

An audit of 3859 preadmission chest radiographs of apparently healthy students in a Nigerian Tertiary Institution

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ABSTRACT

Background: Chest radiographs are routinely requested as part of the medical screening process prior to admission to institutions. Literature on the yield of such an exercise is sparse especially in the Nigerian setting. This study was therefore carried out to assess the usefulness of routine chest radiography for students at the time of admission. **Materials and Methods:** This was a prospective study of 3859 chest X-rays taken at the department of radiology, University of Benin Teaching Hospital for one admission screening for the 2008/2009 academic year. The age and sex of the subjects were also recorded. The heart, lung fields and bony thorax were examined for any abnormality. **Results:** Out of the 3859 pre-admission chest radiographs studied, there were 1951 males or 50.56% and 1908 females or 49.44% subjects. The mean age for males was 21.15 ± 3 . **Conclusion:** This study has shown that pre-admission routine chest radiography in asymptomatic patients remains a relevant screening tool for medical fitness during admissions into institutions. However because of dangers of exposure to ionizing radiation, we advise that a detailed medical history and physical examination be done to restrict its use to only those subjects with signs and symptoms suggestive of disease.

Key words: Benin city, chest radiographs, preadmission

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INTRODUCTION

Routine medical examinations are carried out as a prerequisite for employment in the public or private sector, entry into tertiary educational institutions or admissions to residential schools and routinely, every 4 years, for armed forces personnel. This is to ensure that the individual is free from any serious physical disability or disease that may compromise work performance, necessitate high medical costs or pose a health threat to others at the work place or institution.¹⁻³

Chest radiographs are an integral part of this routine medical examination and are utilized as a screening tool to detect possible intrathoracic abnormality, but the utility value of routine chest radiographs has long been controversial. In the early 1940s and 1950s, screening

using chest radiography was done in the Western countries to detect active tuberculosis. By the 1980s, performing routine preoperative or admission chest radiography was considered as "an idea whose time has passed".⁴ Moreover, with the low incidence of tuberculosis in these countries, the need for routine chest radiographs has been questioned.^{4,5}

The literature on the clinical value and findings of routine chest radiographs in medical screening of students seeking admissions in higher institutions in this environment is sparse. This study was to therefore assess the usefulness of routine preadmission Chest X rays (CXR) among young adults, especially when use and safety (exposure to ionizing radiation) are considered.

MATERIALS AND METHODS

The University of Benin Teaching Hospital, Benin City, Edo State provides specialist care for patients in the South-South region of Nigeria. This prospective study was conducted over a period of 3 months between August to October 2008, for students admitted into the University of Benin, Benin City and referred for chest radiographic examination. All 3859 students were first clinically examined for signs of respiratory disease by the referring

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medical officer before requesting for X-ray chest. Biodata such as age and gender were recorded.

The X-ray machine used was a Watson, Stylos (England) general purpose X-ray machine. The factors employed were 65-75 Kilo-Voltage (kVp), 12-15 mAs, and 180cm Focus to Film Distance (FFD). The authors then jointly analyzed the radiographs. Results of the analyses were classified as normal if there were no lung, heart or bone abnormalities. Abnormal findings such as cardiomegaly, lung infiltrates or pleural diseases or scoliosis, on X-ray were noted when present.

Data obtained was entered into a Microsoft office Excel database and statistically analyzed using statistical package for social science version 15. The data was stratified and the results expressed in descriptive statistics such as frequency tables, percentages, mode, median, and mean. Correlative analysis, Students' *t*-test, was used to test for significant differences. Statistical significance was considered at *P* value of ≤ 0.05 .

RESULTS

A total number of 3859 subjects had their chest x-rays analyzed. Of these 1908 (49.4%) were females while 1951 (50.6%) were males. The age range for the subjects studied was 15 years and 39 years (mean 20.79 ± 0.05 years), while the mean age for the males was 21.2 ± 3.07 years and 20.4 ± 2.62 years for females. Subjects within the ages of 15-20 years constituted the modal age group (2006 or 52.0%).

Table 1: Showing the age distribution for the study

Age group (years)	Number of subjects	Percentage
15-20	2006	52.0
21-25	1645	42.6
26-30	172	4.5
31-35	30	0.8
36+	6	0.2
Total	3859	100

Three thousand, eight hundred and forty-eight subjects or 99.7% had normal findings while 11 subjects (0.3%) were abnormal. Of the 11 abnormal cases, more males (7 or 63.6%) were involved than females (4 or 36.4%); as shown in Table 1.

The abnormal findings are illustrated in Table 2. These included dorsal scoliosis three cases or 27.2%, cardiomegaly 1 case or 9.1%, pulmonary tuberculosis 4 cases or 36.4%, solitary pulmonary nodule 1 case or 9.1%, elevated hemi-diaphragm probably due to previous pleurisy 1 case or 9.1%, and spina bifida occulta 1 case or 9.1%. Further analysis showed that among these eleven abnormal cases, there were more males than females.

DISCUSSION

The value of routine chest radiography lies in detecting diseases, establishing a baseline future reference, providing information about normal appearance, and reassurance that in the present state of assessment, the patient is in reasonably good health.^{6,7} There is little evidence supporting the use of routine investigations in preadmission medical screening. In Nigeria, there are no clear guidelines promoting routine investigations, even when the information can significantly impact on practice patterns and attitudes, as well as have potential medicolegal implications.

In this study, 99.7% of the 3848 preadmission medical radiographs were normal, with 11 subjects showing abnormal findings. This result agrees with earlier reports from Saudi Arabia, UK and USA, which showed low yield for routine chest radiograph in apparently healthy individuals.⁸ Al-Damegh *et al.*⁸ in their study stated that out of 2016 individuals examined, 1988 or 98.6% were normal, and only 28 or 1.4% had abnormal X-ray chest findings, along with the history of chest problems. A three-year study on chest radiographs in routine medical examinations at Hospital Melaka, showed that of 11 024 chest radiograph examinations carried out for routine medical examinations only 217 or 1.97% had positive findings.⁹

Table 2: List of principal radiological findings in this study compared with findings in studies done previously

Researchers	Population studied	Total abnormal CXR	Abnormal CXR with clinical symptoms	Commonest abnormality
Loder <i>et al.</i> ¹²	1000 CXR, United Kingdom	114 cases (11.4)	92 cases (9.2)	Tuberculosis
Lee <i>et al.</i> ⁵	4036 CXR, Multiracial population of Malaysians, Caucasians, Singaporeans	791 cases (19.6)	46 cases (1.1)	Tuberculosis
Al-Damegh <i>et al.</i> ⁸	2016 CXR, Saudi Arabians	28 cases (1.4)	21 cases (1.1)	Tuberculosis
Ministry of Health, Pakistan (2002) ⁹	11,024 cases Pakistanis	322 cases (2.9)	217 cases (2.0)	Cardiomegaly
Tigges <i>et al.</i> ¹¹	1282 cases, Americans	15 cases (1.2)	1 case (0.07)	Pulmonary nodules (Sarcoidosis)
Ogbeide <i>et al.</i> (present study, 2011)	3859 cases, Nigerians	11 cases (0.3)	2 cases (0.05)	Tuberculosis

Figures in parenthesis are in percentage; CXR – Chest X rays

Plain chest radiography has its own limitations. A trained radiologist may overlook 20–30% of significant abnormality on a chest film and it has been shown that pickup rate is improved by providing clinical information on request form.¹ The radiologist must develop a routine, which ensures that all areas of the radiographs are scrutinized. As far as detection of abnormalities on a chest radiograph, the yield has been stated to be between 0.3% and 16.6%.¹⁰⁻¹² In this study, the yield was 0.3%. The highest value of 16.6% was recorded in a study done in Singapore. Rucker *et al.*¹⁰ While Loder,¹² and other researchers¹³⁻¹⁸ have shown that the practice of routine chest radiographs for psychiatric, surgical, general medical and obstetric patients has been criticized, mainly due to low incidence of positive findings among patients with no clinical suspicion of chest disease. Graat *et al.*¹⁹ studied the clinical value of daily routine chest radiographs in medical-surgical intensive care unit and showed that majority of the chest X-rays did not show any new predefined major finding.

In this study the most common disease entity was pulmonary tuberculosis (TB). Tuberculosis continues to be a common health problem in under-developed and developing countries.²⁰⁻²² The diagnosis of TB is based on clinical presentation, radiological and laboratory findings. In this study, there were two cases of pulmonary TB and both were male subjects. Lee *et al.*⁶ showed tuberculosis and cardiomegaly as the commonest findings in their study.

In our study, 11 of the 3,859 subjects studied had positive results. If the costs of the x-rays were estimated by using 2008 price listing of the University of Benin Teaching Hospital, the 3,859 radiographs would cost approximately seven million Nigerian naira (N7,000,000.00). The cost effect is that in comparison, only approximately seventeen thousand Nigerian naira (N17,000.00) for the 11 radiographs yielded positive result.

CONCLUSION

This study has shown that the diagnostic yield of routine chest radiography for pre-admission screening is low. Considering the cost and safety implications of routine radiography, we suggest that detailed medical history, physical examination, electrocardiography, and sputum examination be done before chest radiography is requested.

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