

“Bronchoscopy and Hrct Chest in Evaluation of Patients with Haemoptysis Having Normal Chest X-Ray”

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Abstract

Original Research Article

Hemoptysis is a condition where there is expectoration of blood from the lower respiratory tract and has various causes. Depending upon the underlying cause and the amount of blood lost, its clinical presentation may vary from mild form with streaks of blood to massive blood loss requiring urgent medical attention. In many cases the underlying cause is straight forward on initial chest radiograph, but, at times it becomes difficult to identify the cause with initial evaluation. In such a situation, bronchoscopy and high resolution CT scan have been proposed to be of diagnostic utility, and we, here present our study on the role of bronchoscopy and HRCT chest in the evaluation of hemoptysis in patients with normal chest radiograph.

Keywords: hemoptysis, HRCT chest, bronchoscopy.

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AIM

- Bronchoscopy and HRCT chest in evaluation of patients with hemoptysis having a normal chest X ray.

METHOD AND MATERIALS

STUDY DESIGN

- A prospective study
- Study duration is of 18 months from December 2016 to May2018
- Number of patients is30

PARTICIPANTS

- All the patients who came to outpatient and in-patient department with history of haemoptysis in Bhaskar General Hospital.
- A written informed consent will be obtained from all patients.

METHODOLOGY

A detailed history will be elicited to distinguish spitting and coughing of blood from sources other than lower respiratory tract. Bleeding diathesis and cardiac causes of haemoptysis can be excluded by careful history and examination. Physical examination

must include thorough evaluation of the nasopharynx and larynx. Sputum examination, particularly for acid fast bacilli (AFB) and malignant cells in patients at high risk for bronchogenic malignancy must form apart of work-up. Evaluate the causes by most of non-invasive and invasive procedures. Bronchoscopy and computed tomography (CT) of chest play an important role in patients with haemoptysis and normal CXR

Inclusion Criteria

All patients aged between 15-65 years with one or more episodes of haemoptysis and normal chest X-ray. Willingness of patient to give informed consent

Exclusion Criteria

- Patients with define localizing abnormality on chest X-Ray.
- Massive haemoptysis.
- A Bleeding lesion in upper respiratory tract or oral cavity.
- Patients with cardiac disease.
- Patients with bleeding diathesis and history of oral anticoagulant or anti platelet drug in take.
- Patients with past history of pulmonary tuberculosis.
- Previous history of lung cancer.

CT scan: MD CT 4 slice (Asteon 4th generation, Toshiba, Japan) was used for all patients. 2mm sections at 10mm interval from apex to base of the lung were performed. Intravenous contrast was administered only when there was suspicion of malignancy on CT scan chest, no patient was administered intravenous contrast. The scans were analysed by department of Radio diagnosis, Bhaskar medical college, Hyderabad.

Fibreoptic bronchoscopy – (Pentax FB-18P: Fibreoptic bronchoscopy, Tokyo, Japan). All Patients had to fasting overnight. Pre-medication included Injection atropine, 0.6 mg 30 minutes before procedure, the nose, pharynx and upper airway were sprayed with 4% topical xylocaine spray, intra airway spray with 2% was used as necessary, with patient in supine position, the bronchoscope was passed transnasally after adequate topical anesthesia of nasal passage and pharynx was applied, there after thorough examination of the upper airway and tracheobronchial tree was performed. Bronchial wash, brushings and biopsy were performed whenever indicated. Bronchial wash subjected to Ziehl-Nielsen staining for mycobacterium tuberculosis, CBNAAT, total and differential cells count and cytology for malignant cells respectively.

STATISTICAL ANALYSIS

The data was analyzed using standard statistical methods. The age and sex distribution, the

amount of haemoptysis, duration of haemoptysis, smoking history were expressed in percentage. The age of subjects are assessed in relation to etiology diagnosed by CT scan Chest and bronchoscopy. Statistical analysis was carried out by chi’ssquare.

P Value < 0.01 was considered statistically more significant. P-value <0.05 was considered significant.

STATISTICAL METHOD USED

CHI-SQUARE TEST: This test was employed for discrete distribution for comparison of frequencies.

$$X^2 = \frac{(\text{Observed value} - \text{Expected value})^2}{\text{Expected value}}$$

RESULTS

Out of 30 subjects taken for this study, all 30 subjects completed to the study. All patients were subjected to a detailed history was and physical examination. Whenever relevant history was present patients were subjected to detailed E.N.T and upper G.I examination, to exclude other bleeding sites. All patients with haemoptysis, mild to moderate haemoptysis were included into study, moderate haemoptysis were hospitalized and other patients were managed on an outpatient basis.

Table-4: Age and Sex distribution

Sex	Age			Total	Chi-Square	P Value
	20 Years	21 -40 years	40 years &Above			
Male	4(13.3%)	4(13.3%)	5(16.6%)	13(43.3%)	3.352	0.187
Female	1(3.3%)	8(26.6%)	8(26.6%)	17(56.6%)		
Total	5(16.6%)	12(40%)	13(43.3%)	30(100%)		

Table-4 shows age and sex distribution

Male patients under 20yrs were 13.3% (n=4), 21-40yrs were 13.3%(n=4) and 40yrs and above were 16.6%(n=5). Female patients under 20yrs were 3.3%

(n=1), 21-40yrs were 26.6%(n=8) and 40yrs and above were 26.6%(n=8). This table shows that no statistical significance exist between age and sex (chi-square value of 3.35 and p=0.187).

BAR CHART-1AGE AND SEXDISTRIBUTION

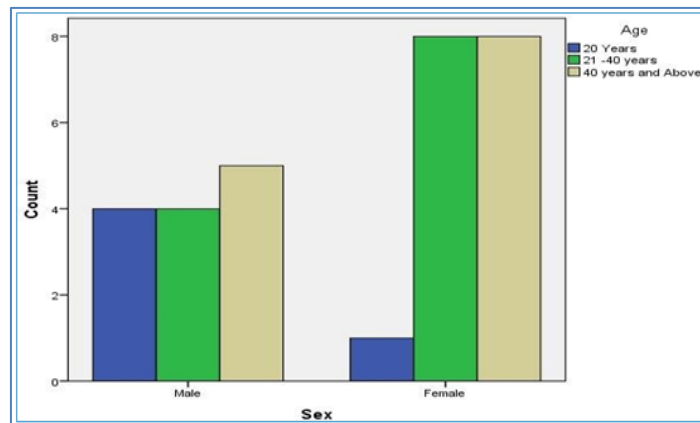


Table-5: Smoking packyears of study

Smoking pack years	Age			Total	Chi-Square	P Value
	20 Years	21-40 years	40 years and Above			
Nil	4(13.3%)	10(33.3%)	8(26.6%)	22(73.3%)	7.524	0.275
1-10 Pack years	1(3.3%)	1(3.33%)	0	2(6.66%)		
11-20 Pack years	0	1(3.33%)	2(6.66%)	3(10%)		
21& Above Pack years	0	0	3(10%)	3(10%)		
Total	5(16.6%)	12(40%)	13(43.3%)	30(100%)		

Table -5 shows smoking packyears of study

On the whole majority of the study were nil 73.3% (n=22), 6.66%(n=2) were 1-10PY ,10%(n=3) were 11-20PY and 10%(n=3) were 21&above PY

This table shows that no statistical significance between age and smoking pack years (chi-square-7.524 and p value -0.275)

BAR CHART-2 Smoking packyears of study

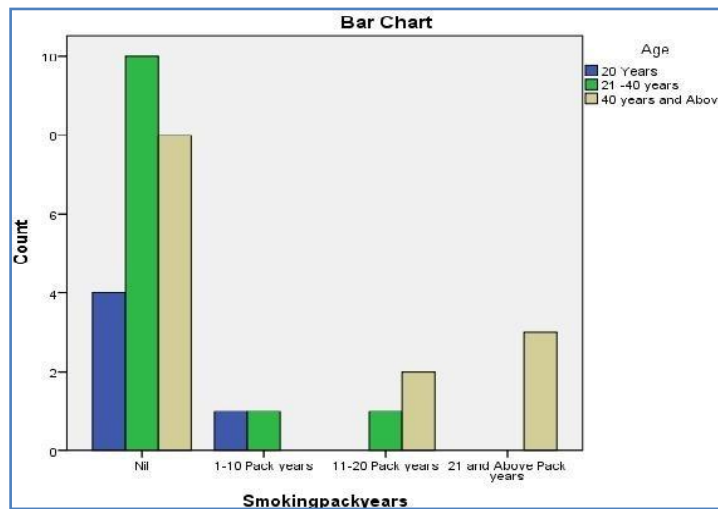


Table-6: Duration of haemoptysis of study

DURATION OF HEMOPTYSIS	Age			Total	Chi-Square	P Value
	20 Years	21-40 years	40 years and Above			
Below 1 Month	4(13.33%)	8(26.6%)	7(23.33%)	19(63.66%)	5.434	0.246
1-3 Month	1(3.3%)	2(6.66%)	6(20%)	9(30%)		
3 Months and Above	05(16.6%)	2(6.66%)	013(43.33%)	2(6.66%)		
Total		12(40%)		30(100%)		

Table-6 shows duration of haemoptysis of study

On the whole majority of the study were 63.66% (n=19) below 1month duration of haemoptysis, 30%(n=9) were 1-3month duration of haemoptysis and 6.66% (n=2)were 3moths &above duration of haemoptysis.

In age group under 20yrs, 13.33%(n=4) were below 1month duration of haemoptysis and 3.3%(n=1) were 1-3month duration of haemoptysis. In age group 21-40yrs, 26.6%(n=8) were below 1month duration of

haemoptysis,6.66%(n=2) were 1-3 months duration of haemoptysis and 6.66%(n=2) were 3months & above duration of haemoptysis.

In age group 40yrs & above, 23.3% (n=7) were below 1month duration of haemoptysis and 20%(n=6) were 1-3months duration of haemoptysis.

This table shows that no statistical significance between age and duration of haemoptysis(chi-square - 5.434 and p value-0.246).

BAR CHART-3 Duration of haemoptysis of study

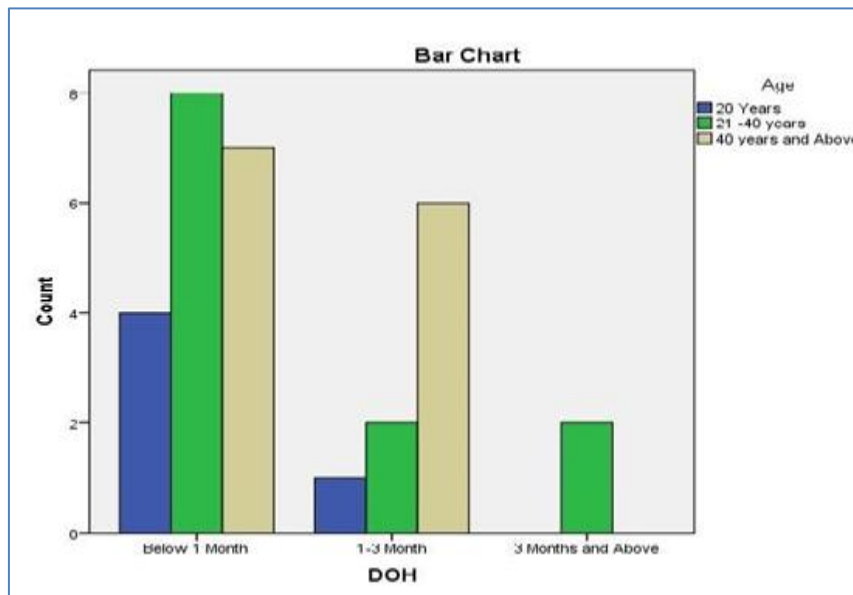


Table-7: Amount of haemoptysis of study

AMOUNT OF HEMOPTYSIS	Age			Total	Chi-Square	P Value
	20 Years	21-40 years	40 years and Above			
Mild	4(13.3%)	8(26.5%)	9(30%)	21(70%)	0.305	0.858
Moderate	1(3.33%)	4(13.3%)	4(13.3%)	9(30%)		
Total	5(16.6%)	12(40%)	13(43.3%)	30(100%)		

Table -7 shows amount of haemoptysis of study

On the whole majority of the study were 70% (n=21) mild haemoptysis and 30% (n=9) were moderate haemoptysis. In age group under 20yrs, 13.3% (n=4) were mild haemoptysis and 3.33% (n=1) were moderate haemoptysis. In age group 21-40yrs, 26.6% (n=8) were

mild haemoptysis and 13.3% (n=4) were moderate haemoptysis. In age group 40yrs & above, 30% (n=9) were mild haemoptysis and 13.3% (n=4) were moderate haemoptysis. This table shows that no statistical significance between age and amount of haemoptysis(chi-square-0.305 and p value-0.858).

BAR CHART-4 Amount of hemoptysis of study

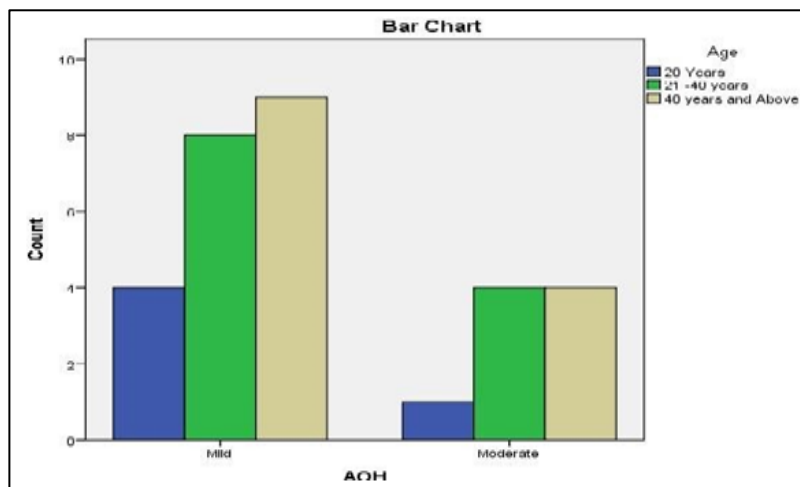


Table-8: Diagnosis

DIAGNOSIS	Age			Total	Chi-Square	P Value
	20 Years	21-40 years	40 years & Above			
Pulmonary Tuberculosis	2(6.66%)	4(13.33%)	0	6(20%)	21.86	0.039
Bronchiectasis	0	2(6.66%)	1(3.33%)	3(10%)		
Malignancy	0	1(3.33%)	6(20%)	7(23.33%)		
Aspergillosis	0	1(3.33%)	0	1(3.33%)		
Brucellosis	0	1(3.33%)	0	1(3.33%)		
Acute Bronchitis	2(6.66%)	1(3.33%)	0	3(10%)		
Not Diagnosed	1(3.33%)	2(6.66%)	6(20%)	9(30%)		
Total	5(16.66%)	12(40%)	13(43.33%)	30(100%)		

Table -8 shows diagnosis

In this study,20%(n=6) were pulmonary tuberculosis,10%(n=3) were bronchiectasis, 23.3%(n=7) were malignancy, 3.33%(n=1) were aspergillosis, 3.33%(n=1) were brucellosis and 10%(n=3) were acute bronchitis.

In age group of below 20 years, 6.66 %(n=2) were pulmonary tuberculosis, 6.66%(n=2) were acute bronchitis. In age group of 21-40 years, 13.3%(n=4)

were pulmonary tuberculosis, 6.66%(n=2) were bronchiectasis, 3.33%(n=1) were malignancy, 3.33%(n=1) were aspergillosis, 3.33% (n=1) were brucellosis and 6.66% (n=2) were acute bronchitis. In age group 40yrs & above, 3.33 %(n=1) were bronchiectasis and 20%(n=6) were malignancy.

This table shows there was statistical significance between age and diagnosis (chi-square - 21.836 and p value-0.039)

BAR CHART-5 Diagnosis

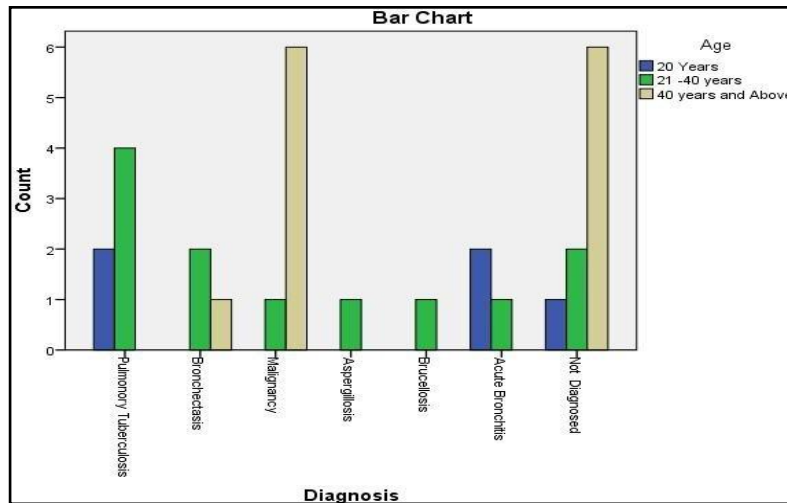


Table-9: Diagnosis based on CT chest scan

Diagnosisbased on	Age			Total	Chi-Square	P Value
	20 Years	21-40 years	40 years & Above			
Pulmonary Tuberculosis	2(6.66%)	4(13.33%)	0	6(20%)	12.09	0.14
Bronchiectasis	0	2(6.66%)	1(3.33%)	3(10%)	2	7
Malignancy	0	1(3.33%)	5(16.66%)	6(20%)		
Aspergillosis	0	1(3.33%)	0	1(3.33%)		
Not Diagnosed	3(10%)	4(13.33%)	7(23.33%)	14(46.6%)		
Total	5(16.66%)	12(40%)	13(43.33%)	30(100%)		

Table- 9 shows diagnosis based on CT chest scan

In age group of 21-40 yrs, majority of pulmonary tuberculosis of the study 13.33 % (n=4) were diagnosed by ct scan chest.

In age group of 21-40 yrs, majority of bronchiectasis of the study 6.66 % (n=2) were diagnosed by CT scan chest.

In age group of 40 yrs & above, majority of malignancy of the study 16.6 % (n=5) were diagnosed

by CT scan chest. In age group of 21-40 yrs, aspergillosis cases, 3.33% (n=1) were diagnosed by ct scan chest.

And remaining 46.6 % (n=14) were not diagnosed. This table shows there was no statistical significance between age and ct scan chest (chi square- 12.092 and p value-0.147).

BAR CHART-6 Diagnosis based on CT chest scan

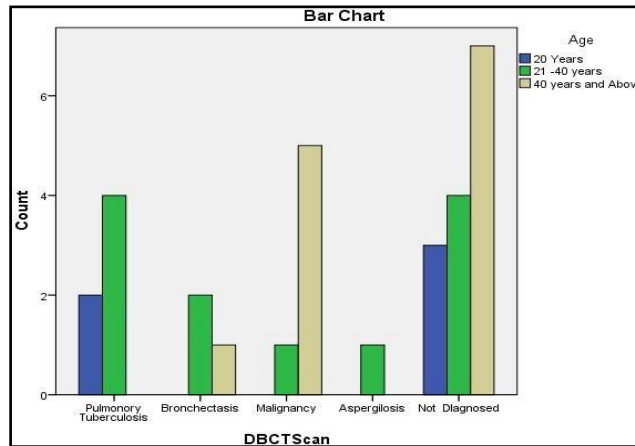


Table-10: Diagnosis based on FOB

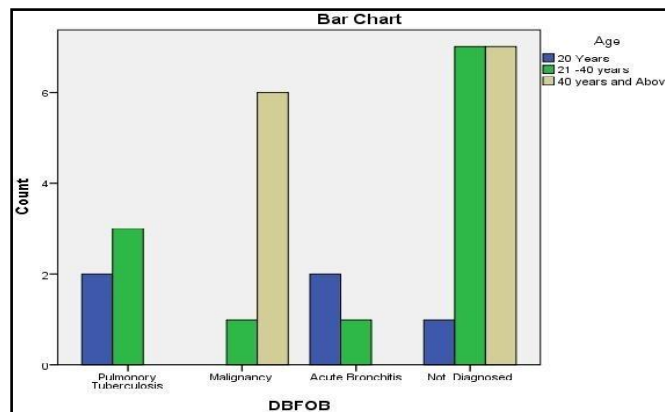
DBFOB	Age			Total	Chi-Square	P value
	20 Years	21-40 years	40 years & Above			
Pulmonary Tuberculosis	2(6.66%)	3(10%)	0	5(16.66%)	16.464	0.011
Malignancy	0	1(3.33%)	6(20%)	7(23.33%)		
Acute Bronchitis	2(6.66%)	1(3.33%)	0	3(10%)		
Not Diagnosed	1(3.33%)	7(23.33%)	7(23.33%)	15(50%)		
Total	5(16.66%)	12(43.33%)	13(43.33%)	30(100%)		

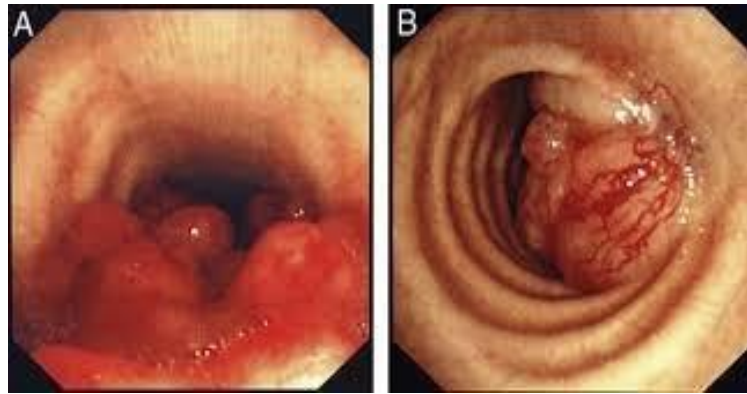
Table- 10 shows diagnosis based on FOB

On the majority of the study, 50% (n=15) were not diagnosed, 23.3 % (n=7) were diagnosed as malignancy, 16.6% (n=5) were pulmonary tuberculosis and 10% (n=3) were acute bronchitis.

This table shows statistical significance between age and diagnosis by bronchoscopy (chi-square value-16.464 and p value-0.011).

BAR CHART-7 Diagnosis based on FOB

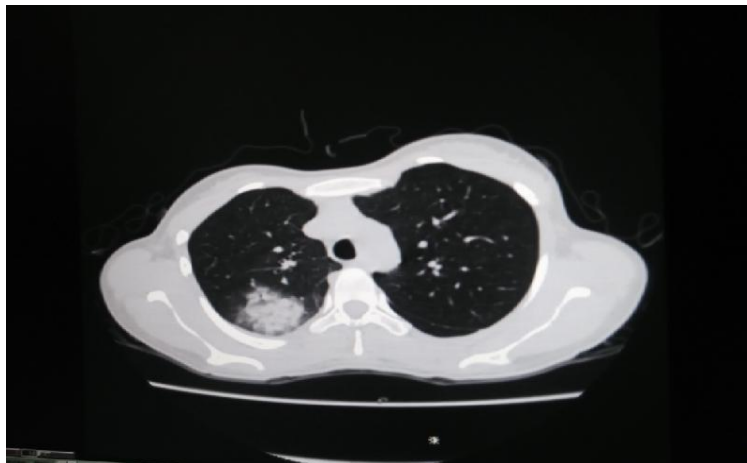




Photograph-3 tracheal tumor in bronchoscopy



Photograph-4 tubercular patchy consolidation



Photograph-5 brucellosis as consolidation in hrct chest

DISCUSSION

30 patients with haemoptysis and normal chest x-ray, were taken in to the study with age group of 15 to 65 yrs, there were 13 (43.3%) males and 17(56.6%) females.

All patients were subjected to detailed history and physical examination, investigations, whenever necessary upper airway examination, upper G.I. Examination was done to exclude other sites of bleeding.

According to Thirumaran *et al.* haemoptysis with normal chest radiograph were investigated further in 270 patients (60% males). The median age was 60 years. Twenty-six patients were diagnosed to have respiratory tract malignancies (larynx, 1; trachea, 1; lung, 22; carcinoid, 1; and leiomyoma, 1). Eight (31%) of the 26 patients with respiratory tract malignancy had radical treatment. Fibreoptic bronchoscopy was diagnostic of cancer in 14 (54%) of the 26 patients with malignancy. CT of the thorax was suggestive of cancer in 24 (96%) of the 25 patients with malignancy.

Table-11: Number of patients with malignancy compare with other studies

Study	Number of patients with Normal CXR	Number of patients with malignancy (%)
Thirumaran <i>et al.</i>	270	24(9.6%)
Bonlokkes <i>et at.</i>	379	16(5.9%)
Jindal <i>et al.</i>	155	7(4.5%)
Heaton <i>et al.</i>	41	4(9.7%)
Zavala <i>et al.</i>	55	9(16.3%)
Current study	30	7(23.3%)

In the present study, according to age distribution of subjects, there were 5(16.6%) subjects with age less than 20 years and 12 (40%) subjects in the age group between 21-40 years, 13 (43.3%) subjects in the age group of 41 and above. The occurrence of haemoptysis in relation to age and sex was not statistically significant ($p > 0.05$).

According to many cohort studies the main causes of haemoptysis with normal chest x ray are lung cancer, bronchiectasis, tuberculosis and acute bronchitis [8,9,11,12,14,15], in many studies malignancy incidence ranged from 0-16%, with average of 6.2 % [8-15].

Table-12: Number of patients with malignancy diagnosed based on FOB compare with other studies

Study	Number of patients with Normal CXR	Number of patients with malignancy(%) diagnosed based on FOB
Thirumaran <i>et al.</i>	26	14(54%)
Current study	30	7(23.3%)

Thirumaran *et al.* Fibreoptic bronchoscopy was diagnostic of cancer in 14 (54%) of the 26 patients with malignancy.

(bronchogenic carcinoma) in particular is low in patient with normal (or) non – localizing chest x ray [18, 7].

In the current study, 6 (20%) cases of lung cancer was suggested by CT scan chest and 7(23.3%) cases by bronchoscopy; the incidence of malignancy

Naidich *et al.* were the first to describe computed tomography finding in bronchiectasis[19] thin section or HRCT has specificity of 99% and sensitivity of 98% for diagnosis when compared to bronchography[27].

Table-13: Number of patients with Bronchiectasis (%) diagnosed based on HRCT-Chest compare with other studies

Study	Number of patients with Normal CXR	Number of patients with Bronchiectasis(%) diagnosed based on HRCT-Chest
Millar <i>et al.</i>	40	7(18%)
Current study	30	3(10%)

Millar *et al.* [12] studied 40 cases of haemoptysis in patients with normal chest radiographs and bronchoscopy (other than presence of endobronchial blood). Abnormalities were seen on subsequent CT in 50% of patients and included bronchiectasis (18%), mass (10%), alveolar consolidation (10%), and abnormal vessels (7.5%). The authors concluded that CT is of value in the investigation of patients with hemoptysis.

No: 6, in various series of studies it was reported to vary between 12-34 % [29, 30].

In the present study bronchiectasis was diagnosed by CT – scan chest in 3cases (10%) Table

McGuinness *et al.* [31] detected pulmonary tuberculosis in 18% cases while Millar *et al.* in 7.5 % cases [30]. In the present study, there were 6 cases (20%) of occurrence of tuberculosis which is consistent with McGuinness et al study. In five cases both CT scan and bronchoscopy were positive. The most consistent feature of active tuberculosis is “Tree in bud appearance” described by Hatipoglu[20].

Table-14: Number of patients with Acute Bronchitis (%) diagnosed by FOB compare with other studies

Study	Number of patients with Normal CXR	Number of patients with Acute Bronchitis (%) diagnosed by FOB.
McGuinness <i>et al.</i>	57	3(5%)
Current study	30	3(10%)

In the study by McGuinness *et al.* [31], acute bronchitis was detected in 5% of cases. In the present study acute bronchitis was diagnosed by bronchoscopy in 3 cases (10%).

There was more diagnosis in patients with haemoptysis less than 1 month and more in age group of 21 – 40 years Table No: 3.

Age group and CT scan chest-based diagnosis did not show any statistical significance ($p > 0.05$) Table No.6 and age group and bronchoscopy-based diagnosis was showed statistical significance ($p < 0.05$) Table No.7, more cases diagnosed in the age group of 21-40 years.

According to NN shah *et al.* In patients with haemoptysis with normal CXR, a diagnosis was established in 54.5% by FOB while 38.6% had a normal bronchoscopy. An endoscopic diagnosis of bronchitis was made in 22.7% patients. In only 9.1% patients an endobronchial mass was seen on bronchoscopy, and all of them were more than 40 years of age. Active bleeding/bleeding site was localized in 18.1% patients.

In patients with abnormal chest roentgenogram who underwent FOB, a definitive diagnosis was established in 75.4% cases with active bleeding/ bleeding site localized in 59.6%. Thirty five percent were having and endobronchial mass. Of all the patients who underwent FOB for recurrent haemoptysis, active bleeding/bleeding site was localized in 48.4% patients. Bleeding site was localized in 62.9% patients who underwent early FOB, while the yield was lower (29.4%) in patients who underwent delayed FOB.

According to S Tak, the exact role of fibre-optic bronchoscopy (FOB) and CT of the chest in the diagnosis of patients presenting with haemoptysis and a normal or non-localizing chest radiograph has not been clearly defined.

A study was designed to evaluate 50 patients presenting with haemoptysis and a normal or non-localizing chest radiograph using FOB and high-resolution computed tomography (HRCT). A definitive diagnosis was established in 17 (34%) patients. The aetiologies included bronchiectasis (24%), bronchial adenoma (6%), tuberculosis (2%) and bronchitis (2%). The diagnosis was made by HRCT in 15 (30%) patients, while FOB was diagnostic in five (10%) patients.

The diagnosis was made by HRCT and FOB in all patients with focal airway abnormalities. Therefore, HRCT effectively delineated abnormalities of both the central and peripheral airways. It is concluded that CT should be obtained prior to FOB in all patients presenting with haemoptysis and a normal or non-localizing chest radiograph.

In the present study there was statistical significance ($p < 0.05$) in Table No: 5, when bronchoscopy and CT scan chest was used for establishing diagnosis in cases of haemoptysis with normal chest x-ray.

In present study, neither the tool for diagnosis CT scan chest or bronchoscopy is very useful in establishing diagnosis individually and hence both CT scan chest and bronchoscopy are complementary to each other in establishing the diagnosis

CONCLUSION

In 30 cases with haemoptysis with normal Chest x-ray the common etiological diagnosis made by bronchoscopy and CT scan chest are malignancy (23.3%), Tuberculosis (20%), Bronchiectasis (10%), Acute bronchitis (10%), and other (Aspergilloma) (3.3%) (Total diagnosis established 66.6% of cases).

- Patients subjected on CT scan chest diagnosis emphasis for more towards to do fiberopticbronchoscopy.
- There was statistical significance between the age group and bronchoscopy diagnosis ($p < 0.05$).
- Both CT scan chest and bronchoscopy are useful in establishing diagnosis in patients with haemoptysis and normal Chest x-ray which was statistically significant ($p < 0.05$).
- Hence both CT scan chest and bronchoscopy are complementary to each other in establishing the diagnosis.

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