



CHEST RADIOGRAPHY: A REVIEW OF 5 YEAR FINDINGS IN PERIPHERAL FACILITIES IN JOS, NORTH -CENTRAL NIGERIA

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ABSTRACT: X-ray is a noninvasive imaging tool that utilizes a small dose of ionizing radiation to produce the image of the internal structure of the body which helps physicians diagnose and treat medical conditions. Chest x-ray is the most commonly performed diagnostic x-ray examination and carried out for a broad content of indications, including but not limited to cardiopulmonary diseases, follow up of known disease to assess progress and evaluation of symptoms that could relate to abdominopelvic pathology.

Materials and Methods: A five (5) year retrospective review of the archive of chest radiographs referred from peripheral facilities in Jos between January, 2015 to December, 2020. The results were expressed as percentages and tests of significance were done using the chi-square. A P-value of < 0.05 was considered statistically significant. **Findings:** The study included 1039 (41.2%) females and 1482 (58.8%) male giving a male to female ratio of 1:1.4 with a mean age of 40.03± 20.38 years. Chest x-ray was normal in 68.9% of the subjects while 783 (31.1%) patients showed various abnormal findings. The common abnormal chest findings were chest infection (20.1%) and hypertensive heart disease (5.3%). Other findings include heart failure (1.5%), hypertension (1.5%), pleural effusion (1.0%) and pulmonary tuberculosis (0.6%). The least findings were lung metastasis and rib fracture following road traffic accidents constituting 0.1% each. The age groups 40-49 years and 50-59 years had the majority of the abnormal chest findings while age groups 10-19 years and 20-29 years had normal findings. This was statistically significant (p<0.005).

KEYWORDS: Chest radiography, Chest Findings, Chest Infection, Hypertensive Heart Disease



INTRODUCTION

Chest x ray is the most common investigation that is performed in the radiology department (Ekpo et al. 2015). It is the first radiologic imaging modality that is requested for the patients that present with complaints of chest pain, cough or difficulty in breathing. Chest x-rays are also used for screening purposes in cases of pre employment, annual medical examination, screening for metastatic chest disease, also for pre and post operative evaluation of the chest (Klein & Rosadi-de-Christenson 2019 and Osahon et al.2017).

Chest radiographs are important for characterizing pulmonary as well as cardio thoracic diseases. It allows for visualization of the chest wall, hilum, great vessels, borders of the heart, and subcutaneous soft tissues of the chest as well as the diaphragm (Klein & Rosadi-de-Christenson 2019).

The accurate interpretation of the chest radiograph can be a bit challenging, especially when there is superimposition of normal anatomic structures with varying radiographic densities, so a good knowledge of the radiologic anatomy of the frontal and lateral chest radiographs are important as obscuration of the normal visualized structures can indicate an abnormality or a disease process (Klein & Rosadi-de-Christenson 2019 and Moore et al 2005). Prompt identification and characterization of abnormal chest radiographic findings aids early diagnosis and possibly guide physicians on follow up imaging modalities and clinical evaluation (Klein & Rosadi-de-Christenson 2019).

Winkler et al in a meta-analysis of the diagnostic accuracy of chest radiograph and ultrasound scan in patients that are critically ill, established an overall diagnostic sensitivity and specificity of chest x ray in diagnosing chest disease to be 49% (95 CI, 40-58% and 92% (58-90%) respectively.

It has been reported in the United States of America that about 52 million chest radiographs are usually done annually. Furthermore, routinely done chest x-rays adds about \$ 1.5 billion to the cost of health care (Akinola et al. 2014). According to the international commission on radiation and unit measurement, chest x-rays account for 25% of all x-ray examinations performed (Osahon et al. 2017). Evaluation of basic x-ray services was done in south western Nigeria over a period of five years. Of the 3,278 examinations that were done, chest x-ray constituted 56 % (Lagundoye & Olowa, 1982).

Computed Tomography scan and Magnetic Resonance Imaging can be used to evaluate the chest. However, they are expensive and not readily available in developing countries. Chest x-ray has the advantage of being readily available, fast, non-invasive and associated with a low radiation dose compared to other imaging modalities that use ionizing radiation (Akinola et al. 2014). The effective radiation dose from one chest x-ray is 0.1 mSv for a frontal chest x-ray which is equivalent to ten days of exposure to natural background radiation. There is no safe radiation dose, however the risk is low compared to its benefits (Akinola et al. 2014).

The aim of this study is to review the chest radiographic findings in peripheral facilities in Jos North Central Nigeria over a period of five years.



Materials and Methods

A five (5) year retrospective review of the archive of chest radiographs of patients sent for chest x-rays for various indications between January, 2015 to December, 2020 was conducted. Patients with incomplete documentation were excluded from the study. A total of 3,609 results were reviewed but only 2521 who met the inclusion criteria were enrolled for the study.

The chest x-ray examination was performed using a multix swing floor mount 500MAs X ray machine (Siemens, 2007 Germany) fitted with a chest stand and a stationary grid.

Demographic data obtained included age, sex, clinical indications and chest x-ray findings. The data was collated, entered into a computer and processed by the use of Statistical Package for Social Sciences (SPSS) version 23 to determine frequencies; means \pm standard deviations. Results are presented using frequency tables and percentages as appropriate. A p-value of <0.05 was considered statistically significant with a confidence interval of 95%.

The hospital's ethical committee and review board concurred that the retrospective study was a continuous quality improvement initiative for patient care and did not require informed consent.

RESULTS

Patients' Demography

A total of 3609 radiographs were reviewed but only 2521 with complete documentation and met the inclusion criteria were enrolled for the study, a prevalence of 69.9%. Of these patients, 1039 (41.2%) were females, 1482 (58.8%) were male giving a male to female ratio of 1:1.4 and their ages ranged from 1-110 years with a mean age of 40.03 ± 20.38 years (Table 1).

Chest findings

Chest x-ray findings were normal in 68.9% of the subjects while 783 (31.1%) patients showed various abnormal findings (Table 2).

The common abnormal chest findings were chest infection (20.1%) and followed distantly by hypertensive heart disease constituting 5.3%. Other findings include heart failure (1.5%), hypertension (1.5%), pleural effusion (1.0%) and pulmonary tuberculosis (0.6%). The least findings were lung metastasis and rib fracture following road traffic accidents constituting 0.1% each (Table 2).

The age groups 40-49 years and 50-59 years had the majority of the abnormal chest findings constituting 20.3% and 21.7% respectively while age groups 10-19 years and 20-29 years had normal findings constituting 16.2% and 17.4% respectively. This was statistically significant (Table 3, $p < 0.005$).

**Table 1: Age and Sex distribution**

Age group (years)										
Sex	0-9	10-19	20-29	30-39	40-49	50-59	60-69	≥70	Total	Percent
Female	60	150	141	176	173	168	100	71	1039	41.2
Male	89	166	213	233	250	225	176	130	1482	58.8
Total	149	316	354	409	423	393	276	201	2521	100.0
Mean Age = 40.03 ± 20.38 years										

Table 2: Relationship between chest findings and sex

SEX					
Findings	Female	Male	Total	Percent	
Normal	771	967	1738	68.9	
Chest Infection	136	371	507	20.1	
Hypertensive Heart Dis.	76	57	133	5.3	
Heart Failure	16	25	41	1.6	
Hypertension	11	27	38	1.5	
Pleural effusion	10	15	25	1.0	
Pulmonary Tuberculosis	9	6	15	0.6	
Cardiomegaly	4	4	8	0.3	
Clavicular Fracture	3	2	5	0.2	
Lung Contusion	2	3	5	0.2	
Lung Metastasis	0	2	2	0.1	
COPD	0	1	1	0.0	
Rib fracture	1	2	3	0.1	
Total	1039	1482	2521	100.0	

Table 3: Relationship between Age group with Chest findings

Findings	Age grp 0-9	10-19	20-29	30-39	40-49	50-59	60-69	≥70	Total
Normal chest findings (%)	132 (7.6)	281 (16.2)	296 (17.4)	279 (16.1)	264 (15.2)	223 (12.8)	140 (8.1)	123 (7.1)	1738 (100.0)
Abnormal findings (%)	17 (2.2)	36 (4.6)	58 (7.4)	130 (16.6)	159 (20.3)	170 (21.7)	136 (17.3)	79 (10.1)	783 (100.0)
Total	149	316	354	409	423	393	276	201	2521

$\chi^2 = 204.457$ (df = 7): $P = 0.000$



DISCUSSION

A total number of 2521 chest radiographs were reviewed. Of these, 1039 (41.2%) were females, 1482 (58.8%) were males giving a female to male ratio of 0.71, the age range of 1-110 years and a mean age of 40.03 ± 20.38 years (Table 1). Ogbole *et al* observed similar demographic characteristics in their study where 56% of the radiographs were obtained in males and 44% were obtained in females⁸. Similarly, Akinola *et al* also found a slight male predominance in the demographic characteristics with an F: M ratio of 0.97.

In the present study, chest radiographic findings were normal in the majority (68.9%) of the subjects. Only 31.1% showed abnormal chest radiographic findings. This observation is in agreement with the report by Ogbole *et al* who found that 85.2% of the chest radiographs in their review were normal. Aronu *et al* also reported that most of the patients examined using the plain chest radiography showed normal chest radiographic features. Similarly, Akinola *et al*⁶ reported an overall prevalence of abnormal findings in only 10% of the chest radiographs reviewed in their study. In another study by Adeko *et al*, it was also found that nearly all the CXR films (95.2%) reviewed in their study were normal. It must be noted, however, that Adeko *et al* carried out their study in presumably normal subjects who had no clinical complaints but were undergoing routine pre-employment evaluation. In such subjects, abnormal findings are likely to be limited to just a few incidental cases of cardiomegaly and aortic unfolding which was the case in their study.

On the contrary, Maduka *et al* reported 82% pathological findings in their study on chest radiographs with pneumonia having the highest frequency of occurrence¹¹. It is important to state that Maduka *et al* carried out their study in the pediatric age group with patients having chest symptoms. In that scenario, most of the radiographs are likely to be abnormal as was the case in their study. It is also worthy of note that routine chest radiographs for medical fitness certification which usually have normal findings are not common in the pediatric population; hence every radiograph in that age group is likely to be for pathologic evaluation of a chest or cardiovascular symptom and as such are likely to be abnormal.

In the present study, the commonest abnormal chest findings were chest infection (20.1%), which was followed remotely by hypertensive heart disease (constituting 5.3%). Other findings include heart failure (1.5%), hypertension (1.5%), pleural effusion (1.0%) and pulmonary tuberculosis (0.6%). The least findings were lung metastasis and rib fracture following road traffic accidents which constituted 0.1% each. These observations were in agreement with the report by Maduka *et al* who found pneumonia (chest infection) as the chest finding having the highest frequency of occurrence (17.0%), followed by neonatal respiratory distress syndrome and bone fracture (7.5%) and the least finding was metastatic lung disease (1.0%).

Akinola *et al*, however, reported cardiomegaly as the commonest abnormal chest finding and accounting for 47.4% of all abnormal findings. Cardiomegaly and aortic unfolding were also the commonest findings in the study by Aronu *et al*.

The age groups 40-49 years and 50-59 years had the majority of the abnormal chest findings constituting 20.3% and 21.7% respectively; while age groups 10-19 years and 20-29 years had more of the normal chest radiographic findings. These findings are similar to those reported by Akinola *et al* who stated that the age group of participants had a statistically significant association with the occurrence of abnormal chest radiographic findings. That adults older



than 40 years had the highest rate of occurrence of abnormality when compared to children below 18 years (2.7%) and adults aged 18-40 years (5.3%).

Limitations

The most important limitation of this study is that the chest radiographs reports were sometimes reported without adequate history or insufficient clinical information which may impact negatively on the accuracy of the final diagnosis.

The retrospective review of the records without inputs from further laboratory workup and clinical reviews may also affect this study.

A prospective study in multiple centers for the evaluation of chest radiograph findings is required.

CONCLUSION

Multiple aetiologies are responsible for the request for chest Radiographic evaluation .Chest radiography is an effective, cheap and complementary imaging tool in evaluating cardiovascular, respiratory and musculoskeletal systems.

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Conflicts of Interest

There are no conflicts of interest.

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