusive chest X-ray findings, follow-up imaging using CT or MRI should be performed to improve diagnostic accuracy.

5.3 Limitations

1. The study used existing radiology records, which may contain incomplete or inconsistent documentation.
2. The study was conducted only at UBTH, the findings may not be generalizable to all healthcare settings in Nigeria.
3. The absence of follow-up imaging modalities such as CT or ultrasound limited the ability to validate radiological interpretations.
4. Incomplete records and missing variables led to the exclusion of some cases, potentially influencing representativeness.
5. Grouping of similar radiological patterns like hypertensive changes and cardiomegaly) might have slightly reduced diagnostic specificity.

5.4 Suggestions for further studies

1. Prospective studies involving different healthcare centres to compare correspondence rates and validate findings across diverse populations should be conducted.
2. There should be inclusion of confirmatory modalities such as CT or echocardiography to determine the sensitivity and specificity of plain chest radiography in elderly patients.
3. Evaluate the effectiveness of AI assisted interpretation tools in improving diagnostic correspondence between clinicians and radiologists.
4. Further studies should investigate how diagnostic correspondence or discordance influences patient management outcomes and treatment success.
5. Future studies should assess the impact of targeted training programs on clinicians' accuracy in diagnostic reasoning and radiology request writing.

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APPENDIX I: DATA EXTRACTION FORM

S/N	DATA ITEM	RESPONSE
1	PATIENT ID	
2	AGE	
3	GENDER	
4	CLINICAL DIAGNOSIS	
5	FINDINGS FROM CHEST X-RAY REPORTS	
6	CORRESPONDENCE BETWEEN CLINICAL AND RADIOLOGICAL DIAGNOSES	

APPENDIX II: ETHICAL APPROVAL LETTER

HEALTH RESEARCH ETHICS COMMITTEE (HREC)
UNIVERSITY OF BENIN TEACHING HOSPITAL
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Committee email: ubthresearchethics@gmail.com
Registration Number: NHREC-UBTH-HREC/24/12/2022B

PROTOCOL NUMBER: ADM/E 22/A/VOL.VII/2025/202

PROPOSAL TITLE: "ASSESSING THE EFFECTIVENESS OF X-RAY REPORT IN DIAGNOSING CHEST RELATED DISEASES IN ELDERLY PATIENTS"

PRINCIPAL INVESTIGATOR(S): OBAIZAMOMWAN OSAMAGBE

DEPARTMENT/INSTITUTION: DEPARTMENT OF RADIOGRAPHY, SCHOOL OF BASIC MEDICAL SCIENCES, UNIVERSITY OF BENIN, BENIN CITY, EDO STATE

DATE CONSIDERED: AUGUST 20TH, 2025

DECISION OF THE COMMITTEE: APPROVED

THIS APPROVAL DATES 20/8/2025 TO 19/8/2026. IF THERE IS DELAY IN STARTING THE RESEARCH, PLEASE INFORM THE HREC SO THAT THE DATES OF APPROVAL CAN BE ADJUSTED ACCORDINGLY

REMARK:

CHAIRMAN: PROF. (MRS) A.N. OFILI

SUPERVISOR (S): MRS OKEH E.O.

DECLARATION BY INVESTIGATOR(S):
PROTOCOL NUMBER (please quote in all enquiries)
Note that no participant accrual or activity related to this research may be conducted outside of these dates. All informed consent forms used in this study must carry the HREC assigned number and duration of HREC approval of the study. In multiyear research, endeavor to submit your annual re-port to the HREC early in order to obtain renewal of your approval and avoid disruption of your research. No changes are permitted in the research without prior approval by the HREC except in circumstances outlined in the Code. The HREC reserves the right to conduct compliance visit your research site without previous notification

Signature & Date.....

