The routine pre-employment screening chest radiograph: Should it be routine?

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Abstract

Background and Objective: A routine chest radiograph is mandatory in many institutions as a part of pre-employment screening. The usefulness of this has been studied over the years keeping in mind the added time, cost, and radiation concerns. Studies conducted outside India have shown different results, some for and some against it. To our knowledge, there is no published data from India on this issue. **Materials and Methods:** A retrospective review of the reports of 4113 pre-employment chest radiographs done between 2007 and 2009 was conducted. **Results:** Out of 4113 radiographs, 24 (0.58%) candidates required further evaluation based on findings from the screening chest radiograph. Out of these, 7 (0.17%) candidates required appropriate further treatment. **Interpretation and Conclusions:** The percentage of significant abnormalities detected which needed further medical intervention was small (0.17%). Although the individual radiation exposure is very small, the large numbers done nation-wide would significantly add to the community radiation, with added significant cost and time implications. We believe that pre-employment chest radiographs should be restricted to candidates in whom there is relevant history and/or clinical findings suggestive of cardiopulmonary disease.

Key words: Chest radiograph; pre-employment; routine; screening; usefulness

Introduction

A routine pre-employment chest radiograph is followed by many institutions across the world to assess the medical fitness of their prospective employees. In our country, pre-employment chest radiograph is routinely done in many large private as well as government owned facilities.[1,2] There has been a lot of discussion regarding the usefulness or the futility of routine chest radiographs as part of screening of prospective employees, with some studies concluding in favor[3,4] and others against such practice.[5-15] To our knowledge, there is no published data from India on this subject.

Access this article online	
Quick Response Code:	Website: www.ijri.org
	DOI: 10.4103/0971-3026.190409

Materials and Methods

This study was a retrospective review of the reports of chest radiographs and data analysis conducted between January 2007 and December 2009 at our tertiary referral medical college hospital.

Retrospective review of reports of routine chest radiographs that were archived in the hospital PACS system was done. The hospital medical records numbers of all who underwent a pre-employment medical check-up were collected and reports of chest radiographs were reviewed. Data was

Cite this article as: Samuel VJ, Gibikote S, Kirupakaran H. The routine pre-employment screening chest radiograph: Should it be routine? Indian J Radiol Imaging 2016;26:402-4.

entered into spreadsheets under various sub-headings. All abnormalities were recorded irrespective of the severity or the effect of the abnormality on the employment of the individual. The study was approved by the Institutional Review Board.

Results

A total of 4113 individuals were finally included in the study. The age range was from 18 to 48 years with an average age of 27.9 years, with nearly equal representation from both genders. The data represented different strata of society as they were for vacancies in all cadres (from housekeeping staff to highly specialized doctors).

The total number of abnormalities was 202. The abnormalities were categorized as skeletal or chest wall, active infection or inflammation, cardiovascular, calcified lymph nodes, lung parenchymal lesions, and miscellaneous, as presented in Table 1. Out of these, 24 (0.58%) candidates underwent further evaluation based on findings on the chest radiograph. The breakdown was consolidation – 7, hilar and mediastinal adenopathy – 4, bronchiectasis – 3, paratracheal ganglioneuroma – 1, pleural based Schwannoma – 1, pleural effusion – 1, pleuropericardial cyst – 1, suspicious for resolving pneumonia – 1, chronic obstructive pulmonary disease – 1, and lung nodules – 4.

In our study, the most common finding was post-inflammatory change (scarring), and the other common findings were cervical rib, scoliosis, and signs of tuberculosis or old tuberculosis. The total number of these common findings together was 136/4113 (3.3%).

Table 1: Categories and abnormalities seen on routine pre-employment chest radiographs

Category	Abnormality
Skeletal or chest wall	Bifid rib, cervical rib, decreased space between ribs, hypoplastic ribs, old fracture, osteophytes, pectus excavatum, reduced vertebral height, scoliosis, Sprengel's shoulder, sternotomy
Active infection or inflammation other than lung parenchymal pathology	Hilar/mediastinal nodes, pleural effusion
Cardiovascular	Azygos fissure, cardiomegaly, prominent pulmonary conus, right-sided aortic arch
Calcified lymph nodes	Calcified lymph nodes
Lung parenchymal lesions	Benign calcific focus, bronchiectasis, chronic bronchitis/COPD, consolidation, lung nodule, post inflammatory changes, resolving pneumonia, scarring
Miscellaneous	Diaphragm abnormalities, pleural lipoma, pleural based Schwannoma, paratracheal ganglioneuroma, Morgagni hernia, pleuropericardial cyst, residual thymus, and gynecomastia

On further evaluation, 4 candidates were found to be positive for active tuberculosis, 2 candidates were found to have pulmonary hypertension, and 1 candidate underwent computed tomography, which showed a paratracheal mass, which was operated and reported as ganglioneuroma histopathologically. In total, 7 candidates needed further medical management while all the other abnormalities were found to be insignificant. Hence, the percentage of abnormality was 4.9% (202/4113), and the percentage of individuals needing further medical intervention was 0.17% (7/4113).

Discussion

Pre-employment chest radiographs have been a point of debate and researchers have come up with results for as well as against it. A study done in Taiwan Industrial Park with a large sample of 17105 participants found that 22 participants showed positive findings suggestive of pulmonary tuberculosis.[3] In a study done in Africa covering 7 private institutions as a part of the routine check-up for new job applicants over a period of 5 years, 168 out of 2540 (7%) showed abnormalities.[4] These authors were in favor of routine pre-employment screening radiographs. In a few other studies, as mentioned below, the results were against it. Tigges *et al*. reported that, out of 1282 radiographs that were done for routine or screening purposes, 15 chest radiographs showed major abnormalities. Fourteen of the 15 findings of major abnormalities (lung nodules, mass, atelectasis, and mediastinal lymphadenopathy) proved to be false-positives. No disease requiring treatment was diagnosed as a result of radiographic findings. The total cost for follow-up radiography and computed tomography was also very high.[5] Jachuck *et al*. reviewed 1000 prospective chest radiographs performed as pre-employment screening for NHS recruits and detected abnormalities in 8, out of which only 1 affected the employment of the individual. They also noted that the cost involved was very high for such a small detection rate and recommended against it.[6] Ladd *et al*. also found the detection rate in routine pre-employment chest radiographs was too low where 5 out of 1760 cases were "relevant" and none of these affected employment. They concluded that this practice is expensive and could also be in violation of European law.[7] Lohiya *et al*.[8] and Abuchi *et al*.[9] also agree with the conclusion that use of routine chest radiographs is futile. Anne Cockcroft found that, out of 640 applicants, more than one-third underwent routine pre-employment chest radiographs specifically for tuberculosis for employment in the NHS and no cases of tuberculosis were detected, and hence, recommended against it.[10] Ashenburg *et al*. conducted a retrospective analysis of 3266 pre-employment chest radiographs during recruitment for Eastman Kodak Company and found that only 25 (0.7%) had relevant findings and only 2 were rejected based on the radiographs findings; they suggested that a

radiograph should be done only if required based on the clinical findings and past history.[11] Two large studies, one done in Pakistan by Saima Naz *et al*. with a sample size of 63648, only 1368 (2.15%) showed significant abnormality leading to the candidates being declared unfit,[12] and in the other carried out in Malaysia by Izamin Idris *et al*., which included chest radiographs of more than 63% of 8315 individuals, showed the percentage of abnormality to be only 0.25%.[13] Both these studies concluded that conducting routine chest radiographs is not recommended. The American College of Radiology proposed that the appropriateness of chest radiography goes up only in cases where there is a strong clinical indication or suspicion of cardiopulmonary disease and concluded that routine chest radiographs are inappropriate in the absence of any clinical concern.[14] Akinola *et al*. also reiterated this fact concluding that, only in cases with suspected chest abnormalities, the percentage of abnormality was high, and hence suggested that the use of routine pre-employment chest radiographs should be reserved to cases where it is clinically indicated.[15]

In our tertiary level hospital, current practice is similar to that being followed in many parts of the country where new job applicants undergo a chest radiograph as part of the pre-employment medical checkup. In our study, the percentage of abnormality detected was 4.9%, and the percentage that needed further medical intervention (significant abnormality) was only 0.17%. The total number of participants (4113) is larger than many studies that have concluded in favor of rejecting routine pre-employment screening.[3,4] As our participants included applicants for vacancies in all cadres ranging from housekeeping, technical, nursing, and highly specialized doctors, we can assume that the data represents a fairly wide spectrum of the society. A limitation of our study is that, as the radiographs were reported by different radiologists, there is a possibility that minor abnormalities may not have been mentioned by all, if they were considered clinically insignificant.

Although the amount of radiation that one is exposed to during a chest radiograph is fairly low (0.02 mSv), considering such a low yield rate, this is unnecessary radiation for the large majority of individuals. Considering the large numbers being done currently throughout the country, it would add significantly to the community radiation. The cost involved and time required for the test and its interpretation were not calculated in this study, but it would be significantly high when considered on a national scale.

We believe that a chest radiograph has no place in routine pre-employment medical screening. We recommend that a chest radiograph as a screening tool be restricted to those with history or clinical findings suggestive of thoracic disease.

Acknowledgement

The author and the co-authors acknowledge the medical records staff and the PACS engineer for their help in acquiring patient demographic details.

Financial support and sponsorship

No grants were taken and the PACS system was used from the department of Radiology at the hospital where the study was done.

Conflicts of interest

There are no conflicts of interest.

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