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A study of Radiographic Features and Patterns of Pulmonary Tuberculosis: HRCT

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ABSTRACT

Background: *PTB is becoming more prevalent across the world. A significant research area would seem to be the evaluation of PTB findings on HRCT.*
Objective: Using the high-resolution computed tomography to investigate pulmonary tuberculosis in patients.
Material and Methodology: *A cross-sectional study was carried out at Al-Amin diagnostic center, Gondal Hospital, and Chattha Hospital. Each patient accomplished a written informed consent form preceding the HRCT examination. In this study, 103 patients had the procedure; all of them had PTB, and the results of their examinations were analyzed using HRCT. The mean age of the patients was 49.9. The eligibility of the patients was assessed using the inclusion criteria.*
Results: *Consequences from 103 patients with PTB revealed that n=64 (62.1%) were men and n=39 (37.9%) were women, with the highest ratio being n=19 (18.4%) among patients in the 31–40 age range. The most frequent clinical symptom of PTB was Productive cough (22.5%). The respective HRCT findings were revealed in the cases under investigation nodules 17.4% and cavitation 15.4%.*
Conclusion: In the investigation, PTB impacted men and patients in the 31–40 age groups more frequently than women. The predominant HRCT findings of patients among PTB were nodules, cavitation, and lymphadenopathy. The HRCT outcomes were more closely related to the right lung and right superior lobe.
Keywords: Nodules, High-Resolution Computed Tomography, Lymphadenopathy, Cavitation, Pulmonary Tuberculosis.

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INTRODUCTION

Pulmonary tuberculosis (TB), a prevalent disease that is also a medical and social problem, is what leads to high mortality and morbidity, especially in underdeveloped countries. [1] The tubercle bacillus and other members of the M. tuberculosis complex are the etiology of TB. [2] A significant risk to their health exists for 10% to 20% of persons who acquire the infection and then proceed to develop active TB. The remaining patients have latent TB, which can become active when an immune system is weakened. [3] TB can also infect other organs. [4],[5]

Pulmonary tuberculosis prevalence varies according to gender and location. [6] Active cases of pulmonary tuberculosis (PTB) seem to be more probably to be misdiagnosed,

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which promotes the disease's spread. The possibility to stop the disease from spreading is lost with each unidentified case and each missed diagnosis. The patient's risk of complications and death is also increased by delays. [7] Increased community dissemination, high mortality, and deteriorating TB symptoms have all been associated with delays in diagnosis and treatment. [8] Primary tuberculosis patients are considerably more inclined to have few or no symptoms. Lethargy, irritability, weakness, unusual fatigue, headache, and weight loss are potentially significant symptoms. When caseation necrosis occurs and the caseation liquefies, the patient often experiences cough and sputum, which are generally characterized by mild hemoptysis. Pleuritic chest pain might be localized. Shortness of breath usually occurs later in the disease's progression and indicates a severe condition with widespread lung involvement. [9] Important risk factors for spreading infection were early age, severe malnutrition, absence of BCG immunization, contact with an adult who had positive sputum tests, and exposure to ambient cigarette smoke. [10] Therapeutic success was observed by 67.8% of PTB patients who had never been treated before and those who had. [11] Timely and effective TB management, which can cure the patient, prevent future transmission, and eliminate drug resistance, is a key component of TB control. [12] Along with ensuring proper medical treatment and a reduction in mortality, limiting the spread of infectious TB patients is one of the main goals of tuberculosis (TB) preventive efforts in countries with high TB prevalence. [13][14][15]

Fig 1: 31-year-old showed Left and right lungs; both feature a tree-in-bud pattern.

On a CT scan, the cavity's wall may appear thick, thin, smooth, or irregular. A standard air level is in the hollow. [16][17] the most obvious radiographic characteristic of primary TB is lymphadenopathy. A focal hypodense region with lobular and mediastinal nodes on an improved CT scan indicates the diagnosis. [18] Approximately half of the patients had cavitation, which is a defining aspect of post-primary. [19]

MATERIAL AND METHODOLOGY

At Chattha Hospital, Gondal Hospital, and Al-Amin Diagnostic Center, a cross-sectional research was conducted. Prior to the HRCT test, each patient turned in a signed informed permission form. The research period involved the recruitment of 103 patients using

a practical sample method. The sample size was calculated using the reported mean of relevant prior research [20, 21,22]. All of the patients were diagnosed with PTB, and the results of their HRCTs were analyzed. The average age of the patients was 49.9. 31 to 40 was the most impacted age range. All patients with ages between 15 and 85 were included, and both genders were represented (male and female). Extrapulmonary TB was the study's exclusion criterion. A standardized questionnaire that queried the patient's age and gender, clinical presentation, and HRCT results were used to gather the information. In general, the entire lung was scanned using a multidetector 64-slice CT scanner (Toshiba and GE Lightspeed) with a thickness and interval of approximately 5mm. The participation of the patients was assessed using the inclusion criteria. Depending on their eligibility for the inclusion criteria, all patients were assessed. By the data collecting sheet, HRCT results were gathered. After being entered into a Word spreadsheet, the gathered information was transcript into an SPSS spreadsheet.

RESULTS

A cross-sectional study of 103 patients with Pulmonary Tuberculosis was conducted. Results were evaluated by the data of patients obtained by a data collection sheet used to collect various information. These variables were age, gender, sign and symptoms, HRCT findings, lung involvement, and affected lobes. The current study showed that the average age was 49.9 and the most affected gender was male. The frequency of signs and symptoms showed that productive cough was the commonest symptom among pulmonary tuberculosis patients. HRCT evaluation demonstrated that nodules, cavitation, and lymphadenopathy were the commonest features.

Table 1: Age distribution

Age groups of patients		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	10-20	6	5.8	5.8	5.8
	21-30	15	14.6	14.6	20.4
	31-40	19	18.4	18.4	38.8
	41-50	17	16.5	16.5	55.3
	51-60	14	13.6	13.6	68.9
	61-70	17	16.5	16.5	85.4
	71-80	9	8.7	8.7	94.2
	81-90	6	5.8	5.8	100.0
	Total	103	100.0	100.0	

A cross-sectional investigation was undertaken on 103 patients with pulmonary tuberculosis. The average patient age, as shown in **Table 1**, was 49.9. The age distribution between 10-20 and 81-90 (5.8%) had the lowest patient rates, while the age range between 31-40 (18.4%) had the highest patient prevalence.

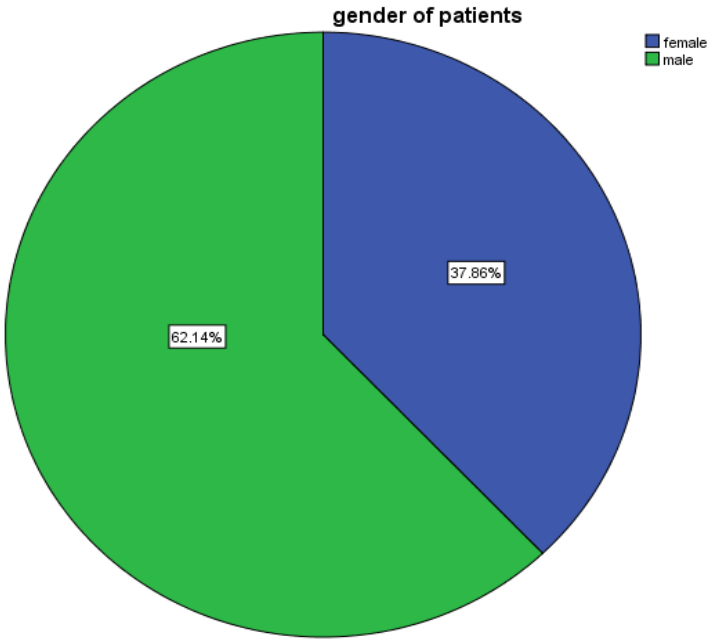

Fig 1: demonstrated the prevalence of the gender by the Pie chart. (N= 103)

Figure 1 represented the gender distribution. In the current study, males (62.14%) are more afflicted than females (37.86%).

Table 2: Illustrated pulmonary tuberculosis patients' clinical symptoms (N=103).

Sign and symptom of patients		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Productive cough	43	22.5	22.5	22.5
	Fever	38	19.9	19.9	42.4
	Shortness of breath	35	18.3	18.3	60.7
	Chest Pain	32	16.8	16.8	77.5
	Dry cough	20	10.5	10.5	88.0
	Weight loss	12	6.3	6.3	94.2
	Hemoptysis	8	4.2	4.2	98.4
	Fatigue	3	1.6	1.6	100.0
	Total	191	100.0	100.0	

The prevalence of signs and symptoms among individuals with pulmonary TB was presented in **Table 2**. In the current study, the signs and symptoms of patients with pulmonary tuberculosis were productive cough (22.5%), fever (19.9%), shortness of breath (18.3%), chest pain (16.8%), dry cough (10.5%), weight loss (6.3%), hemoptysis (4.2%), and fatigue (1.6%).

Table 3: HRCT findings

HRCT findings		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Nodules	53	17.4	17.4	17.4
	Cavitation	47	15.4	15.4	32.8
	Lymphadenopathy	44	14.4	14.4	47.2
	Ground glass opacities	38	12.5	12.5	59.7
	Consolidations	36	11.8	11.8	71.5
	Tree in bud pattern	33	10.8	10.8	82.3
	Interlobar thickening	21	6.9	6.9	89.2
	Fibrotic changes	18	5.9	5.9	95.1
	Bronchiectasis	15	4.9	4.9	100.0
	Total	305	100.0	100.0	

Table 3 of the current study exhibits 9 HRCT findings, with the percentages of each being as follows: nodules (17.4%), cavitation (15.4%), lymphadenopathy (14.4%), ground-glass opacities (12.5%). According to the findings, bronchiectasis (4.9%) had the lowest percentage, and nodules (17.4%) had the highest percentage.

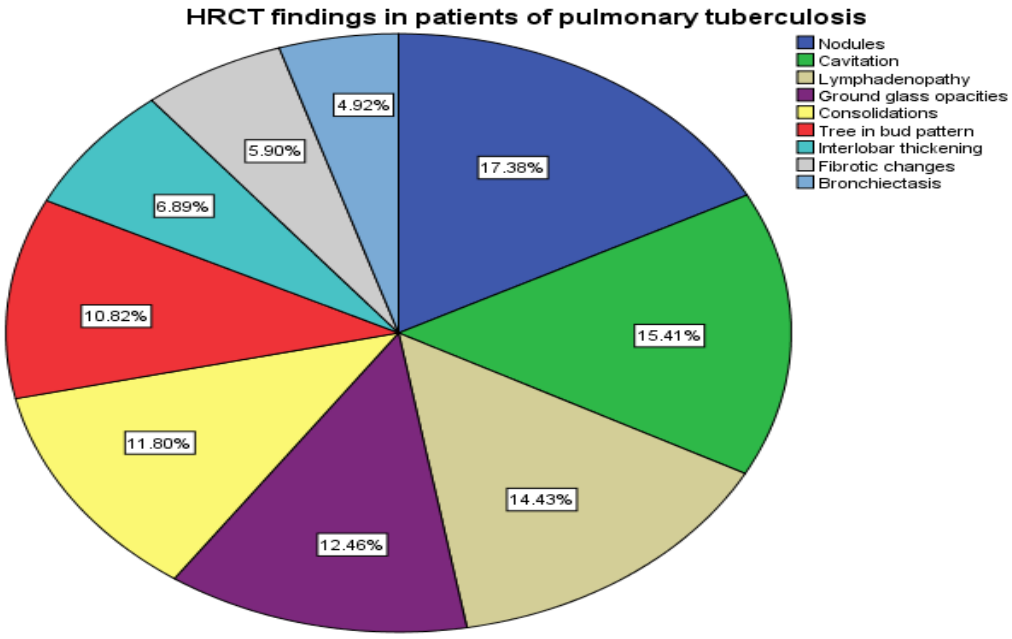

Fig 2: demonstrated the prevalence of the HRCT findings by the Pie chart. (N= 103)

Table 4: Affected lung/involvement

Affected lung/involvement		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Right	73	54.5	54.5	54.5
	Left	61	45.5	45.5	100.0
	Total	134	100.0	100.0	

The prevalence of the afflicted lungs was shown in **Table 4.** the right lung is more severely affected (54.5%) than the left lung (45.5%).

Table 5: Affected lobes of the lungs

Affected lobes of the lungs		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Right superior lobe	52	27.2	27.2	27.2
	Right middle lobe	29	15.2	15.2	42.4
	Right inferior lobe	40	20.9	20.9	63.4
	Left superior lobe	42	22.0	22.0	85.3
	Left inferior lobe	28	14.7	14.7	100.0
	Total	191	100.0	100.0	

Table 5 represented the distribution of affected lobes. All lobes had the following percentage: right superior lobe (27.2%), right middle lobe (15.2%), right inferior lobe (20.9%), left superior lobe (22%) and left inferior lobe (14.7%).

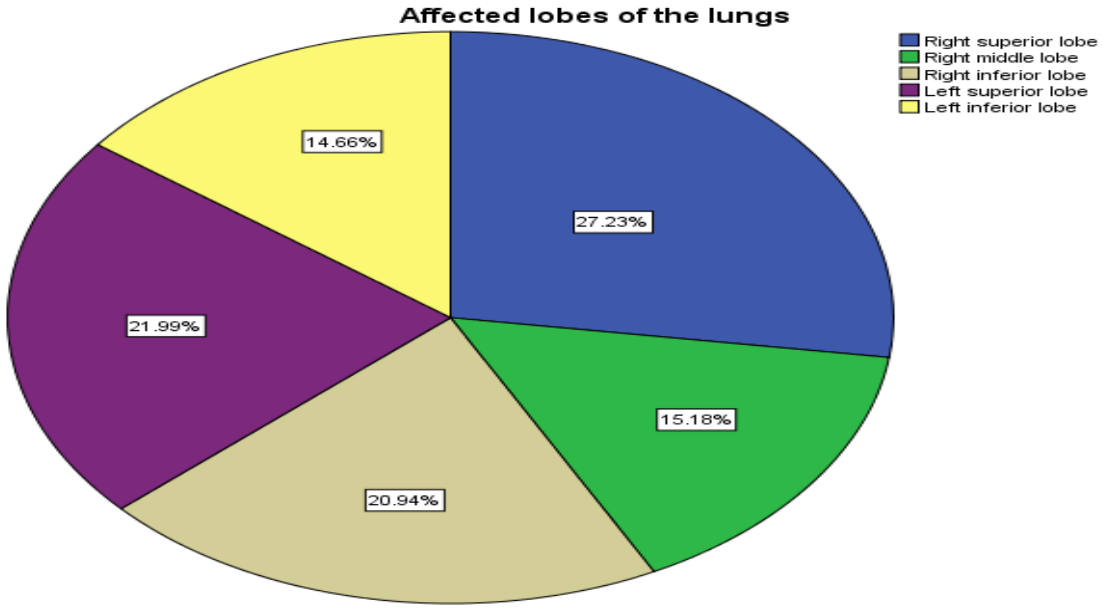

Fig 3: Affected lobes

Discussion

In this study, 103 patients had the procedure; all of them had PTB, and the results of their examinations were analyzed utilizing HRCT. Age was 49.9 on average for patients. The current study agreed with Raghuvanshi et al who found that centrilobular nodules n=35(85.4%), ground-glass opacity n=33(80.5%), cavities n=30(73.2%), tree in bud pattern n=27(65.8%), consolidation n=26(63.4%), bronchiectasis n=2(4.7%), and interlobular septal thickening n=2(4.7%) were the main findings [20]. Nodules, cavities, consolidation, and tree in bud were the significant outcomes on HRCT, according to Ahmed EE. et al's study, which was in agreement with the current investigation. [21] Saad T et al. study showed that the commonest symptom among pulmonary tuberculosis patients was productive cough n=149(99.3%) which agreed with the current study. [22]

Results from 103 patients with pulmonary tuberculosis showed that 64 (62.1%) of them were men, which was related to the study of Akkara et al., n=196(74%). [23] The current study revealed that nodules n=53(17.4%) was the prevalent finding that emerged on HRCT in patients with pulmonary tuberculosis, in contrast to Caliskan T. et al's finding that nodules n=48(62%) was the most common finding. [24] Pulmonary tuberculosis may show up on imaging tests as a patchy opacity, consolidation, one or more cavities, or miliary nodules. [25] Also, Waqas Rasheed et al studies showed a high ratio of affected males n=64(59.3%) than females n=44(40.7%). [26] In the current study, results showed that the right superior lobe n=52(27.2%) was more impacted which was agreed with the study of Imtiaz S et al. [27] The study design, HRCT technology, sampling, and sample size variables may be to account for the variations in the HRCT results from the current investigation and those from other investigations.

CONCLUSION

In the patients of the current study, pulmonary TB afflicted men more frequently. Ages 31 to 40 were the most affected. In individuals with pulmonary tuberculosis, the primary findings of HRCT comprised nodules, cavities, lymphadenopathy, and ground glass. More damage was inflicted to the right lung than to the left. More of the HRCT results were attributed to the right superior lobe. The least afflicted areas according to HRCT results were the left inferior lobe.

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