A Retrospective Comparative Analysis of Chest Radiograph Findings Among Patients in a Tertiary Hospital in Rivers State.

Abstract:

Background: Chest radiograph is an imaging modality that uses ionizing radiation used for the evaluation of the thorax and its content. It is readily available, accessible, cheap and greatly employed in the health sector for various reasons.

Objective: Chest radiographs serve as an indispensable diagnostic instrument when it comes to evaluating cardiac and respiratory ailments. The purpose of this study is to examine and compare chest radiograph findings in a tertiary institution, over a two-year periodretrospectively.

Methods: A retrospective analysis of 6,223 chest radiographs was performed at the University of Port Harcourt Teaching Hospital. From patient records, demographic and clinical data were extracted and analysed with SPSS version 21.0, setting the level of statistical significance at $p<0.05$.

Result: The mean age of the study population was 38.14±20.25 years, and the female gender comprised the majority (54.93%). Cardiomegaly was the most frequently observed indication (20.48%), whereas pleural effusion/collection was the least frequent (4.04%). A statistically significant disparity was identified among all clinical parameters across years: cardiomegaly and aortic unfolding exhibited a higher prevalence in 2019, whereas atheromatous plaques demonstrated a greater prevalence in 2020.

Conclusion: The prevalence of cardiomegaly highlights the possible necessity for routine chest radiographs among the ageing adult population in Nigeria. This research emphasises the significance of ongoing radiographic monitoring for the early detection of cardiothoracic conditions and offers valuable epidemiological insights.

Keywords: Comparative, Chest radiograph, Cardiomegaly, Retrospective analysis, Nigeria.

Introduction

Chest radiography remains one of the most performed and essential imaging modalities in clinical practice, particularly for the evaluation of the thoracic cavity, including the lungs and heart [1]. In addition to its critical role in the diagnosis of respiratory and cardiac ailments, it also performs pre-surgical preparations, emergency evaluations, and general health assessments. In addition, the considerable diagnostic information that chest radiographs provide, as well as their accessibility and cost-effectiveness, have contributed to their extensive utilisation[2].Chest radiography is commonly utilised in tertiary hospitals across Nigeria to evaluate a variety of ailments, including tuberculosis, pneumonia, heart failure, and lung cancer [3,4]. Notwithstanding its widespread application, local data regarding the patterns and distributions of findings derived from chest radiographs are scarce. It is imperative to comprehend these patterns to enhance diagnoses, the administration of patients, and the allocation of resources within radiology departments.

The variability in chest radiograph findings with respect to demographic factors, including age and gender, has been underscored in numerous studies. An investigation carried out in the northwestern region of Nigeria documented an elevated incidence of thoracic lesions in males[5]. Similarly, a study conducted in South Africa identified cardiomegaly as a prevalent occurrence, specifically among the elderly population [6]. The discrepancies highlight the necessity for research that is specific to each region,thuscustomizingtheclinical practices to address the health needs of local populations.By documenting and comparing chest radiograph findings over a two-year period at a tertiary hospital in Rivers State, Nigeria, this retrospective study seeks to fill this void. Through the examination of data obtained from a considerable sample size of 6223 patients, the objective of this study is to furnish an all-encompassing summary of the prevailing chest radiographic findings along with their correlation with demographic variables. In addition to contributing to the international body of knowledge, the results will provide valuable insights that may be applied locally to improve clinical practice and patient outcomes.

Methodology:

The present retrospective investigation was carried out at the University of Port Harcourt Teaching Hospital (UPTH), located in Rivers State, Nigeria, specifically at the Radiology Department. The duration of the study was between January 1, 2019, and December 31, 2020.

Data Collection:

The database of the radiology department was searched for information on chest radiograph findings, clinical indications, and patient demographics. There was a total of 6,223 patient records recovered. The inclusion criteria included all patients who had undergone standard chest radiographs throughout the duration of the study period.

Analysis of the Data: The data were input into a spreadsheet after being methodically organised. The statistical analysis was conducted utilising version 21.0 of SPSS. To summarise the demographic characteristics and radiographic findings, descriptive statistics were employed. Determination of the relationship between clinical parameters and the year of radiograph, was done using chi-square test with statistical significance establishedatp<0.05. The variables that were analysed in this study comprised age, gender, and specific chest radiograph findings, namely pleural effusion/collection, cardiomegaly, aortic unfolding, atheromatous plaques, and lung lesions.

Quality Control:

Data validation tests were conducted to ascertain the presence of accuracy and consistency. Qualified radiologists performed the radiologic interpretations of the chest radiographs in accordance with standardised diagnostic criteria.

RESULTS:

Table 1: Socio-Demographic Characteristics

Characteristics	Frequency (n=6223)	Percentage (%)
Year		
2019	2779	44.66
2020	3444	55.34
Gender (n=6222)		
Male	2804	45.07
Female	3418	54.93
Age (n=6198)		
≤1 year	260	4.19
2-9	347	5.60
10-19	498	8.03
20-29	901	14.54
30-39	1332	21.49
40-49	1106	17.84
50-59	708	11.42
60 +	1046	16.88
Mean±SD	***38.14 ± 20.25 years***	

Table1 indicates that the 30-39 age category has the highest frequency, accounting for 1332 radiographs (21.49%). The 40-49 age group follows with 1106 radiographs 17.84%) while those over 60 years make up 1046 of them (16.88%). The 20-29 age group has 901 radiographs (14.54%).Thelowest representation is in the age group of one year, with 260 radiographs (4.19%). Additionally, more patient underwent chest radiographs in 2020, and there was a higher overall frequency of the same among females.

Table 2: Clinical Parameters

Characteristics	Frequency (n=6223)	Percentage (%)
Cardiomegaly (n=6220)		
Yes	1274	20.48
No	4946	79.52
Aortic Unfold (n=6223)		
Yes	1268	20.38
No	4955	79.62
Atheromatous plaque (n=6220)		
Yes	290	4.66
No	5930	95.34
Lung Lesion (n=6217)		
Yes	982	15.80
No	5235	84.20
Pleural Collection (n=6218)		
Yes	251	4.04
No	5967	95.95

Table 2 shows the clinical parameters in order of descending frequency.

Table 3: Association between Clinical Parameters and year

Clinical parameters	**Year**		***Chi-Square*** (χ^2)	***(p-value)***
	2019	**2020**		
	n=2779	**n=3444**		
	Freq (%)	**Freq (%)**		
Cardiomegaly				
Yes	689 (24.8)	585 (17.0)	57.51	*0.001**
No	2089 (75.2)	2857 (83.0)		
Aortic Unfold				
Yes	677 (24.4)	591 (17.2)	49.16	*0.001**
No	2102 (75.6)	2853 (82.8)		
Atheromatous plaque				
Yes	105 (3.8)	185 (5.4)	*8.83*	*0.003**
No	2674 (96.2)	3256 (94.6)		
Lung Lesion				
Yes	509 (18.3)	473 (13.8)	24.0	*0.001**
No	2270 (81.7)	2965 (86.2)		
Pleural Collection				
Yes	153 (5.5)	98 (2.8)	*28.*10	*0.001**
No	2624 (94.5)	3343 (97.2)		

**Statistically significant (p<0.05)*

Table 3indicates thatall parameters compared within the period of study are statistically significant.

Discussion

The primary observations consist of cardiomegaly being the most prevalent, followed by notable instances of pulmonary lesions, aortic unfolding, atheromatous plaques, and pleural effusion/collection.Cardiomegaly emerged as the most prevalent finding (20.48%), although not a disease itself but rather a sign of an underlying heart condition[5]. It mayindicate in this setting, cardiovascular diseases, such as hypertension and heart failure which are quite prevalent in the study population. This finding aligns with regional health reports that have documented an increase in the prevalence of hypertensive heart disease in the sub-Saharan African region [3]. The increased incidence of cardiomegaly in 2019 relative to 2020 could indicate that the condition was either underreported or that more effective management strategies were implemented in 2020.However other causes of cardiomegaly includecoronary heart disease,cardiomyopathies, and chronic anaemia to mention a few.[6]

Lung lesions constituted the second most frequent discovery (15.80%), which can indicate chronic infections, malignancies, or other severe respiratory conditionshighlighting substantial respiratory health concerns that may be associated with the prevalent infections in Nigeria, such as tuberculosis and pneumonia [7].

Aortic unfolding constituted 20.38% of the cases, while atheromatous lesions were observed in 4.66% of the cases. Aortic unfolding is predominantly associated with ageing and does not necessarily indicate pathological conditions; conversely, atheromatous plaques signify systemic atherosclerosis and increase the risk of cardiovascular disease, thereby emphasising the prevalence of cardiovascular ailments among the general populace [8,9]. The finding of pleural effusion or collection occurred least frequently (4.04%), which aligns with its overall lesser incidence in comparison to other conditions affecting the thorax. Nevertheless, pleural effusion merits considerable consideration owing to its correlation with severe underlying conditions, including advanced infections and malignancies [10].Consideringthe elevated incidence of cardiomegaly and lung lesions, improved protocols for the detection and treatment of cardiovascular and respiratory ailments are required. Especially for at-risk populations (e.g., elderly patients, those with hypertension), routine chest radiographs may enable earlier detection and intervention. In addition, these results indicate that public health initiatives, such as tuberculosis control programmes and enhanced hypertension management, are necessary to address the underlying causes.Furthermore, the gender discrepancy that was noted, as a greater proportion of females underwent chest radiographs, may indicate variations in the propensity to seek medical attention or the prevalence of specific ailments.

Potential outcomes could be enhanced by customising public health messages and interventions to account for these variations. Radiographic findings also exhibited a temporal trend, with substantial year-to-year variations, according to our findings. An example of this is the significant decline in the occurrence of cardiomegaly and aortic unfolding between the years 2019 and 2020. This observation may suggest enhanced public health initiatives or modifications in the provision and accessibility of healthcare, specifically in response to the COVID-19 pandemic that disrupted the global distribution of healthcare resources and the dynamics of patient care [11].

Although this research provides valuable insights, its limitations must be duly recognised. Due to the retrospective nature of the data collection and retrieval processes, potential biases may arise. Moreover, it should be noted that the research is limited to a solitary tertiary institution, thus potentially departing from the general population. It is advisable to conduct prospective, multi-centre studies employing more rigorous designs to validate and further develop these findings. In addition, although there was a statistically significant correlation between years and clinical parameters, the underlying causes of these variations were not thoroughly investigated. Further investigation is warranted to clarify the underlying causes of these patterns, considering factors such as demographic changes, public health endeavours, and the ramifications of globalisation.

Conclusion:

This study highlights the high prevalence of cardiomegaly and lung lesions in chest radiographs from a tertiary hospital in Rivers State, Nigeria, emphasizing the urgent need for routine screenings, particularly among the aging population and high-risk groups. The results highlight substantial public health issues pertaining to cardiovascular and respiratory disorders. It is important to incorporate routine radiographic surveillance and focused public health campaigns, including improved management of hypertension and control programmes for tuberculosis. Future research should explore broader epidemiological patterns and the integration of advanced imaging technologies to improve early detection and intervention, thereby enhancing patient care and health outcomes.

Limitations of study: Radiographs are taken with ionizing radiation machines and so certain safety measures should be employed. Also, it is a retrospective study.

Suggestions for Further Investigation:

Further investigations should strive to build upon these discoveries by conducting prospective, multi-center studies to authenticate results and offer a more comprehensive evaluation of the epidemiological patterns. An examination of the socio-economic, environmental, and genetic elements that contribute to these results may provide more profound understandings, facilitating the development of more precise and efficacious public health interventions. Furthermore, an investigation into the potential incorporation of sophisticated imaging technologies, including computed tomography (CT) scans and artificial intelligence (AI) diagnostic instruments, may augment the precision and effectiveness of cardiothoracic disease identification and treatment.

Policy Recommendations:

It is advisable that policymakers contemplate the integration of routine chest radiograph screenings into standard health examinations for populations at high risk. Furthermore, it is important to enhance the capacity of public health infrastructure in order to facilitate greater accessibility to diagnostic services and guarantee the provision of treatment alternatives for identified ailments. The evidence of gender disparities also calls for the implementation of focused strategies to promote equal access to and utilization of healthcare.

Ethical Approval

The investigation was granted ethical approval by the Ethics Committee of the hospital

Disclaimer (Artificial intelligence)

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1.option 1.

2.

3.

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