



CODEN [USA]: IAJ PBB

ISSN: 2349-7750

INDO AMERICAN JOURNAL OF PHARMACEUTICAL SCIENCES

<http://doi.org/10.5281/zenodo.1336296>

Available online at: <http://www.iajps.com>

Research Article

CHEST X-RAY DIAGNOSTIC ACCURACY THROUGH HRCT (HIGH RESOLUTION COMPUTED TOMOGRAPHY) IN THE CASES OF INTERSTITIAL LUNG DISEASE

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Abstract:

Objective: The research was aimed to find Chest "X – Ray" diagnostic accuracy in the patients of interstitial lung disease through chest HRCT "High Resolution Computed Tomography).

Material and Method: This research was cross-sectional which was carried out at Services Hospital, Lahore in Diagnostic Radiology Department (September, 2016 to May 2017). There were a total 137 patients of both genders having clinical suspicion of the (ILD) i.e. interstitial lung disease of age from 20 to 50 years were made to study. Those patients along with h/o past histopathological diagnosis, taking treatment already & women who were pregnant were excluded from study. The patients had chest x-ray & HRCT and findings were recorded in the form of presence or the absence of (ILD).

Results: Average age was ranging between 40.21 ± 4.29 years. Out of 137 subjects, the ratio was as: 79 at 57.66 percent males & 58 at 42.34 percent females. The female to male ratio was "1:1.36". ILD was identified through Chest "X – Ray" in eighty subjects at 58.39 percent patients in which 72 being true +ve had (ILD) & eight being false +ve were without (ILD) on (HRCT). The final sensitivity, diagnostic accuracy of chest x-ray, -ve predictive value, specificity & +ve predictive value in diagnosing (ILD) was found 80.0 percent, 81.02 percent, 90.0 percent, 82.98 percent and 68.42 percent respectively.

Conclusion: The research finally concluded that chest x-ray is a simple, economical, non-invasive & easily available alternate choice to (HRCT) along with an acceptable diagnostic accuracy of eighty-one percent in all the diagnosis of (ILD).

Keywords: HRCT, Chest x-ray, Non-invasive, Interstitial lung disease,

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Please cite this article in press Muhammad Haziq Khan *et al.*, *Chest X-Ray Diagnostic Accuracy through HRCT (High Resolution Computed Tomography) In the Cases of Interstitial Lung Disease.*, *Indo Am. J. P. Sci.*, 2018; 05(07).

INTRODUCTION:

Interstitial lung diseases are combinations of several pulmonary diseases which have many differences in terms of natural history, pathologic features, causes, presentation, clinical presentation and imaging. It was uncommon in the past while it is quite common now according to epidemiologic investigations and it is due to many environmental causes [1].

In case when clinicians ignore initial symptoms or consider them to common lung diseases like (COAD) i.e. chronic obstructive pulmonary airway disease then the identification of (ILD) can be delayed. The spread rate of (ILD) was observed 76 percent in all those patients presenting with the chronic pulmonary disease in a research [2]. The identification of (ILD) needs a complete exposures workout, life style, clinical presentation, drugs and occupational history establishing clinical context [3]. In this regard greater than sixty percent cases are found idiopathic [4].

The rest of the cases can be caused due to many parenchymal lung disorders along with a variety of environmental or occupational factors in which pulmonary aspiration, radiation therapy, smoking, drugs, neoplasms & systemic diseases along with pulmonary involvement are included [2, 4]. Though (ILD) normally appears in adults but it may be observed in children as well. Some (ILDs) are found in young age like autoimmune pulmonary disorders, sarcoidosis & pulmonary Langerhans's cell histiocytosis while (IPF) idiopathic pulmonary fibrosis normally presents in the age ranging from "40 – 70" years.

Another disease is (IPF) familial where two or more than two; 1st degree linked families are involved & fibrosis start appears in relatively young age. Mortality rate of (ILD) & incidence rate have a direct proportion to age [5, 6]. The Chest (X-Ray) is the 1st line inquiry of pulmonary disease of any nature. Numerous interpretation of (such as radiographs of plain chest) are available to identify it with more correction. But the limited spatial resolution & superimposition of many structures, the confident identification of (ILD) is disturbed by the in-built limitations of chest radiographs [7].

The (CXR) i.e. chest radiograph is easily provided, non-invasive investigation and in- expensive while its specificity, sensitivity & accuracy has been declared to be 82 percent, 47 percent & 77 percent respectively for identification of (ILD) by the (Padley *et al.*) [8]. Heavy resolution CT) invention, that is HRCT, has developed the skill for the identification of (ILDs) characterisation.

HRCT is demonstrated during the initial work up of patient with better clinical suspicion or CXR features which are in fact suggestive of (ILD) [9]. It has much big sensitivity as compare to plain radio graph to identify (ILD) & specific imaging patterns can also assist in the characterization & assessment of (disease activity) as well [9].

Because of discrepancy among international & local data so the research was thought to produce more & more local data and it helped us to know diagnostic accuracy of (CXR) in ILD in our local population. It was observed very less previously but now we have found its diagnostic accuracy in local population because expenses of HRCT are not affordable to them.

All patients could be given simple, non-invasive, economical, & readily available alternate choice to HRCT along with reduction in the patient radiation dose.

MATERIAL AND METHODS:

This research was cross-sectional which was carried out at Services Hospital, Lahore in Diagnostic Radiology Department (September, 2016 to May 2017). The size of sample was total 137 cases with expected prevalence of ILD as 76 percent, 11 percent for specificity, 95 percent confidence level and a 10.5 percent margin of error for sensitivity. It was to take specificity of (x-ray chest) and sensitivity in (ILD) as 82 percent & 47 percent respectively.

Taking approval from the ethical review committee a total of 137 patients were referred to the radiology department for HRCT to scan with the clinical suspicion of (ILD) of age 20 to 50 years of both genders. They were enrolled by non-probability convenience sampling method. After taking informed consent & history in which any drug intake & smoking and h/o occupation are included. Then the patients had their CXR on Shimadzu x-ray system run at 800 mA before HRCT examination assessment in which (HRCT) & (CXR) was double blinded.

Every CXR was evaluated by consultant radiologist for the presence & the absence of (ILD). After it patients experienced imaging of HRCT on whole body through CT scan machine. A consultant radiologist reviewed the HRCT & data was recorded on a form having 2 parts.

SPSS was used to analyse data. HRCT findings were calculated in which presence or absence of (ILD) were included. A table of (2 × 2) contingency helped in the measurement of specificity, sensitivity, +ve and -ve predictive value & also chest (X-ray)

diagnostic accuracy to diagnose (ILD) in which HRCT was taken as gold standard.

RESULTS:

Average age was ranging between 40.21 ± 4.29 years. Out of 137 subjects, the ratio was as: 79 at 57.66 percent males & 58 at 42.34 percent females. The female to male ratio was "1:1.36". ILD was identified. Detailed outcomes have been displayed in tabular and pictorial form below:

through Chest "X – Ray" in eighty subjects at 58.39 percent patients in which 72 being true +ve had (ILD) & eight being false +ve were without (ILD) on (HRCT). The final sensitivity, diagnostic accuracy of chest x-ray, -ve predictive value, specificity & +ve predictive value in diagnosing (ILD) was found 80.0 percent, 81.02 percent, 90.0 percent, 82.98 percent and 68.42 percent respectively.

Table – I: Summary of results

Results	Positive result on X-Ray (True positive and False positive)	Negative result on X-Ray (False positive and True Negative)	P-Value
Positive result on HRCT	72 (TP)	18 (FN)	0.213
Negative result on HRCT	8 (FP)	39 (TN)	

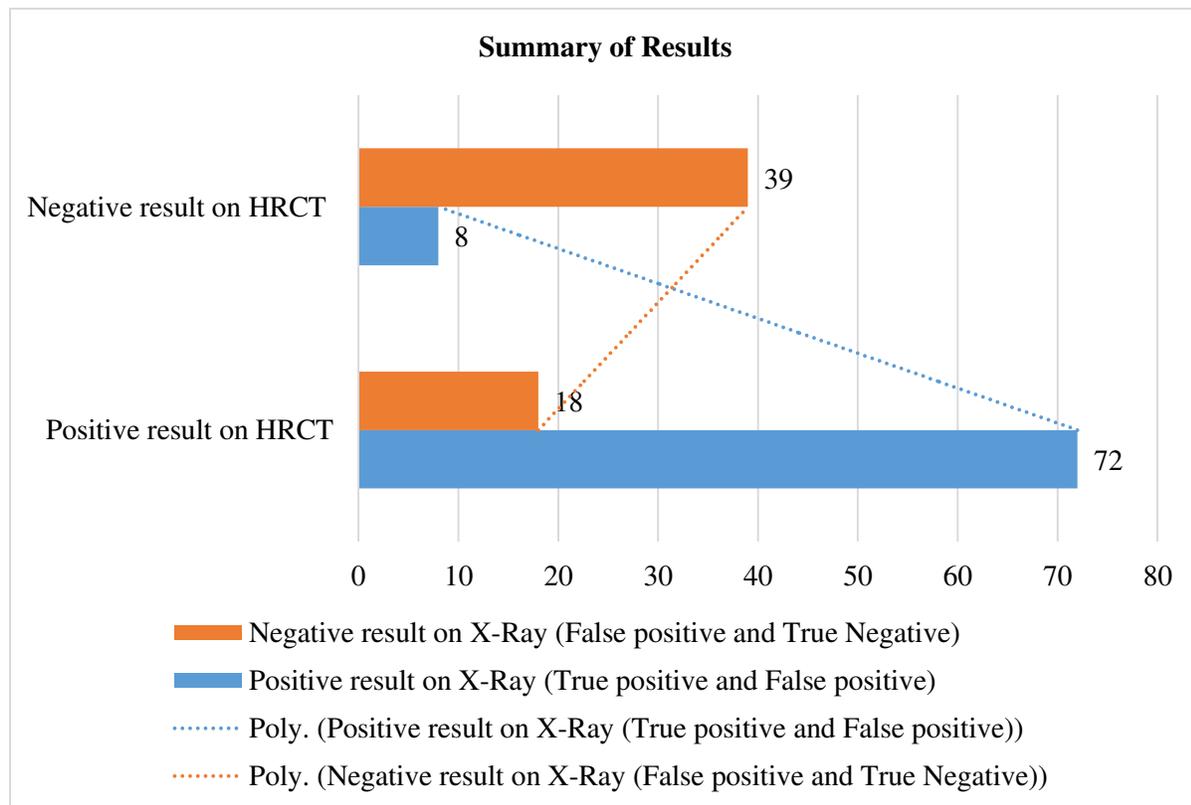


Table – II: Stratification of male gender (n=79)

	Positive result on X-Ray (True positive and False positive)	Negative result on X-Ray (False positive and True Negative)
Positive result on HRCT	39 (TP)	11 (FN)
Negative result on HRCT	3 (FP)	26 (TN)

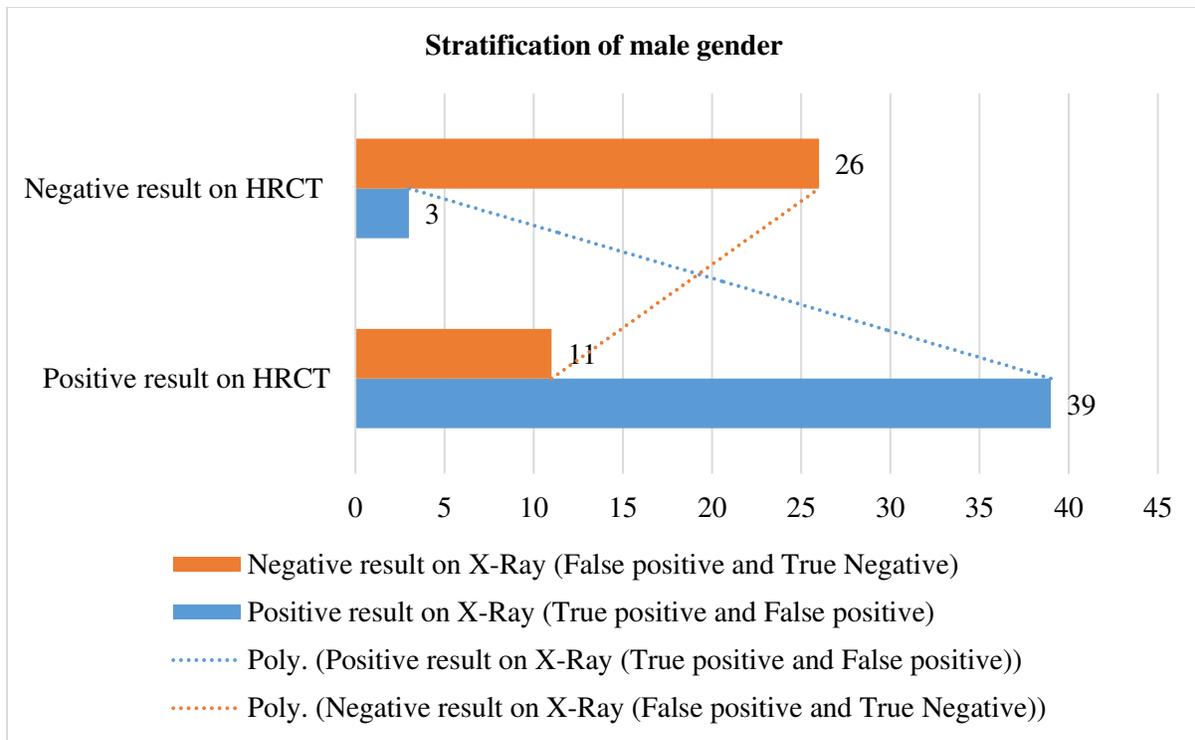


Table – III: Stratification of female gender (n=58)

	Positive result on X-Ray (True positive and False positive)	Negative result on X-Ray (False positive and True Negative)
Positive result on HRCT	33 (TP)	7 (FP)
Negative result on HRCT	5 (FP)	13 (TN)

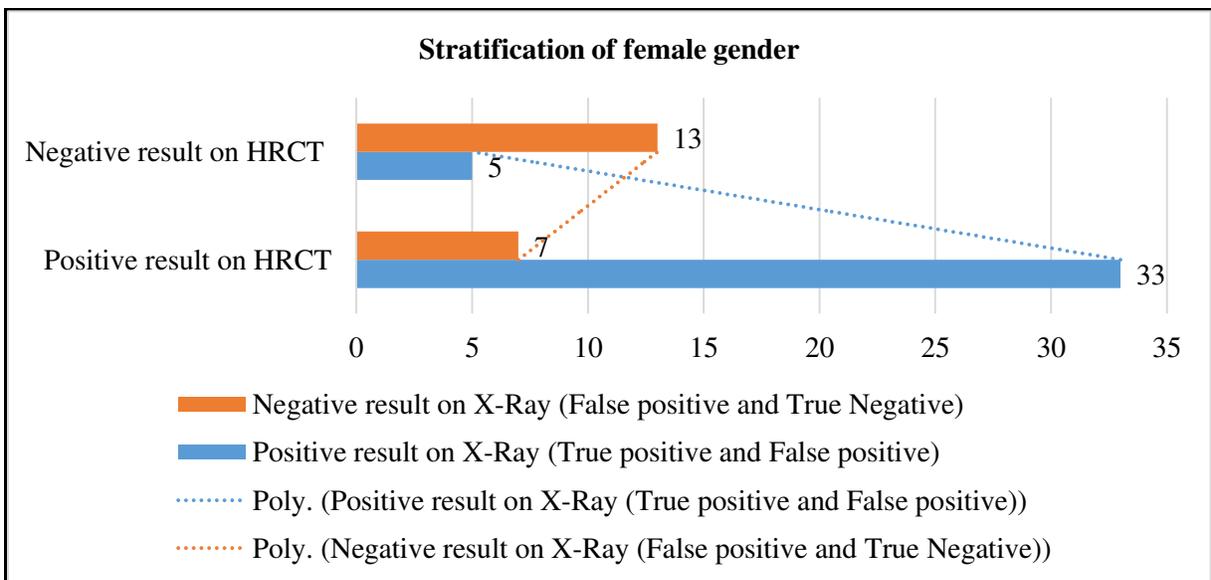
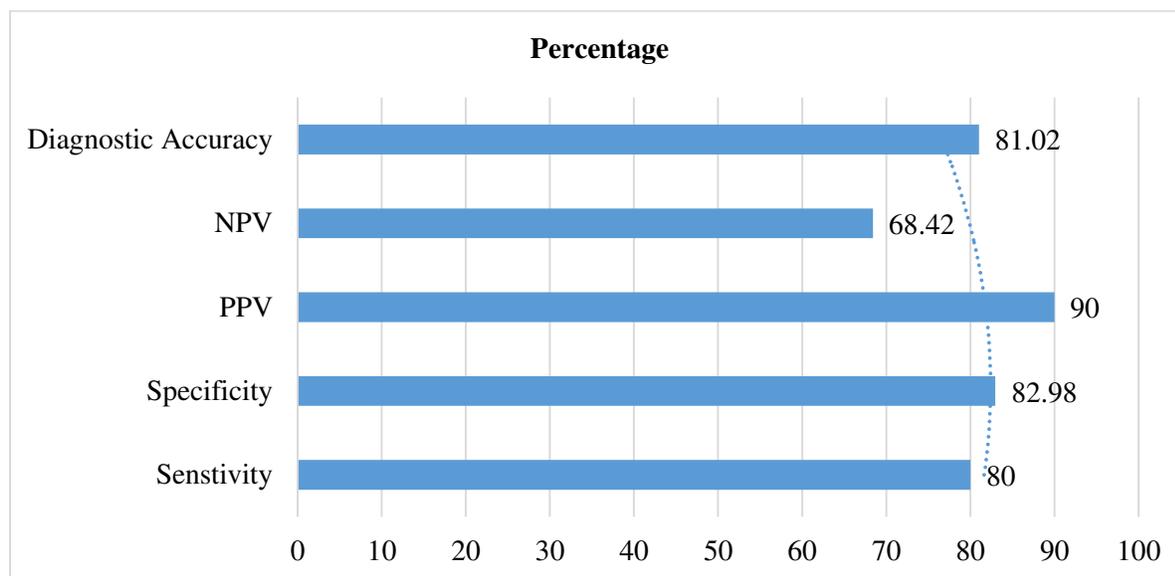


Table – IV: Diagnostic accuracy of X-ray chest in diagnosing interstitial lung disease

Outcomes	Percentage
Sensitivity	80
Specificity	82.98
PPV	90
NPV	68.42
Diagnostic Accuracy	81.02



DISCUSSION:

In the present years, several improvements are there in interpretation of plain chest radiographs. Few researches are performed to compare (plain chest radiography) & (HRCT) in the specific interstitial diseases as silicosis, ankylosing spondylitis, systemic & sclerosis. The whole gamut of (ILDs) as a group yet not studied mostly [10].

A research carried out on (progressive systemic sclerosis) shows (HRCT) was much sensitive in comparison to the chest radiography. It was only possible while assessing the minimal involvement of the interstitial lung in numerous cases [11]. HRCT was found more superior than the related imaging modalities along with enhanced parenchymal abnormality clarity [12].

A study conducted on (idiopathic pulmonary fibrosis) patients reveals through (HRCT) that it can assist in timely cure and detection than conventional modalities such as radiography [13]. Conventional radiography is in-effective in identifying the early changes in parenchymal & little opacities of (silicosis) in patients against (HRCT) [14].

Plain (CXR) is among the baseline (respiratory

symptoms) modalities. All imaging (ILD) characteristics are usually delicate & may be ignored if performed by an un-experienced radiologist. If it is provided not with a special referral, (HRCT) chest scans should be ordered in all cases of clinical suspicion of (ILD).

The HRCT makes use of thin section C.T images & greater spatial frequency algorithm which means it has greater spatial & contrast resolution than routine C.T [15]. Average age was between 40.21 ± 4.29 years with mostly 48.17 percent of age from 41 to 50 years. The results are comparable to study of Shabbier et al & Gagiya et al who observed average age of 41 & 43 years respectively [16, 17].

Most of the (ILD) have long history & normally present in old age adults in 6th or even more decades of their lives. Few (ILDs) types like connective tissue disease, sarcoidosis, lung disease & other inherited disease of lung is observed at young age [18, 19] & sexual predilections can also be observed in few (ILDs).

IPF affected cases proportion in male to female is 1.5:1 ratio; whereas, while LAM & PTS (pulmonary tuberous sclerosis) primarily endangers the females [20]. A study by Bernalillo guessed that (31.5

patients / 100000 years) in & (26.1 patients / 100000 years) in males and female respectively [21].

The (CXR) ignores abnormalities in (twenty percent) of patients [4]. CXR has its specificity, sensitivity & accuracy have been declared to be 82 percent, 47 percent & 77 percent respectively for diagnosing (ILD) as shown by (Padley SPG et al) [8].

A study by Coutinho et al² showed that specificity, sensitivity, +ve & -ve predictive values for the x-ray identification of (ILD) were observed to be respectively (90 %, 70 %, 62.3 % & 93 %).

Various patterns can be observed through radiography of the chest such as reticular, curvilinear densities, diffuse opacities with lower lobe predilection and linear netlike appearance. Presence of multiple cystic, honeycombed areas or coarse reticular pattern beside translucencies have an association to poor diagnosis at an advanced level of the disease.

The pleural is not usually common & its presence shows few other diagnosis [24]. A research on forty-nine subjects by (Tahbaz et al 25) observed only three at 6.1 % involvement of reticulonodular on the x-ray of chest but (HRCT) reflected about involvement of pulmonary parenchymal in thirty-two at the rate of 65.3 percent cases & showed just (three true +ve), (29 false -ve), 0 false = ve & (17 true -ve) cases. A conclusion showed less sensitivity of (chest x-ray) of just 9.5 percent while in this research, specificity was observed as (100 percent).

The (CXR) is primary investigation but due to in-built limitations as super-imposition of structures & poor spatial resolution, clear imaging features may not be observed [26]. It was also evaluated by (Grenier et al 27) that chest radiography diagnostic value & computed tomography's high resolution in ILD (chronically diffused) in 140 consecutive cases beside lung diffused infiltration observed through radiography.

Having no knowledge of any pathologic & clinical data, all radiographs & (C.T) scans were read by 3 independent observers. The 1st choice identifications of all 3 observers with confidence was 75 % probability, were correct through C.T as compare to radiography as ($p < 0.001$). All the inter-observer plans of supposed identifications were clearly quite better with higher resolution (C.T) in which ($p < 0.001$).

CONCLUSION:

The research finally concluded that chest x-ray is a simple, economical, non-invasive & easily available alternate choice to (HRCT) along with an acceptable diagnostic accuracy of eighty-one percent in all the diagnosis of (ILD).

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