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UTILITY OF ROUTINE CHEST RADIOGRAPHS IN KENYA

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ABSTRACT

Background: Many otherwise healthy Kenyans are required to obtain chest radiographs as part of routine medical examination to exclude pulmonary TB, a condition of significant public health concern. Many of these people are required to have these radiographs taken yearly as part of routine check-up. No local data is available to support this practice. Though a quick procedure to perform and readily available throughout the country, chest radiograph exposes the individual to a dose of ionising radiation. Ionising radiation is associated with increased risk of malignancy. The cost is also substantial.

Objective: To determine the prevalence of radiological findings consistent with PTB among routine medical examination chest radiographs.

Design: A cross-sectional descriptive study.

Settings: Department of Radiology Kenyatta National Hospital, Department of Imaging and Radiation Medicine, University of Nairobi, Plaza Imaging Solutions, a private radiology practice in Nairobi and Department of Radiology, the Nairobi Hospital.

Subjects: Four hundred and two chest radiographs of patients presenting for routine medical examinations were analysed.

Results: Sixty three radiographs had abnormal but clinically insignificant findings (16%). Only one radiograph (0.25%) had radiological features of PTB. The rest were reported as normal (84%).

Conclusion: In this study, the diagnostic yield for the intended purpose (to include/exclude PTB) was extremely low (0.25%). It is recommended that routine chest radiographs as screening tools for active pulmonary tuberculosis be reconsidered due to poor diagnostic yield. The authors propose a bigger nation wide study before a policy decision can be proposed.

INTRODUCTION

In Kenya, routine chest radiographs (CXR) are performed as part of routine Medical Examination for individuals intending to join secondary schools, colleges and universities, travel or migrate abroad, joining formal employment, an insurance scheme and undergoing periodic medical examinations while in employment.

There is no medical indication for these radiographs. The only reason they are performed is because the patient falls in any of the above categories. The CXR is performed mainly to exclude pulmonary tuberculosis, an infection of major public health concern.

A number of Western European and North American countries require that individuals travelling

to their countries from areas with high prevalence of PTB undergo a CXR. Australia is another country with such requirement. This study, sought to find out whether there was justification for routine chest radiographs to continue being performed considering the financial implications and radiation burden to the patient.

Medicine is a dynamic field. Periodic evaluation of current practices is vital. There is scanty evidence in literature of studies done to justify continued inclusion of a chest radiograph as part of routine medical examinations. In Kenya, no such study has ever been carried out.

It is not possible or practical to shield the radiosensitive tissues of the thyroid or breast as this would render the procedure obsolete as a radiologist would want to check for pathology; these

being the cervical spine and the lungs. Inevitably therefore, these glands cannot be shielded from radiation.

MATERIALS AND METHODS

A descriptive study was undertaken between October 2011 and March 2012. The study population consisted of all those individuals referred for routine chest radiographs in the radiology departments of Diagnostic Imaging and Radiation Medicine, University of Nairobi and Kenyatta National Hospital during the study period. Other centres were Plaza Imaging Solutions and The Nairobi Hospital. Both are leading Private imaging centres within of Nairobi.

Although the main catchment area is Nairobi, many of the individuals radiographed came from the surrounding counties. Routine chest radiographs reports signed by a qualified and experienced radiologist were reviewed. All the radiographs were reported by radiologists with more than ten years of experience.

The abnormal chest radiological findings were recorded as the variable outcome. The spectrum of the abnormal findings was determined. The main reason for the chest radiograph was also recorded.

Chest radiograph reports that did not include the age and sex of the patient were excluded from the study. Also excluded were radiographs where clinical signs and symptoms indicated chest disease. These were not classified as routine medical examinations (RME).

RESULTS

A total of 402 chest radiograph reports were examined. The males were 208 accounting for 51.7% of the total population. The females were 194 making 48.3% of the study population.

Socio-demographic characteristics

Age and sex: Overall mean age was 29.7 years. The 25th and 75th percentiles are 19 years and 38 years respectively with a lower range of four years to an upper range of 63 years. The oldest participant was 86 years of age. A few outliers were noted.

When stratified by sex, male participants had the youngest at 4 years and oldest at 61 years, with the 25th percentile and 75th percentile at 19 and 39 years respectively. Among the female participants, 19 years fell on the 25th percentile, while the 75th percentile was the 37 year.

Age difference between male and female was not found to be significantly different ($p=0.7$). The 13-34 age-group had the most radiographs (265) accounting for 65.9%. This can be attributed to the fact that most of the Kenyan population is young and that most of the people migrating and travelling abroad for studies

are young people in this age bracket.

Prevalence of abnormal results by sex: More males than females had abnormal x-ray results (18% v 13%), with about 16% of the total population having abnormal results. This difference however was not statistically significant ($p=0.13$).

Prevalence of abnormal results by age groups: A significantly higher population studied was aged between 12 and 34 years. Not surprisingly therefore, 8% of all abnormalities fell within this age group. The difference in prevalence of abnormal x-ray result was significantly different when stratification by age was done ($p<0.01$.)

Sixty three chest radiographs had a total of eighty one abnormalities. This is because in some individuals a single radiograph had two or more abnormalities. For analysis, these abnormalities were grouped into six groups. Focal lung fibrosis represented on the CXR by a focal fibrotic streak or tenting of the hemidiaphragm accounted for 38.3% of the pathological lesions. Only two cases of cardiomegaly were present (2.5%). A calcified focus possibly representing a healed previous infection occurred in 11 radiographs which is 13.6% of the cases.

Only three radiographs had unfolded aorta as a pathological findings. The ages of the patients were 86, 61 and 59 years reflecting the possibility of age (senile unfolding) as a possible etiology

Reason for routine chest radiographs: Migration and travel accounted for most of the chest radiographs at 377. This accounted for 93.8% reflecting the fact that the study centres received a lot of referrals from International Organisation for Migration (IOM). Periodic medical examination accounted for only 1% which may reflect the fact that in Kenya, the issue of healthy people visiting their doctors for routine medical check-up is still at a nascent stage.

DISCUSSION

The prevalence of abnormal findings was higher in this study than in a study done in Germany for preemployment chest radiographs which involved 1760 participants. Of these 94.8% were normal (1). The study findings compare with a similar one by Krarup, K. C. *et al* who retrospectively reviewed 1994 CXR soft new employees of Leicestershire Health Authority to assess the use of this tool to detect and prevent PTB. No evidence suggestive of PTB was found in all the radiographs (2).

A chest radiograph examination exposes the individual to ionising radiation of about 0.1 millisieverts (mSv) (3) and (4). Other investigators have calculated similar figures (5). Although other authors have found higher doses of more than 1mSv

in some situations (6), 0.1mSv is generally accepted as the average dose sustained in a routine radiograph.

This should not give a false sense of security. The fact is radiation dose is cumulative. The younger one is therefore the higher the risk of a greater cumulative dose due to multiple radiographic exposures. No one should be exposed to the tiniest dose of radiation unless it is absolutely necessary.

There is an increased risk of malignancy following exposure to ionising radiation. Several epidemiological studies have confirmed this relationship especially in areas that have experienced nuclear disasters. Tronko *et al* has described radiation induced thyroid cancer in Ukraine following the Chernobyl nuclear accident (7).

One author has vividly described radiation from medical imaging as 'a silent harm' (8) Despite these facts, many members of the public and even doctors do not fully appreciate the dangers posed by radiation. Bosanquet, D.C., *et al* working in the United Kingdom showed that doctors of all grades have a very poor knowledge of radiation exposure even with the most common investigations (9).

Further, many doctors are not even aware of the cost of a chest radiograph (10). The financial implication to the patient is therefore not in mind when ordering what they consider a simple and routine examination.

Writing in the Journal of the National Medical Association, Lohiya, G. S., *et al* concluded that preemployment chest radiographs are not useful, gave the client unwarranted radiation and the employer a false sense of security (11). The study concluded by terming routine chest radiographs futile and recommending periodic review of long established procedures.

Sebro, K., *et al* performed a cross-sectional retrospective study of 12,662 chest x-ray reports collected over an eight year period (1989- 1997) from prospective University students. No active PTB was noted in this study at the University of West Indies. Three hundred and ninety nine findings which were classified as clinically insignificant were reported. These included calcified foci and mild scoliosis. The study recommended the discontinuation of such examinations noting that they posed unnecessary radiation to students joining university (12).

In conclusion, the yield of routine chest radiographs to detect active tuberculosis among asymptomatic Kenyans is extremely poor.

We recommend the usefulness of routine chest

radiographs in Kenya need to be reconsidered due to the poor yield of significant positive findings. The practice of carrying out routine chest radiographs should possibly be stopped. Only those patients who are symptomatic warrant a chest x-ray.

The concerned authorities should devise a more sensitive screening method for pulmonary tuberculosis. A normal chest radiograph may give a false sense of security. A laboratory screening method may yield higher results. The authors propose a larger study to include a larger part the country and get a bigger sample size. This would increase the level of confidence before major policy changes are affected.

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