

# Incidentalomas in Chest Radiograph of Apparently Healthy Individuals Presenting for Pre-Employment Medical Examination in Enugu State, Nigeria

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## INTRODUCTION

The pre-employment medical examination is often part of an employment process and can include a complete physical examination, imaging, and some ancillary blood tests. In this environment, it is usually the last hurdle an individual must pass before officially being employed in a job. Its purpose is to determine the suitability or otherwise of a person at a particular job type and to establish that they have no contagious

### ABSTRACT

**Background:** A chest radiograph is the most commonly requested and performed imaging for diagnosis and screening including medical examination. **Aim:** The study aimed to determine the prevalence and pattern of incidentalomas in radiographs of cases presenting for pre-employment medical examination. **Methods:** This was a retrospective review of chest radiographs conducted for patients presenting for pre-employment medical examination from January to December 2022. Relevant data including sociodemographic characteristics, clinical details and chest radiograph reports were retrieved using study proforma from all patients with complete medical data were analyzed using statistical package for social sciences (SPSS) version 23 with the level of statistical significance set as  $P < 0.05$  taken as statistically significant. **Results:** Three hundred and eleven chest radiographs of subjects aged 20–49 years were evaluated, of which 22 (7.1%) incidentalomas were found. Most were females (55%). Of these incidentalomas, 12 (54.6%) were in the cardiovascular system, while the skeletal and pulmonary systems accounted for eight (36.4%) and two (9.1%), respectively. In all participants, clinically significant findings were eight (2, 6%), comprising of cardiomegaly five (1.6%), leash of vessels in the upper zone one (0.3%), blunt costophrenic angle one (0.3%), and right-sided aortic arch one (0.3%). Age and gender have no statistical significance in the incidental findings. **Conclusion:** Although the incidence of clinically significant incidentalomas appears low in our environment where beliefs and lack of adequate healthcare financing prevent the majority from seeking timely medical attention, chest radiograph remains an invaluable tool for pre-employment medical examination. Some underlying medical conditions could be picked up, further investigation sought to save life, and it serves as a baseline with which future findings may be compared.

**KEYWORDS:** Chest radiograph, incidental findings, incidentalomas, pre-employment medical examination

disease that could jeopardize the health of other workers. It is also essential, especially in a hospital environment

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where patients may be at risk of contracting an infectious disease.<sup>[1]</sup>

The physician may request additional investigations essential for the evaluation of the compatibility between the health status of the worker and the type of job they are going for.<sup>[2]</sup>

A chest radiograph is the most commonly requested and performed imaging for diagnosis and screening (such as for pre-employment, annual medical examination, screening for metastatic chest disease, and pre- and postoperative evaluation of the chest).<sup>[2-5]</sup>

Medical imaging may demonstrate unexpected findings which may require the ordering of further investigations. Incidental imaging findings/abnormalities, also called incidentalomas, are defined as an imaging abnormality found in an asymptomatic, apparently healthy patient or an imaging abnormality found in a symptomatic patient, but the abnormality was not related to the symptoms the patient had.<sup>[6,7]</sup>

Studies have shown that the detection of clinically significant incidentalomas on chest imaging could be vital for optimal patient care,<sup>[8]</sup> as such findings may aid in early diagnosis and treatment. It can be life-saving, particularly in cases of undiagnosed hypertension, incipient heart failure, or suspicious pulmonary lesions including malignancies.

Failure to detect essential subtle lesions on imaging may result in giving the patient a false reassurance that all is well,<sup>[8]</sup> as the incidence of diagnostic delays often results in poorer prognosis.

Hence, if the findings from the imaging require management or a change in management, it is noted as a clinically important incidental finding.<sup>[8,9]</sup>

Incidentalomas, however, may have doubtful clinical relevance and may result in patients' anxiety, expensive further workup, and potentially invasive procedure.<sup>[10-12]</sup>

Hayward<sup>[13]</sup> proposed the acronym "VOMIT" meaning victims of modern imaging technology to describe this occurrence of the increased number of incidental findings and subsequent anxiety among patients due to the advances in technology and information.<sup>[13,14]</sup>

It is therefore key that clinicians adequately counsel their patients of incidental findings discovered on imaging in order not to alarm patients more than is necessary.<sup>[14]</sup> Also, this should be followed with proper identification and documentation of incidental findings for future use including medico-legal cases.<sup>[14]</sup>

Few data exist on the incidental findings on the chest radiograph of pre-employment apparently healthy

individuals in our setting. Hence, this study aims to determine the prevalence of chest radiograph incidentalomas in apparently healthy individuals undergoing pre-employment medical examination in Enugu. Also, further investigations were advised in some positive cases.

## MATERIALS AND METHODS

### Study design

This was a retrospective review of all chest radiographs of individuals who presented for pre-employment medical examination from January to December 2022 in the Department of Radiation Medicine, the University of Nigeria Teaching Hospital (UNTH), Ituku/Ozalla, Enugu.

### Study site

UNTH is a federal tertiary hospital located in Enugu state. It is a 500-bedded hospital providing specialist inpatient and outpatient services to the five states of Enugu, Anambra, Ebonyi, Imo, and Abia, as well as the adjoining states of Rivers, Bayelsa, Delta, Kogi, and Benue among others.

### Ethical consideration

Ethical approval was sought and obtained from the Health Research Ethical Committee of the University of Nigeria Teaching Hospital, Ituku/Ozalla, Enugu, with reference no NHREC/05/01/2008B-FWA00002458 dated January 7, 2023.

### Study selection

All cases of pre-employment chest radiographs with complete medical records and reports conducted during the period under review were selected. The chest radiographs were all taken in standard, posterior-anterior projection with an ItaiRay X-ray Machine (year 2019 static IR302/A-A) and reviewed by two consultant radiologists (OAC and ESN) of over 20 years of experience each.

A study proforma was designed and used in data retrieval from the departmental booking registers/electronic databases, archived X-ray films, as well as electronic images and their corresponding radiologist reports. Information captured for each patient included sociodemographic characteristics, relevant medical history, date of examination, incidental chest radiograph finding/diagnosis, and action taken.

### Inclusion criteria

All chest radiographs were conducted for pre-employment assessment within the study period with complete records.

### Exclusion criteria

Pre-employment cases with incomplete data were excluded from the study.

## Data analysis

Data were processed and analyzed using IBM SPSS version 23. Descriptive results were presented as tables, the relationship between variables was tested using the Chi-square test for categorical variables, and values  $<0.05$  were taken as statistically significant.

## RESULTS

A total of 311 chest radiographs were evaluated. The age range was 20–49 years, and most were in

**Table 1: Demographic characteristics**

	Frequency	Percentage %
Age group		
20–24	40	12.9
25–29	214	68.8
30–34	46	14.8
35–39	6	1.9
40–44	2	0.6
45–49	3	1.0
Total	311	100.0
Sex		
Male	147	47.3
Female	164	52.7

**Table 2: Distribution of incidentalomas based on system**

Systems	Incidentalomas	Frequency (%)
Cardiovascular	Prominent aortic knuckle	6 (27.3%)
	Cardiomegaly	5 (22.7%)
	Right-sided aortic arch	1 (4.6%)
Skeletal	Cervical rib	2 (9.0%)
	Spina bifida occulta	2 (9.0%)
	Scoliosis	1 (4.6%)
	Metallic implant on spine	1 (4.6%)
	Healed fracture of T3	1 (4.6%)
	Bifid right fourth anterior rib	1 (4.6%)
Pulmonary	Right upper zone leash of vessels	1 (4.6%)
	Blunt right costophrenic angle	1 (4.6%)
TOTAL		22 (100.0%)

**Table 3: Clinically significant findings that required further investigations**

Clinically significant findings	Further investigations required
Cardiomegaly	2D echocardiography
Leash of vessels in the upper zone which is an indicator of an inflammatory process in that area, most likely from tuberculosis	Sputum GeneXpert, ESR
Blunt costophrenic angle. Needs to rule out if it is due to pleural collection	Ultrasonography
Right-sided aortic arch—a rare condition—specifically enquire if the person has been having symptoms of dysphagia, stridor, etc., which can be a consequence of this anomaly	CT angiography

the 25–29 years of age bracket, 214 (68.8%). See Table 1 below.

Of all the 311 subjects, 22 (7.1%) incidentalomas were found with 10 (45%) males and 12 females (55%). Females although there were 20 individuals, two had two different incidental findings each, making it a total of 22 incidentalomas.

Of all incidentalomas, cardiovascular findings were more, 12 (54.6%), followed by skeletal findings eight (36.4%) and pulmonary findings two (9.1%), as shown in Table 2 below.

In all the participants, clinically significant incidental findings were eight (2.6%) and comprised cardiomegaly five (1.6%), the leash of vessels in the upper zone one (0.3%), blunt costophrenic angle one (0.3%), and right-sided aortic arch one (0.3%), as shown in Table 3 below.

The age and gender did not reveal any statistically significant relationship with the incidental findings.

Further medical evaluation, including imaging and/or other ancillary investigations, was advised in the clinically significant cases of incidentalomas to delineate the lesion and appropriate diagnosis made.

In some cases of incidentalomas with clinically significant findings, further imaging or other relevant investigation/s were advised to the referring clinician as the case may be. See Table 3.

## DISCUSSION

The finding of incidentalomas of 7.1% in this study compares with similar studies from southwest Nigeria, Cameroun (Central Africa), and Cote d'Ivoire (Francophone, West Africa).<sup>[2,15,16]</sup> Our figures are, however, in contrast to some other similar works which showed much lower rates ranging from 0.2% to 3%<sup>[17-21]</sup> and other studies that demonstrated higher rates of incidental findings ranging from 10% to 46.2%.<sup>[10,14,22]</sup> The reasons for the high figures may be because of the varieties in subjects studied as well as the imaging modality used. For instance, the study conducted in Lagos, southwest Nigeria, incorporated a wider range of subjects, including both children and adults ranging from 8 months to 72 years, who presented for pre-employment, pre-surgery, and pre-admission,<sup>[22]</sup> while that conducted in Europe involved a larger number of patients that had symptom of acute cough,<sup>[10]</sup> yet, the other study conducted in New York, USA, was conducted with CT scan.<sup>[14]</sup> The latter is a cross-sectional imaging modality with a higher diagnostic yield.

Although the prevalence of incidentalomas was higher in females in our study as was reported in a similar work

in Lagos, southwest Nigeria,<sup>[22]</sup> and the United States,<sup>[14]</sup> there was no significant statistical relationship between sex and incidentalomas.

No incidentaloma was seen in our subjects less than 24 years of age. Age, however, was not statistically related to the finding of incidentalomas. A similar Nigerian study has also reported that no case of incidentalomas was observed in those under 25 years.<sup>[16]</sup>

The most common incidentaloma in this study was from the cardiovascular system and included cardiomegaly and prominent aortic knuckle. None of the subjects, however, gave any history of hypertension or cardiac problems. This is similar to research conducted in the western part of Nigeria, as well as Egypt and India<sup>[1,8,19]</sup> but contrary to reports from Cameroun, USA, and some other parts of India, whose highest incidentaloma was blunted costophrenic angle, pulmonary nodule, and postinflammatory scarring, respectively.<sup>[2,14,23]</sup>

Common causes of cardiomegaly among adults in our setting include dilated cardiomyopathy, left ventricular hypertrophy, valvular heart defects, pulmonary arterial hypertension, pericardial effusion, sickle-cell anemia, endomyocardial fibrosis, and schistosomiasis cor-pulmonale.<sup>[22,24]</sup> Also, pregnancy, systemic high blood pressure, coronary artery disease, arrhythmias, thyroid disorders, heart failure, and congenital cardiac diseases could be the reason for the cardiomegaly observed in such patients.<sup>[25]</sup>

In addition, reports have also demonstrated that physically active, young persons especially those engaged in very competitive sports have physiologically enlarged hearts.<sup>[26]</sup> However, we were not able to validate the causes of the abnormal cardiovascular findings in our participants except for the right-sided aortic arch which is a congenital anomaly—although rare. None of our subjects was pregnant at the time. Two of the subjects that had cardiomegaly were females of para 2 and above with the other females nulliparous. It is uncertain whether the multiparity was the reason for the cardiomegaly.

Our study showed that of all the incidentalomas, 2.6% were clinically significant. This is similar to a report in the Netherlands that showed a clinical significance of 3%. However, it is in contrast to that from Egypt which reported 10.4%,<sup>[8,10]</sup> as well as the study in Nigeria that demonstrated a radiological significance as high as 73.1%.<sup>[22]</sup>

This suggests that clinically significant findings may be geographical. The pre-employment medical examination with chest X-ray is valuable in our setting, which has poor health-seeking behavior.

## CONCLUSION

Incidental chest imaging findings were 7.1% of all cases. These incidental findings included cardiovascular, pulmonary, and skeletal systems. Prominent aortic knuckle was the most common incidentaloma. Age and sex were not statistically related to the incidentalomas. Further imaging/investigations were advised in those cases with clinically significant findings. A chest radiograph still remains an important investigation required for pre-employment medical examination, as some underlying medical condition could be picked up and further investigation sought to save life.

Furthermore, such investigations may serve as a baseline medical record with which later findings may be compared.

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Nil.

## Conflicts of interest

There are no conflicts of interest.

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