



Retrospective Study on Chest Assessment using Plain Radiographs

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ABSTRACT

BACKGROUND AND OBJECTIVE: In Nigeria, chest injury constitutes about 40% of the workload of most thoracic surgery units and accounts for about 20% of deaths in thoracic surgery units. The present study was conducted to observe the patterns of plain radiographic finding amongst chest radiographs in Warri Central Hospital, Delta state.

METHODS: In this cross-sectional retrospective study, two hundred and ninety six (296) subjects (males = 147, females = 149) took part in the study. The plain radiographs (x-rays) of patients with thoracic injuries and diseases was traced through the accident and emergency ward and the cardio-thoracic unit. Information on the biosocial data, etiology, clinical symptoms and sign, and diagnosis was also obtained and documented. Ethical clearance was sought for from the

Research and Ethics Committee in Department of Human Anatomy and Cell Biology, Faculty of Basic Medical Sciences, College of Health Sciences, Delta State University and data were analysed with simple descriptive statistics and presented in frequency charts and tables via the Statistical Package for Social Sciences (SPSS version 22).

FINDINGS: The pathology that was observed the most was hypertension (55.1%) while the least observed were cardiomyopathy, congestive hypertensive cardiac, diasphyseal clavicular malunited fracture, bronchopneumonea, pleuritis, congenital diaphragmatic hernaia, pericardial effusion, and combination of two or more (0.3% each).

CONCLUSION: The study suggests that plain chest radiograph can be used where there are no other imaging modalities with higher sensitivity and specificity for picking slight pathological signs of hypertension and where a patient cannot afford the use of other modalities such as echocardiogram, computed tomography and magnetic resonance imaging.

KEY WORDS: *Plain Radiographs, Chest Radiographs, Warri, Delta State*

Introduction

Radiography is the imaging of body structures, or parts of the body, using X-rays. X-rays are a form of radiation (X-radiation) similar to visible light, radio waves and microwaves. X-radiation is special because it has a very high energy level that allows the X-ray beam to penetrate through the body and create an image or picture. Plain X-rays are the simplest medical images created through X-radiation.

The chest X-ray remains the starting point in the imaging armamentarium. Different views known as projections can be adopted in producing a chest radiograph by changing the relative orientation of the body and the direction of the X-ray beam (1). The projections can be classified into routine projections and additional projections. The routine projections are; posteroanterior projection, Antero-posterior projection, and lateral projection while the

additional projections are oblique projection, right or left lateral decubitus projections, apical projection and lordotic projection and the expiratory view (1). When PA projection is not possible then an anterior-posterior projection will be taken. Anterior-posterior (AP) imaging is used when the patient is non-ambulatory but usually results in the reduction of image quality, including magnification of heart size and poorer detail of lung structure. However, artefactual opacities of the pathology could be present and produced by the AP technique (2). Nonetheless, in paediatric chest imaging, the anterior posterior projection is frequently employed to reduce stress in positioning and ensures the patient comfort (2).

However, there is widespread use of chest radiography in emergency diagnosis and treatment because it is fast and easy, the examination requires little or no special preparation, and it utilizes very little dose of ionizing radiation to create images when compared to CT or radionuclide imaging (3). It was noted that common findings of chest radiographs present several unique challenges and nuances stemming from the congenital variants and pathologic processes specific to the population (4).

Any form of physical injury to the chest including the heart and lungs is considered to be chest injury. Chest radiography is very important because it will identify most significant chest wall injuries. In Nigeria, chest injury constitutes about 40% of the workload of most thoracic surgery units and accounts for about 20% of deaths in thoracic surgery units (5); both types of chest trauma namely blunt and penetrating chest trauma can result in mortality. Although in most series, blunt chest trauma occur more frequently than penetrating chest trauma in the ratio of 70:30, analyses do not show deaths from the two types of chest trauma to be proportionally distributed (6). This study was conducted to observe the patterns of plain radiographic finding amongst chest radiographs in Warri Central Hospital, Delta state.

Methods

This cross-sectional retrospective study was approved by the Research and Ethics Committee in Department of Human Anatomy and Cell Biology, Faculty of Basic Medical Sciences, College of Health Sciences, Delta State University, Abraka prior to the commencement of this research.

Sample and Sampling Technique: The simple random sampling technique was used for selection while the sample size was based on the number of plain radiographs (x-rays) that was available as at the time of the study.

Data Collection: The plain radiographs (x-rays) of patients with thoracic injuries and diseases was traced through the accident and emergency ward and the cardio-thoracic unit. Information on the biosocial data, etiology, clinical symptoms and sign, and diagnosis was also extracted and recorded.

Inclusion Criteria: All patients with chest trauma within the study period whose data (biodata) and radiologist report were available were included in the study.

Exclusion Criteria: Any patient though with chest trauma within this study period but whose bio-data or the radiologist report was not available or was either incomplete or lost from the record were excluded from the study.

Data Analysis: The data were analyzed with simple descriptive statistics and presented in frequency charts and tables via the Statistical Package for Social Sciences (SPSS version 22).

Results

A total of two hundred and ninety six (296) subjects (males = 147, females = 149) took part in the study and were of various tribes including, Urhobo, Igbo, Ijaw, Isoko, Hausa, Itsekiri, Yoruba, Esan, Efik and Tiv as shown in figure 1 & 2. The tribe with the highest visits was Urhobo (33.4%) while the least visit was among Tiv (2%).

The pathology that was observed the most was hypertension (55.1%) while the least observed were cardiomyopathy, congestive hypertensive cardiac, diaphyseal clavicular

malunited fracture, bronchopneumonea, pleuritis, congenial diaphragmatic hernaia, pericardial effusion, and combination of two or more (0.3% each) as shown in see figure 3.

From the current study, the most prevalent pathology was hypertension among the males (27%) and females (28%) while the least were bilateral upper lobe pneumonitis, pulmonary tuberculosis, congenial diaphragmatic hernaia, hypertensive cardaic changes and bronchopneumonea among the males and cardiomyopathy, pleuritis, congestive hypertensive cardaic, pericardial effusion and diasphyseal clavicular malunited fracture among the females as shown in table 1.

From the current study, among the 1-10yrs age group, the only pathologies observed were pulmonary koch's disease (0.3%) and lower respiratory tract infection (0.7%). Hypertension was most prevalent among the 41-50yrs age group (15.9%) while it was least among the 81-90yrs age group (0.7%). Pulmonary koch's disease was most prevalent among the 61-70yrs age group (5.7%) while it was least among the 1-10yrs age group (0.3%). Also, bilateral upper lobe pneumonitis was most prevalent among the 21-30yrs age group (0.7%) while it was least among the 41-50yrs age group (0.3%). In addition, cardaic failure was only observed among the 41-50yrs age group (1.4%) and the 61-70yrs age group (0.7%) while it was absent in the other age groups (See table 2).

Among all the tribes in the present study, hypertension was the most prevalent chest pathology observed while the least were: bilateral upper lobe pneumonitis, cardiomyopathy, pleuritis, bronchopneumonea, and pericardial effusion among the Urhobo; congenial diaphragmatic hernaia, congestive hypertensive cardaic and diasphyseal clavicular malunited fracture among the Igbo; pulmonary infection process and post primary pulmonary tuberculosis among the Ijaw; cardaic failure and pulmonary infection process among the Isoko; hypertension among the Hausa, pulmonary infection process and hypertensive cardaic changes among the

Itsekiri; pulmonary infection process among the Yoruba; pulmonary koch's disease among the Esan; and pulmonary koch's disease among the Tiv as presented in table 3.

The most prevalent pathology was hypertension (18.2%) in all the study years while the least were post primary pulmonary tuberculosis (0.3%), hypertensive cardaic changes (0.3%), pericardial effusion (0.3%) and diasphyseal clavicular malunited fracture (0.3%) for 2019; bilateral upper lobe pneumonitis (0.3%), cardiomyopathy (0.3), hypertensive cardaic changes (0.3%) and bronchopneumonea (0.3%) for 2018; lower respiratory tract infection (0.3%) for 2017; and pulmonary koch's disease (0.3%) and pulmonary infection process (0.3%) for 2016 as shown in table 4.

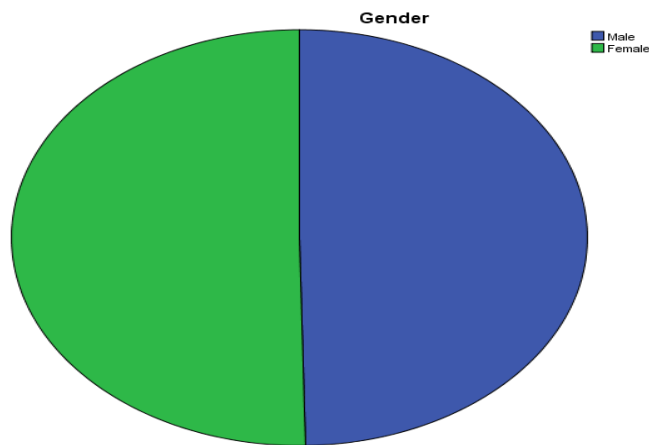


Figure 1: Demographic data of participants who took part in the study

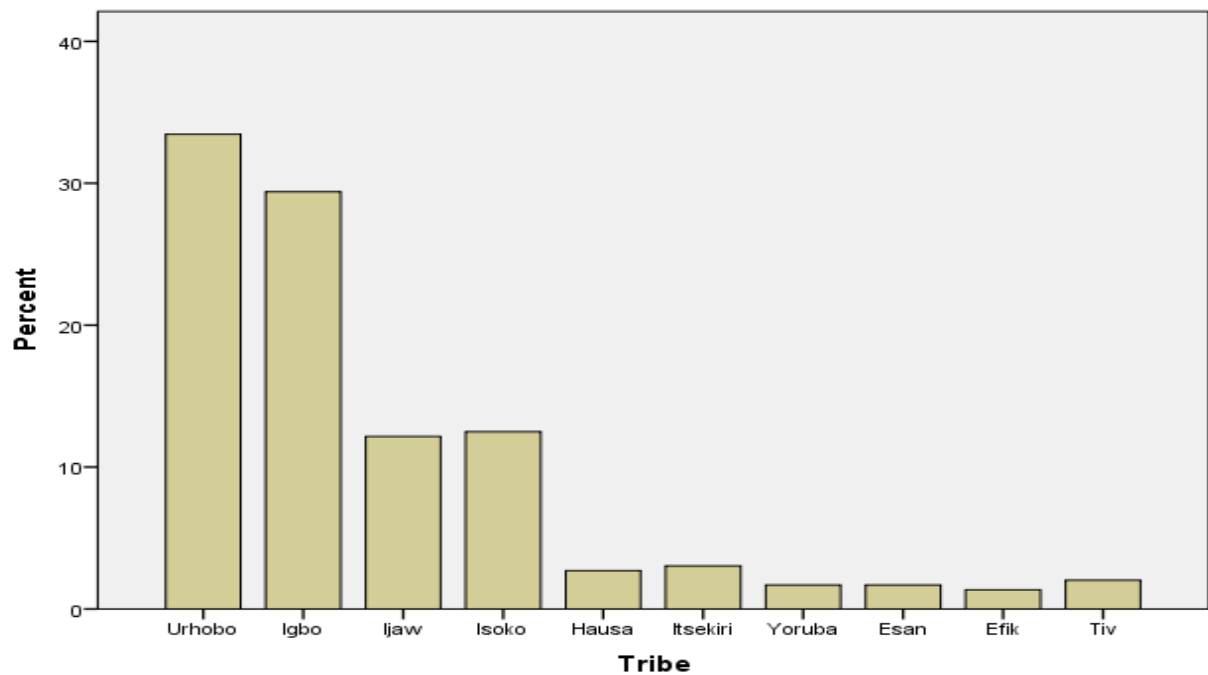


Figure 2: Number of subjects per tribe

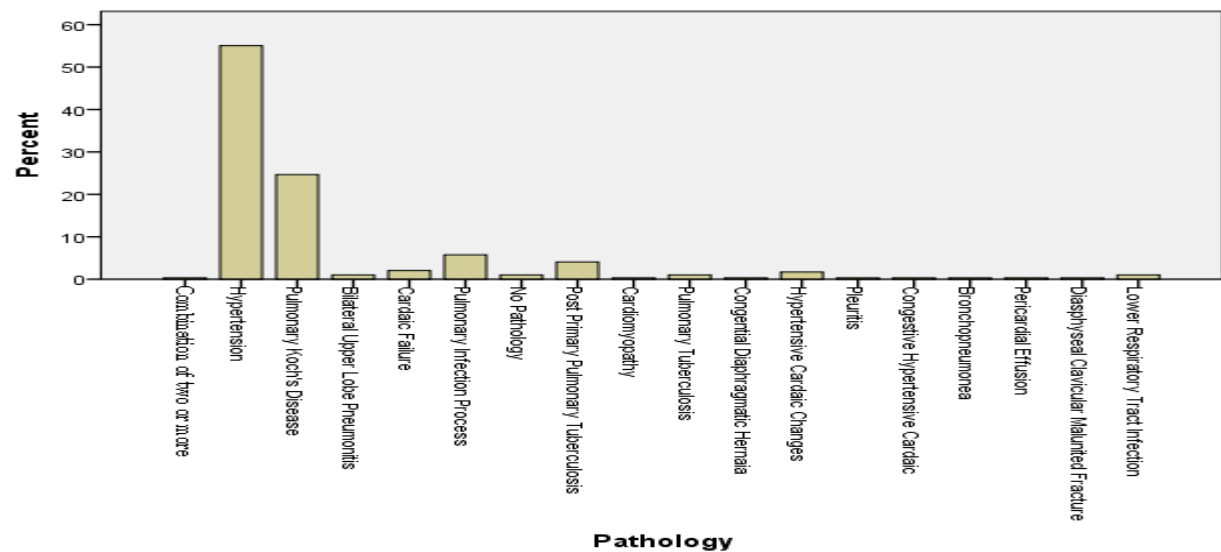


Figure 3: Observed pathologies

Table 1: Prevalence of Chest Pathologies (Gender)

			Gender		
			Male	Female	Total
Pathology	Hypertension	Count	80	83	163
		% of Total	27.0%	28.0%	55.1%
	Pulmonary Koch's Disease	Count	37	36	73
		% of Total	12.5%	12.2%	24.7%
	Bilateral Upper Lobe Pneumonitis	Count	1	2	3
		% of Total	.3%	.7%	1.0%
	Cardiac Failure	Count	2	4	6
		% of Total	.7%	1.4%	2.0%
	Pulmonary Infection Process	Count	11	6	17
		% of Total	3.7%	2.0%	5.7%
	No Pathology	Count	1	2	3
		% of Total	.3%	.7%	1.0%
Post Primary Pulmonary Tuberculosis		Count	7	5	12
		% of Total	2.4%	1.7%	4.1%
	Cardiomyopathy	Count	0	1	1
		% of Total	0.0%	.3%	.3%
	Pulmonary Tuberculosis	Count	1	2	3
		% of Total	.3%	.7%	1.0%
	Congenital Diaphragmatic Hernia	Count	1	0	1
		% of Total	.3%	0.0%	.3%

Hypertensive Cardiac Changes	Count	1	4	5
	% of Total	.3%	1.4%	1.7%
Pleuritis	Count	0	1	1
	% of Total	0.0%	.3%	.3%
Congestive Hypertensive Cardiac	Count	0	1	1
	% of Total	0.0%	.3%	.3%
Bronchopneumonia	Count	1	0	1
	% of Total	.3%	0.0%	.3%
Pericardial Effusion	Count	0	1	1
	% of Total	0.0%	.3%	.3%
Diasphyseal Clavicular Malunited Fracture	Count	0	1	1
	% of Total	0.0%	.3%	.3%
Lower Respiratory Tract Infection	Count	3	0	3
	% of Total	1.0%	0.0%	1.0%
Total	Count	147	149	296
	% of Total	49.7%	50.3%	100.0%

Table 2: Prevalence of Chest Pathologies (Age Group)

			Age								
			21-				81-				
			1-10	30	31-40	41-50	51-60	61-70	71-80	90	Total
Pathology	Hypertension	Count	0	10	18	47	37	42	7	2	163
		% of Total	0.0%	3.4%	6.1%	15.9%	12.5%	14.2%	2.4%	0.7%	55.1%
	Pulmonary Koch's Disease	Count	1	7	13	13	14	17	5	3	73
		% of Total	.3%	2.4%	4.4%	4.4%	4.7%	5.7%	1.7%	1.0%	24.7%
	Bilateral Upper Lobe Pneumonitis	Count	0	2	0	1	0	0	0	0	3
		% of Total	0.0%	.7%	0.0%	.3%	0.0%	0.0%	0.0%	0.0%	1.0%
	Cardiac Failure	Count	0	0	0	4	0	2	0	0	6
		% of Total	0.0%	0.0%	0.0%	1.4%	0.0%	.7%	0.0%	0.0%	2.0%
	Pulmonary Infection Process	Count	0	2	6	6	3	0	0	0	17
		% of Total	0.0%	.7%	2.0%	2.0%	1.0%	0.0%	0.0%	0.0%	5.7%
	No Pathology	Count	0	0	0	2	1	0	0	0	3
		% of Total	0.0%	0.0%	0.0%	.7%	.3%	0.0%	0.0%	0.0%	1.0%
	Post Primary Pulmonary Tuberculosis	Count	0	0	0	2	7	2	1	0	12
		% of Total	0.0%	0.0%	0.0%	.7%	2.4%	.7%	.3%	0.0%	4.1%
	Cardiomyopathy	Count	0	0	0	0	0	1	0	0	1

	% of	0.0%	0.0%	0.0%	0.0%	0.0%	.3%	0.0%	0.0%	.3%
	Total									
Pulmonary	Count	0	0	1	0	1	0	1	0	3
Tuberculosis	% of	0.0%	0.0%	.3%	0.0%	.3%	0.0%	.3%	0.0%	1.0%
	Total									
Congenital	Count	0	0	1	0	0	0	0	0	1
Diaphragmatic	% of	0.0%	0.0%	.3%	0.0%	0.0%	0.0%	0.0%	0.0%	.3%
Hernaia	Total									
Hypertensive	Count	0	0	1	2	1	0	1	0	5
Cardaic Changes	% of	0.0%	0.0%	.3%	.7%	.3%	0.0%	.3%	0.0%	1.7%
	Total									
Pleuritis	Count	0	0	0	0	0	1	0	0	1
	% of	0.0%	0.0%	0.0%	0.0%	0.0%	.3%	0.0%	0.0%	.3%
	Total									
Congestive	Count	0	0	0	0	0	0	1	0	1
Hypertensive	% of	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	.3%	0.0%	.3%
Cardaic	Total									
Bronchopneumonea	Count	0	0	1	0	0	0	0	0	1
	% of	0.0%	0.0%	.3%	0.0%	0.0%	0.0%	0.0%	0.0%	.3%
	Total									
Pericardial Effusion	Count	0	1	0	0	0	0	0	0	1
	% of	0.0%	.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	.3%
	Total									
Diasphyseal	Count	0	0	0	0	1	0	0	0	1
Clavicular	% of	0.0%	0.0%	0.0%	0.0%	.3%	0.0%	0.0%	0.0%	.3%

Malunited Fracture		Total									
Lower Respiratory	Count	2	1	0	0	0	0	0	0	3	
Tract Infection	% of Total	.7%	.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	1.0%	
Total	Count	3	23	41	77	66	65	16	5	296	
	% of Total	1.0%	7.8%	13.9%	26.0%	22.3%	22.0%	5.4%	1.7%	100.0%	

Table 3: Prevalence of Chest Pathologies (Tribe)

			Tribe									
			Urhobo	Igbo	Ijaw	Isoko	Hausa	Itsekiri	Yoruba	Esan	Efik	7
Pathology	Hypertension	Count	52	53	21	16	1	5	3	4	4	4
		% of Total	17.6%	17.9%	7.1%	5.4%	.3%	1.7%	1.0%	1.4%	1.4%	1
Pulmonary	Koch's	Count	23	17	9	14	5	2	0	1	0	2
Disease		% of Total	7.8%	5.7%	3.0%	4.7%	1.7%	.7%	0.0%	.3%	0.0%	.
Bilateral	Upper	Count	1	2	0	0	0	0	0	0	0	0
Lobe Pneumonitis		% of Total	.3%	.7%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0
Cardaic Failure		Count	0	2	2	2	0	0	0	0	0	0
		% of Total	0.0%	.7%	.7%	.7%	0.0%	0.0%	0.0%	0.0%	0.0%	0
Pulmonary		Count	6	4	2	2	0	1	2	0	0	0
Infection Process		% of	2.0%	1.4%	.7%	.7%	0.0%	.3%	.7%	0.0%	0.0%	0

		Total									
No Pathology	Count	2	1	0	0	0	0	0	0	0	0
	% of	.7%	.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	Total										
Post Primary	Count	6	2	2	0	2	0	0	0	0	0
Pulmonary	% of	2.0%	.7%	.7%	0.0%	.7%	0.0%	0.0%	0.0%	0.0%	0.0%
Tuberculosis	Total										
Cardiomyopathy	Count	1	0	0	0	0	0	0	0	0	0
	% of	.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	Total										
Pulmonary	Count	0	0	0	3	0	0	0	0	0	0
Tuberculosis	% of	0.0%	0.0%	0.0%	1.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	Total										
Congenital	Count	0	1	0	0	0	0	0	0	0	0
Diaphragmatic	% of	0.0%	.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Hernaia	Total										
Hypertensive	Count	4	0	0	0	0	1	0	0	0	0
Cardiac Changes	% of	1.4%	0.0%	0.0%	0.0%	0.0%	.3%	0.0%	0.0%	0.0%	0.0%
	Total										
Pleuritis	Count	1	0	0	0	0	0	0	0	0	0
	% of	.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	Total										
Congestive	Count	0	1	0	0	0	0	0	0	0	0
Hypertensive	% of	0.0%	.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Cardiac	Total										

Bronchopneumonea	Count	1	0	0	0	0	0	0	0	0	0
	% of	.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	Total										
Pericardial Effusion	Count	1	0	0	0	0	0	0	0	0	0
	% of	.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	Total										
Diasphyseal	Count	0	1	0	0	0	0	0	0	0	0
Clavicular	% of	0.0%	.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Malunited Fracture	Total										
Lower Respiratory	Count	0	3	0	0	0	0	0	0	0	0
Tract Infection	% of	0.0%	1.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	Total										
Total	Count	99	87	36	37	8	9	5	5	4	0
	% of	33.4%	29.4%	12.2%	12.5%	2.7%	3.0%	1.7%	1.7%	1.4%	0.0%
	Total										

Table 4: Prevalence of Chest Pathologies (Study Period)

				Year				
				2019	2018	2017	2016	Total
Radiographic	Unfolded Aorta	Count		19	28	16	1	64
Features		% of		6.4%	9.5%	5.4%	.3%	21.6%

	Total					
Patchy Opacity	Count	20	24	17	1	62
	% of	6.8%	8.1%	5.7%	.3%	20.9%
	Total					
Streaky & Patchy Opacity	Count	3	3	3	0	9
	% of	1.0%	1.0%	1.0%	0.0%	3.0%
	Total					
Enlarged heart	Count	12	14	8	0	34
	% of	4.1%	4.7%	2.7%	0.0%	11.5%
	Total					
Hazy Opacity	Count	2	0	0	0	2
	% of	.7%	0.0%	0.0%	0.0%	.7%
	Total					
Streaky Opacity	Count	0	1	1	0	2
	% of	0.0%	.3%	.3%	0.0%	.7%
	Total					
Hilar and Perihilar Vascular	Count	0	3	0	0	3
Accentuation	% of	0.0%	1.0%	0.0%	0.0%	1.0%
	Total					
Enlarged Aorta	Count	0	1	0	0	1
	% of	0.0%	.3%	0.0%	0.0%	.3%
	Total					
No Lung Hilia Mediastinal	Count	0	1	1	0	2
Cardaic	% of	0.0%	.3%	.3%	0.0%	.7%
	Total					

Patchy Paramediastial	Count	0	1	3	0	4
	% of Total	0.0%	.3%	1.0%	0.0%	1.4%
Unfolding and Curvilinear	Count	0	0	2	0	2
Calcification of the Aorta	% of Total	0.0%	0.0%	.7%	0.0%	.7%
Bony Chest Abnormality	Count	0	0	3	0	3
	% of Total	0.0%	0.0%	1.0%	0.0%	1.0%
Multiple Coin Opacity	Count	0	0	1	0	1
	% of Total	0.0%	0.0%	.3%	0.0%	.3%
Pleural Effusion	Count	4	1	0	0	5
	% of Total	1.4%	.3%	0.0%	0.0%	1.7%
Prominent Transverse Fissure	Count	0	0	1	0	1
	% of Total	0.0%	0.0%	.3%	0.0%	.3%
Patchy Streak with Cystic Component	Count	1	0	1	0	2
	% of Total	.3%	0.0%	.3%	0.0%	.7%
Tenting at Right Hemidiaphragmatic	Count	0	1	0	0	1
	% of Total	0.0%	.3%	0.0%	0.0%	.3%
Accentuated Hila Vessel	Count	3	3	3	1	10

		% of Total	1.0%	1.0%	1.0%	.3%	3.4%
	Mid-Clavicular Fracture	Count	1	0	0	0	1
		% of Total	.3%	0.0%	0.0%	0.0%	.3%
Total		Count	95	101	96	4	296
		% of Total	32.1%	34.1%	32.4%	1.4%	100.0%

Discussion

In this study, out of the 296 radiographs evaluated, the pathology that was observed the most was Hypertension (55.1%) while the least observed were Cardiomyopathy, Congestive hypertensive cardiac, Diasphyseal Clavicular malunited fracture, Bronchopneumonea, Pleuritis, Congential diaphragmatic hernaia, and Pericardial effusion. This finding is in accordance with a study by Vasan et al. (7) among 1298 subjects found significant association of hypertension with age. The finding from this current study disagreed with a study by Davies et al. (8), who reported pneumonia as the most common radiographic finding (54.92%). These discrepancies could be attributed to the small sample sizes used in the current study and the geographical variation of both studies.

In this study, females accounted for over 50.3% of the total radiographs studied when compared with their male counterparts (49.7%). This is in keeping with the studies conducted by Ugwu, (9) and Garcia et al. (10). In the Ugwu's study, females were highest, 59.75% (n=49) and males were 42.24% (n=23) out of the 82 pathological cases. In a similar study by Garcia et al.

(10), reported females as highest 55.8% (n=24) and males were 44.2% (n=19). The increased female involvement in chest pathologies has been ascribed to Household Air pollution (HAP).

Among the patient samples evaluated, there was a predominance of patients from Urhobo (33.4%) followed by Igbo (29.4). Among all tribes in the present study, hypertension was the most prevalent chest pathology observed while the least were: bilateral upper lobe pneumonitis, cardiomyopathy, pleuritis, bronchopneumonia, and pericardial effusion among the Urhobo; congenital diaphragmatic hernia, congestive hypertensive cardiac and diaphragmatic clavicular malunited fracture among the Igbo; pulmonary infection process and post primary pulmonary tuberculosis among the Ijaw; cardiac failure and pulmonary infection process among the Isoko; hypertension among the Hausa, pulmonary infection process and hypertensive cardiac changes among the Itsekiri; pulmonary infection process among the Yoruba; pulmonary Koch's disease among the Esan; and pulmonary Koch's Disease among the Tiv.

It was observed from the study that among the 1-10yrs age group, the only pathologies observed were pulmonary Koch's disease (0.3%) and lower respiratory tract infection (0.7%). Hypertension was most prevalent among the 41-50yrs age group (15.9%) while it was least among the 81-90yrs age group (0.7%). Pulmonary Koch's disease was most prevalent among the 61-70yrs age group (5.7%) while it was least among the 1-10yrs age group (0.3%). Also, bilateral upper lobe pneumonitis was most prevalent among the 21-30yrs age group (0.7%) while it was least among the 41-50yrs age group (0.3%). In addition, cardiac failure was only observed among the 41-50yrs age group (1.4%) and the 61-70yrs age group (0.7%) while it was absent in the other age groups. The result from this current study is in agreement with a study by Ugwuanyi et al. (11), who reported that patients aged 70 years and above visited the radiology department for chest x-ray querying hypertension more than other groups, with a frequency and percentage of 71(35.5%), while those between (61-70) years were 53 (26.5%), and those with the least were those of the age range of less than 20 and 30 years with 4(2.0%). Although plain x-ray

cannot be described to be an excellent tool for diagnosing hypertension, it revealed a considerable level of abnormal findings that helped in establishing the relative level of prevalence, establishing a relationship between sex and pattern of findings as well as the age range with the highest incidence of hypertension. Therefore, plain chest radiograph can be used where there are no other imaging modalities with higher sensitivity and specificity for picking slight pathological signs of hypertension and where a patient cannot afford for the use of other modalities such as echocardiogram, computed tomography and magnetic resonance imaging.

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