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CLINICORADIOLOGICAL, ETIOLOGICAL PROFILE AND OUTCOME IN MODERATE TO MASSIVE HEMOPTYSIS IN ADMITTED PATIENTS IN A TERTIARY CARE HOSPITAL

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Abstract

Hemoptysis is the expectoration of blood from the respiratory tract and ranges from mild blood-streaked sputum to massive life-threatening bleeding. Moderate to massive hemoptysis is associated with significant morbidity and mortality, requiring prompt evaluation and management. In developing countries like India, pulmonary tuberculosis remains one of the most common causes, while bronchiectasis, bronchitis, and lung malignancy are also important etiologies. This prospective observational study aims to determine the clinicoradiological profile, etiology, and outcome of moderate to massive hemoptysis in patients admitted to a tertiary care hospital in Telangana. The study will include 100 patients presenting with true active hemoptysis who meet the inclusion criteria and are willing to participate. Patients with hematemesis, oral bleed, epistaxis, and upper respiratory tract infections will be excluded. Data collection will include detailed clinical history, physical examination, chest X-ray, computed tomography, sputum examination including CBNAAT and culture studies, and fibre optic bronchoscopy. The study will be conducted over a period of 18 months at Government General and Chest Hospital, Erragadda. The study is expected to provide valuable insights into the clinical presentation, radiological findings, underlying etiologies, and outcomes of moderate to massive hemoptysis, thereby contributing to improved diagnosis and management strategies.

Keywords: Hemoptysis, Massive Hemoptysis, Moderate Hemoptysis, Pulmonary Tuberculosis, Bronchiectasis

INTRODUCTION

The word "hemoptysis" originated from Greek word "haima" which means "blood" and "ptysis" which means "spitting" .[1] It is the symptom per se and not the disease but alarms and frightens the patient that they had serious illness. It adds psychological burden to the patient.[2] Hemoptysis is defined as coughing out of blood from the lung parenchyma or tracheobronchial airway as a result of pulmonary or bronchial hemorrhage.[1–3] It can arise in the tracheobronchial tree from glottis to alveoli.[4]

Involvement of bronchial artery is responsible for majority of cases and pulmonary artery is the cause in <10% of the cases. Common site of hemoptysis are tracheobronchial tree, pulmonary parenchyma and pulmonary vasculature.[4]

Pulmonary tuberculosis is the commonest cause of hemoptysis in developing countries like India, but in the developed countries bronchitis, bronchiectasis and bronchogenic carcinoma are the top most causes.

AIMS AND OBJECTIVES

PRIMARY OBJECTIVE

- To study the clinicoradiological, ethological profile and outcomes in moderate to massive hemoptysis in admitted patients
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SECONDARY OBJECTIVE

- To study the clinicoradiological profile of moderate to massive hemoptysis
- To determine the etiology of moderate to massive hemoptysis
- To assess outcome of moderate to massive hemoptysis

MATERIALS AND METHODS

STUDY DESIGN: Prospective observational study.
STUDY PERIOD: 18 months from Date of approval
STUDY CENTRE: Government General and Chest Hospital , Hyderabad
SAMPLE SIZE: 100 patients who met inclusion criteria in OP/IP attending pulmonary medicine department during the study period
SOURCE OF DATA: Out patient and in patient attending Government General and Chest Hospital
SUBJECT SELECTION:

Inclusion criteria

1. All patients with history of active symptoms presenting to the emergency department at our institute are screened and only patients with true hemoptysis are included in the study
2. Patients who have given consent

Exclusion criteria

1. Hematemesis 2.Oral bleed 3.Epistaxis 4.Upper respiratory tract infections 5.Bleeding diathesis
6.All cases of spurious hemoptysis 7.Pseudo hemoptysis

STUDY PROTOCOL

All prospective patients came to Pulmonary Medicine out-patient department with history of hemoptysis were screened. Patients who had true hemoptysis only were included in this study after excluding hematemesis by clinical history and relevant investigations. Amount of hemoptysis enquired from Government General and Chest Hospital , Hyderabad the patient and his/her relatives for quantification and classification. Patients with moderate to massive hemoptysis were admitted in Pulmonary Medicine ward of for further evaluation. Ethical committee approval from the above hospital was obtained before the study was started.

Totally 110 cases with history of moderate to massive hemoptysis came to pulmonary medicine out patient department from June 2023 to December 2025 for further management. As per the inclusion/exclusion excluded. Out of 15 patients 10 had history of previous hospitalization within 3 months for the same complaints and 5 patients had causes other than hemoptysis like hematemesis and upper respiratory tract bleeding.

Written informed consent was obtained from each patient after giving information about the aims and methods of this study. 2 patients were not given consent for this study. So totally 93 patients were included in this study.

Following data were collected from all the 93 patients Demographic data
Name ,Age,Sex ,Address and contact mobile number
Detailed clinical history with following particulars were collected
History of hemoptysis: duration, frequency, amount of hemoptysis per day, number of episodes in the past.
Constitutional symptoms: fever, loss of appetite, loss of weight

Hemoptysis was classified according to the amount of blood expectorated as[4]

- Mild :<30 ML/Day
- Moderate:31 – 100 ML/Day
- Severe:101 – 600 ML/Day
- Massive:>600 ML/Day or any amount of hemoptysis associated with hemodynamic and respiratory compromise

H/o previous ATT: under DOTS or private treatment. pulmonary or extra pulmonary, number of spells of ATT, outcome after completion of treatment Co morbid conditions like diabetes mellitus, systemic hypertension, coronary artery diseases, chronic obstructive pulmonary disease, chronic kidney disease, chronic liver disease etc., were obtained
H/O drug intake of antiplatelet agents, anticoagulants or antihypertensive obtained. No one in our study were taking antiplatelet agents or anticoagulants.

- Through physical examination of following were done. General examination from head to foot done to note pallor, clubbing, cyanosis, icterus, lymphadenopathy and pedal edema.
- Vital signs: pulse rate, blood pressure, respiratory rate and temperature were recorded.
- Spo2 was recorded by hand held pulse oximetry
- Respiratory and other system examination were done thoroughly
- Coughed out blood examined for Colour and food particles if any present.

Following investigations were done in all the 93 patients

- Blood taken for routine investigations - complete hemogram, liver function test, renal function test, serum for electrolytes and random blood sugar.
- Blood grouping and Rh typing, Arterial blood gas analysis was done in patients having severe breathlessness or Spo2 of < 92%.

After controlling hemoptysis, patient was advised to collect sputum free of blood in a screw caped container. Sputum was examined for bacterial and fungal culture. Sputum CBNAAT test was done by using Gene X pert machine, Sputum cytology for malignant cells was done in patients with constitutional symptoms, smokers and who had negative for CBNAAT.
Chest radiography was taken in all 93 patients to find out location and extent of the lesion. ECG was done in all 93 patients to find out the cardiac status of the patients. BRONCHOSCOPY was done whenever indicated

RESULTS

PATIENT CHARACTERISTICS:

A total number of 93 patients with moderate to massive hemoptysis were included in our study after satisfying the inclusion and exclusion criteria.

AGE DISTRIBUTION:

The number of patients in the age group of <30, 31-40, 41-50, 51-60, >60 years were 7 (7.5%), 23 (24.7%), 36 (38.7%), 20 (21.5%) and 7 (7.5%) Respectively.

Table 1: Age Distribution

Age	Frequency	Percentage
<= 30 years	7	7.5
31 - 40 years	23	24.7
41 - 50 years	36	38.7
51 - 60 years	20	21.5
> 60 years	7	7.5
Total	93	100

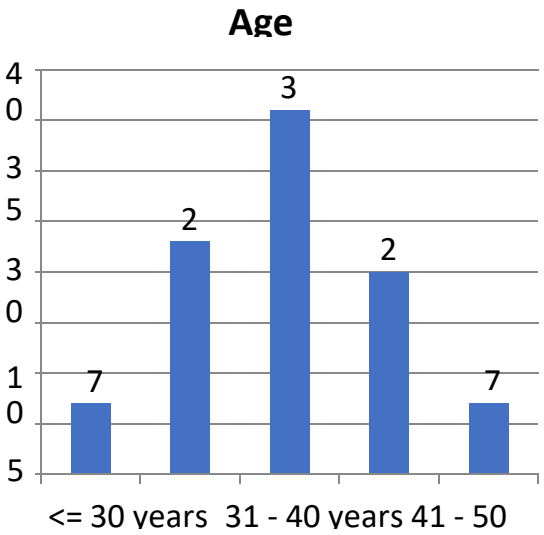

Figure 1 : Age Distribution

Maximum incidence was seen in 41-50 years group followed by 31-40 years. Minimum age was 22 years and maximum age was 85 years. Mean age was 45.74 years with standard deviation of 10.663.

GENDER DISTRIBUTION

Among the 93 patients enrolled in the study 71 were male and 22 were females. Majority of patients were male (76.3%) in this study. Rest of them constitutes females (23.7%).

Table 2: Gender Distribution

Sex	Frequency	Percentage
Male	71	76.3
Female	22	23.7
Total	93	100.0

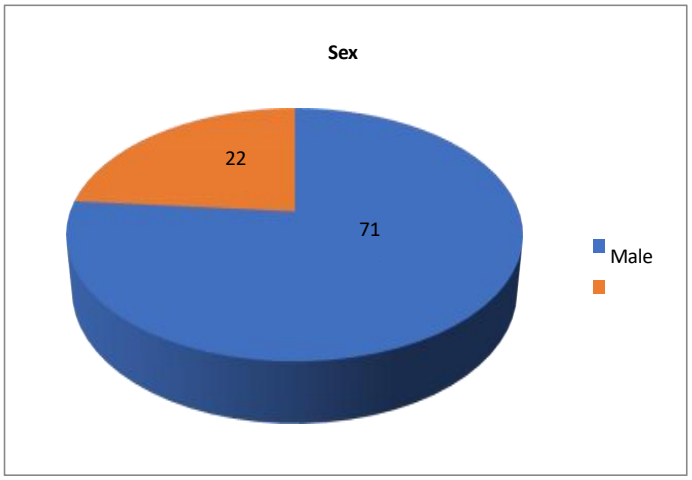

Figure 2-Gende Distribution

In the present study 41 – 50 years was the most common age group affected for both males and females. 28 males and 8 females were in the same age group which constitutes 38.7% of the total patients

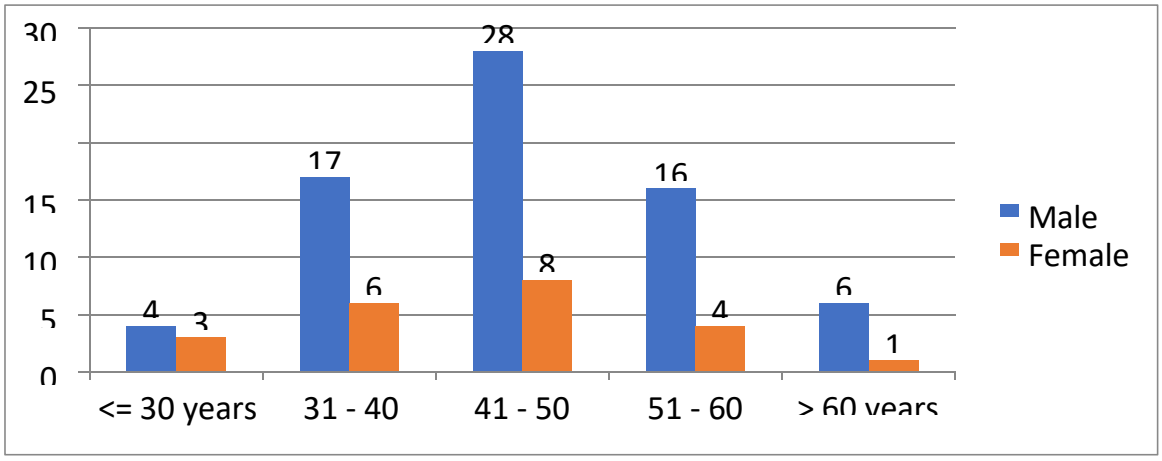

Figure 3: Age Vs Sex

DURATION OF HEMOPTYSIS:

Minimum duration of hemoptysis in our study was 1 day and maximum duration was 8 days with standard deviation of 0.907. More number of patients were seek admission prior to hospital admission had 2 days duration of hemoptysis which constitutes 45.1% of the study population. Severe to Massive hemoptysis seeks hospital admission within 1-3 days of onset whereas in moderate hemoptysis they wait from 1 day to 8 days before going to hospital for admission.

CLASS OF HEMOPTYSIS:

Hemoptysis was moderate in 71 (76.3%) patients. Severe in 14 (15.1%) and massive in 8 (8.6%) patients. Moderate hemoptysis was the most common class in study patients.

Table 5. Class Of Hemoptysis

Class of hemoptysis	Number of patients	Percentage
Moderate	71	76.3
Severe	14	15.1
Massive	8	8.6

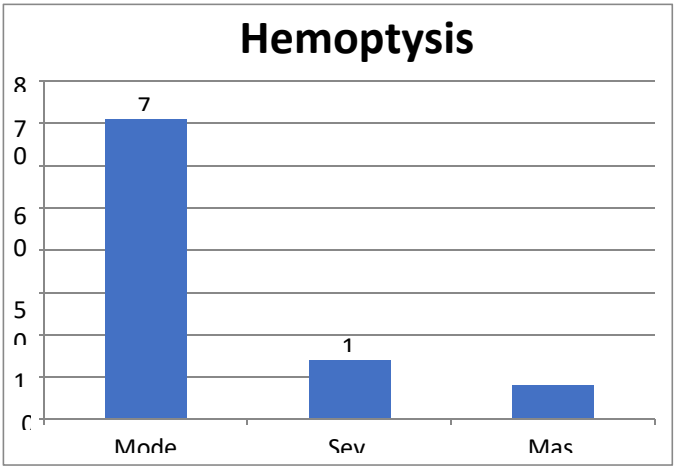

Figure 4. Distribution Of Hemoptysis Severity

PAST HISTORY OF TB

75 (80.6%) patients had taken treatment for tuberculosis previously. Rest (19.4%) had not taken drugs for tuberculosis in the past. So majority of them were treated for tuberculosis in the past.

Table 6. Past History Of Tuberculosis

Past history of TB	Total number of patients	Percentage
YES	75	80.6
NO	18	19.4
Total	93	100

Massive hemoptysis was more common in previously treated tuberculosis patients. 9.33% of hemoptysis in previously treated tuberculosis patients was massive hemoptysis in our study.

Table 7. Comparison Of Past History Of Tuberculosis With Class Of Hemoptysis

Hemoptysis class	Past H/o TB		Total	Fisher exact p value
	Yes	No		
Moderate	55 (73.33%)	16 (88.88%)	71 (76.34%)	
Severe	13 (17.33%)	1 (5.55%)	14 (15.05%)	
Massive	7 (9.33%)	1 (5.55%)	8 (8.6%)	
Total	75 (100%)	18 (100%)	93 (100%)	0.095

CO MORBID CONDITIONS:

The commonest co morbidity was chronic obstructive pulmonary disease found in 32 patients (34.4%). None of them had acute exacerbation of COPD at the time of admission. Diabetes mellitus was found in 18 (19.35%) patients and constitutes second position. Others were coronary artery disease 1 (1.07%) and chronic liver disease 1 (1.07%). No one had chronic kidney disease.

Table 8: Co-Morbidity Status

Comorbidities	Count	%
CAD	1	1.1%
CLD, COPD	1	1.1%
COPD	29	31.2%
DM	15	16.1%
DM, CAD	1	1.1%
DM, COPD	2	2.2%
NO	44	47.3%

DISEASED LOBE FOUND BY CT CHEST or CHEST X-RAY:

CHEST-XRAY` was done in all 93 patients. Many of them (44.1%) had multiple lobe involvement. Right upper lobe only was involved in 25.8% and Left upper lobe was in 20.4% of patients. 4.3% had right lower lobe and 3.2% had left lower lobe involvement by CT Chest or CHEST-XRAY Right middle lobe was involved in only 2.2%.

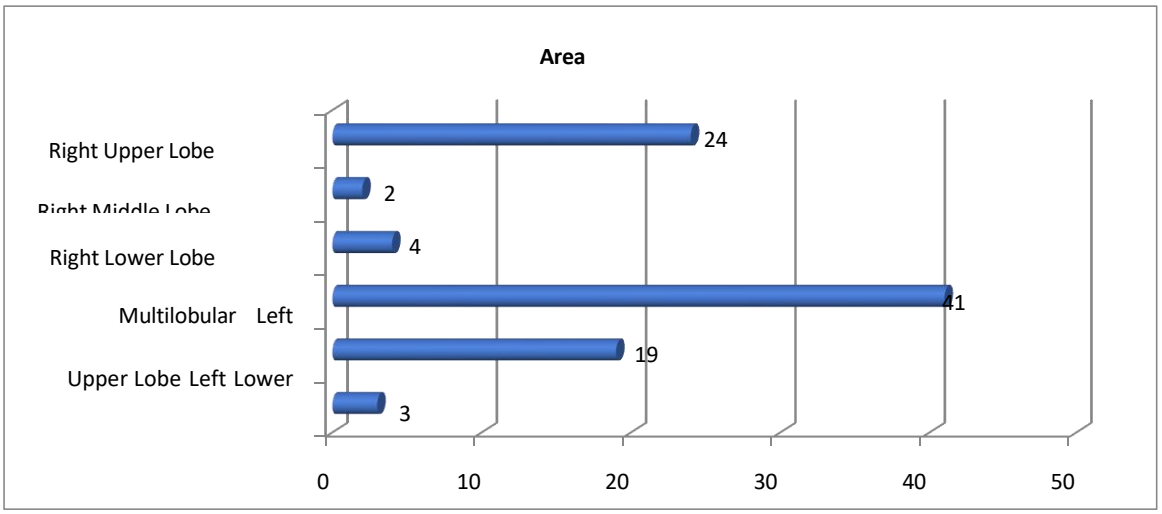

Figure 6. Lobe Involvement In Hemoptysis

RADIOLOGICAL LESIONS IN CT CHEST:

Consolidation was the most common radiological lesion found in 35 (37.6%) and fibrosis or cavity or both was the second commonest found in 25 (26.9%) patients. 22 (23.7%) patients has bronchiectatic changes. Air crescent sign in cavity was seen in 6 (6.5%) patients. 5 (5.4%) patients had mass lesion in CT Chest.

Table 12: Lesions In Ct Chest

	Count	Percentage
Aspergilloma	6	6.5%
Bronchiectasis	22	23.7%
Consolidation	25	37.6%
Fibrosis/Cavity	35	26.9%
Mass	5	5.4%

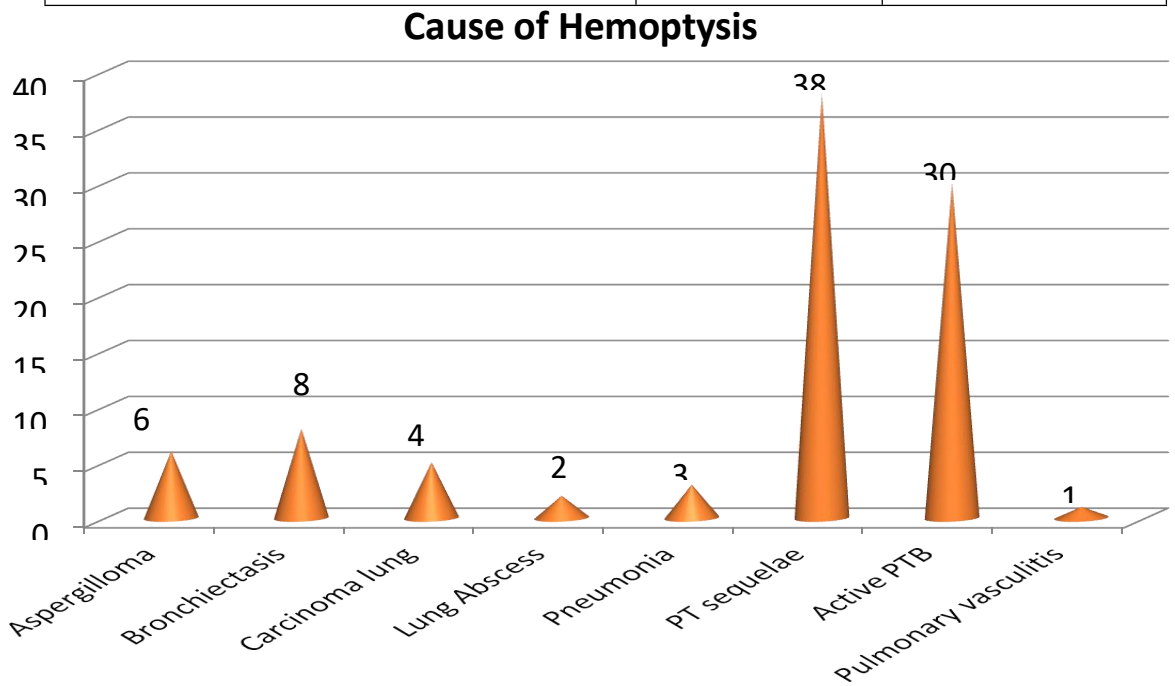

Figure 8. Cause Of Moderate To Massive Hemoptysis

Table 14. Comparing Causes With Severity Of Hemoptysis

Causes of Hemoptysis	Hemoptysis class						Fisher exact p value
	Moderate		Severe		Massive		
	Count	%	Count	%	Count	%	
Aspergilloma	3	50.0%	2	33.3%	1	16.7%	
Bronchiectasis	5	62.5%	2	25.0%	1	12.5%	
Carcinoma lung	5	100.0%	0	0.0%	0	0.0%	
Lung Abscess	2	100.0%	0	0.0%	0	0.0%	
Pneumonia	3	100.0%	0	0.0%	0	0.0%	
PT sequelae	28	73.7%	7	18.4%	3	7.9%	
Active PTB	24	80.0%	3	10.0%	3	10.0%	
Pulmonary Vasculitis	1	100.0%	0	0.0%	0	0.0%	**0.022**

Multiple lobe involvement (44%) were seen in pulmonary tuberculosis (active and sequelae), bronchiectasis, pneumonia and pulmonary vasculitis in our study. Right upper lobe is more commonly involved than other lobes followed by left upper lobe, right lower lobe, left lower lobe and right middle lobe. Here the P value is significant 0.001.

Table 16. Comparison Of Causes And Findings Of Ct Chest

Cause of Hemoptysis	CT Findings					Total	Fisher exact p value
	Asper gilloma	Bronchie ctasis	Consoli dation	Fibrosis / Cavity	Mass		
Aspergilloma	6	0	0	0	0	6	
Bronchiectasis	0	8	0	0	0	8	
Carcinoma lung	0	0	0	0	5	5	
Lung Abscess	0	0	2	0	0	2	
Pneumonia	0	0	3	0	0	3	
PT sequelae	0	13	2	23	0	38	**0.001**
Active PTB	0	1	27	2	0	30	
Pulmonary Vasculitis	0	0	1	0	0	1	
Total	6	22	35	25	5	93	

Table 17: Causes Of Secondary Bacterial Infection

Organisms	Count	Percentage
Klebsiella	1	33.3
Pseudomonas	2	66.6

Table 18. Management Done For Hemoptysis

		Count	Percentage
Management	Conservative	87	93
	BAE	2	2.15
	Surgery	4	4.3

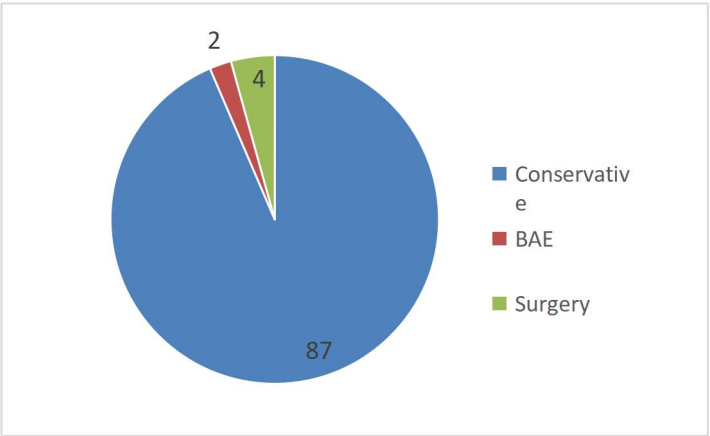

Figure 10types Of Management Done In Hemoptysis

		Count	Percentage
Outcome	Alive	89	95.7
	Dead	4	4.3

4 Patients were died due to massive hemoptysis and asphyxiation of blood in spite of the all resuscitative measures. The overall mortality rate was 4.3%

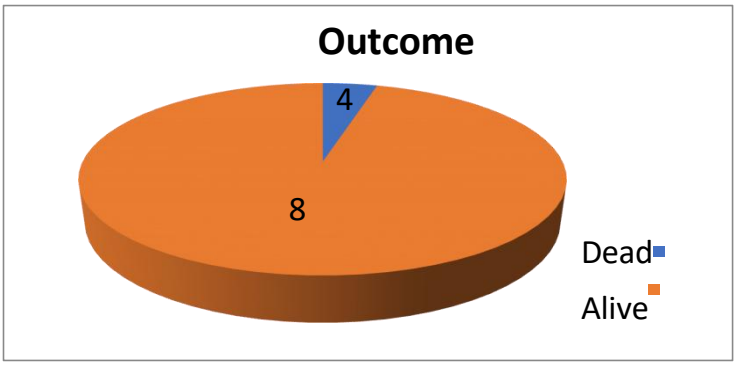

Table 19. Outcome Of Management

Table 21: Comparison Of Severity Of Hemoptysis With Outcome

Hemoptysis class	**Outcome**		**Total**	**Fisher exact p value**
	Dead	**Alive**		
Moderate	0 (0%)	71 (100%)	71 (100%)	
Severe	0 (0%)	14 (100%)	14 (100%)	
Massive	4 (50%)	4 (50%)	8 (100%)	
Total	4 (4.3%)	89 (95.69%)	93 (100%)	**< 0.001**

Table 22: Comparing Outcome With Past History Of Tuberculosis

Past H/o TB	**Outcome**		**Total**	**Fisher exact p value**
	Dead	**Alive**		
Yes	4 (5.33%)	71 (94.66%)	75 (100%)	
No	0 (0%)	18 (100%)	18 (100%)	
Total	4 (4.3%)	89 (95.69%)	93 (100%)	0.416

In this study duration of hospital stay, blood pressure and total leukocyte count had significant P value of 0.001 by „t“ test.

Table 24. Vital Signs And Blood Parameters

	GROUP	N	MEAN	STD. DEVIATION	p VALUE BY 't' TEST
Duration of Hemoptysis	Dead	4	2.25	0.50	0.678
	Alive	89	2.06	0.92	
Duration of hospital Stay	Dead	4	5.75	4.03	**0.009**
	Alive	89	11.01	3.84	
PR	Dead	4	93.00	15.87	0.749
	Alive	89	95.26	13.69	
BP	Dead	4	100.00	8.16	**0.034**
	Alive	89	115.84	14.56	
HB	Dead	4	10.35	0.87	0.136
	Alive	89	11.86	1.99	
RBC	Dead	4	3.81	0.69	0.699
	Alive	89	3.95	0.73	
PLATELET	Dead	4	2.90	0.66	0.622
	Alive	89	2.73	0.70	
TC	Dead	4	15.98	3.87	**0.001**
	Alive	89	10.39	3.17	

Table 27. Comparison Of Causes And Outcome Of Hemoptysis

Cause of Hemoptysis	**Outcome**		**Total**	**Fisher exact p value**
	Dead	**Alive**		
PT sequelae	1	37	38	
Active PTB	2	28	30	
Bronchiectasis	1	7	8	
Aspergilloma	0	6	6	
Pneumonia	0	3	3	
Carcinoma lung	0	5	5	
Lung Abscess	0	2	2	
Pulmonary Vasculitis	0	1	1	
Total	4	89	93	**0.001**

Four patients were died from this study by asphyxiation and the etiology were active pulmonary tuberculosis in 2, pulmonary tuberculosis sequelae in 1 and bronchiectasis in 1. P value was 0.001 and is significant. 4 patients (6.06%) out of 66 patients managed by conservative treatment were died. No one from BAE or surgery were died. But not significant and the p value was 0.246.

Table 27. Comparing Outcome With Management

Management	**Outcome**		**Total**	**Fisher exact p value**
	Dead	**Alive**		
Conservative	4 (6.06%)	83 (93.93%)	87 (100%)	

BAE	0 (0%)	2 (100%)	2 (100%)	
Lobectomy	0 (0%)	4 (100%)	4 (100%)	
Total	4 (4.3%)	89 (95.69%)	93 (100%)	0.246

DISCUSSION

Hemoptysis is a common life-threatening situation in India and all other parts of the world. Causes of hemoptysis varies from infection to malignancy. It depends upon geographical area, the institution where research is conducted and time of study within the same institution.

In this descriptive study various causes of hemoptysis were evaluated from patients admitted in a tertiary care centre. A total of 93 patients with moderate to massive hemoptysis were evaluated in our study.

Analysis of age distribution showed that hemoptysis was commonly found in the age group 41-50 years (38.7%) followed by 31 – 40 years (24.7%) in this study. Maximum incidence was seen in 41-50 years group followed by 31-40 years. Minimum age was 22 years and maximum age was 85 years. Mean age was 45.74 years with standard deviation of 10.663.

This Age group was common for both males and females. It is corresponded with a study done by Das et al[1] which reported as most common age group was 40-49 years (23%) followed by 50-59 years (22%). Age group of 30 to 50 years is common in a study conducted by Rachakonda et al[6] at Guntur, south India which was similar to our study results.

Male to female ratio in the present study was 3.22:1 concluding male were thrice more susceptible than females for hemoptysis.

In the present study 41 – 50 years was the most common age group affected for both males and females. 28 males and 8 females were in the same age group which constitutes 38.7% of the total patients.

Among the 93 patients enrolled in the study 71 were male and 22 were females. Majority of patients were male (76.3%) in this study.

Rest of them constitutes females (23.7%). Nawal et al[2] found that hemoptysis was 2.23 times more common in male than female. Our findings were similar to those found by Bhalla et al[4] (3.57:1).

Minimum duration of hemoptysis in our study was 1 day and maximum duration was 8 days with standard deviation of 0.907.

More number of patients were seek admission prior to hospital admission had 2 days duration of hemoptysis which constitutes 45.1% of the study population. Severe to Massive hemoptysis seeks hospital admission within 1-3 days of onset whereas in moderate hemoptysis they wait from 1 day to 8 days before going to hospital for admission.

Moderate hemoptysis contributes to majority and was found in 76.3% in the present study. Severe in 14 (15.1%) and massive in 8 (8.6%) patients. Moderate hemoptysis was the most common class in study patients. It was similar to various studies conducted in India. Singh et al[5] found it in 73.4% of his total 346 patients.

75 (80.6%) patients had taken treatment for tuberculosis previously. Rest (19.4%) had not taken drugs for tuberculosis in the past. So majority of them were treated for tuberculosis in the past.

Massive hemoptysis was more common in previously treated tuberculosis patients. 9.33% of hemoptysis in previously treated tuberculosis patients was massive hemoptysis in our study. Among the massive hemoptysis 87.5% of were occurred in previously treated tuberculosis patients. Here the p value was not significant.

The commonest co morbidity was chronic obstructive pulmonary
disease found in 32 patients (34.4%). None of them had acute exacerbation of COPD at the time of admission. Diabetes mellitus was found in 18 (19.35%) patients and constitutes second position. Others were coronary artery disease 1 (1.07%) and chronic liver disease 1 (1.07%) Smoking is considered as important risk factor for development of hemoptysis. In the present study majority (40) were never smoker (43%). 34 patients (36.6%) were current smoker. 19 patients (20.4%) were former smoker not taking tobacco since last 6 months. former and current smokers contributes to 57% of hemoptysis. Similar results were seen in Rachakonda et al[6] and Nawal et al[2].

Among the 4 patients died 2 were former smoker who quit smoking within 6 months of time. Nawal et al[2] in their study showed 64.55% of smokers (current and former) in hemoptysis patients. Never smoker in my

study was 43%, that was similar to study conducted by Das et al[1] which was 46%.
Minimum duration of hospital stay was 1 day and maximum day was 23 days with standard deviation of 4. Mean duration of hospital stay was 11 days. Mean pulse rate, systolic blood pressure, hemoglobin, blood cell count, total protein and albumin were within normal limits.
CHEST X-RAY or CT Chest done on patients which showed that Many of them (44.1%) had multiple lobe involvement. Right upper lobe only was involved in 25.8% and Left upper lobe was in 20.4% of patients. 4.3% had right lower lobe and 3.2% had left lower lobe involvement . Right middle lobe was involved in only 2.2%.
Consolidation was the most common radiological lesion found in 35 (37.6%) and fibrosis or cavity or both was the second commonest found in 25 (26.9%) patients. 22 (23.7%) patients has bronchiectatic changes. Air crescent sign in cavity was seen in 6 (6.5%) patients. 5 (5.4%) patients had mass lesion in CT Chest.
Lung abscess was also a rare cause of moderate to massive hemoptysis in our country. Out of 72 hemoptysis patients only 2 cases of lung abscess found by Singh et al[5] at northern Madhya Pradesh of India. Another study by Prasad et al[15] found 2 cases of lung abscess out of 476 patients from a chest clinic in India. Rachakonda et al[6] found 4 cases out of 216 patients from their study at a tertiary care centre. In present study we have two patients which constitute 2.2% of total cases presenting with hemoptysis which is similar to that of Rachakonda et al[6] study.
Tuberculosis was the most common cause of moderate to massive hemoptysis found in 73.1% (68) of patients. Among them active pulmonary tuberculosis was noted in 44.12% (30) and sequelae of pulmonary tuberculosis was found in 55.88% (38) of patients. Previously treated pulmonary tuberculosis: intensive phase will be of 12 weeks, where injection streptomycin will be stopped after 8 weeks and the remaining four drugs (isoniazid, rifampicin, pyrazinamide and ethambutol) in daily dosages as per the weight bands will be continued for another 4 weeks. There will be no need for extension of intensive phase. At the start of continuation phase pyrazinamide will be stopped while the rest of drugs - isoniazid, rifampicin, and ethambutol in daily dosages continued for another 20 weeks.[34]
From 19.12.2018 onwards there is no separate regimen for new and previously treated tuberculous patients as per RNTCP programme. All previously treated TB patients will also be initiated a standard first line anti TB regimen (2HRZE/4HRE) as prescribed for new TB patients with no injection streptomycin.
Bronchiectasis was in 8.6% (8) and aspergilloma was in 6.5% (6) of patients found as etiology. Primary carcinoma of lung was diagnosed in 5.4% (5) of patients. The other important causes were community acquired pneumonia 3.2% (3), lung abscess 2.2% (2) and vasculitis 1 (1.1%). According to Boaz Hirshberg et al,[60] Bronchiectasis, lung cancer, bronchitis, and pneumonia are the leading causes of hemoptysis in the cohort studied. Most of the data regarding hemoptysis are based on retrospective studies published between 1930 and 1960, although new data have been gathered lately in studies that examined the utility of CT scan and fiberoptic bronchoscopy in the evaluation of hemoptysis. In most of the studies, one can find a bias secondary to patient selection or the diagnostic investigation employed. Which is similar to present study Severe to massive hemoptysis in our study was mainly due to pulmonary tuberculosis (active and sequelae), aspergilloma and bronchiectasis. Carcinoma lung, pneumonia, lung abscess and pulmonary vasculitis in our study only caused moderate hemoptysis. Here the p value is 0.022 and is significant in our study.
Multiple lobe involvement (44%) were seen in pulmonary tuberculosis (active and sequelae), bronchiectasis, pneumonia and pulmonary vasculitis in our study. Right upper lobe is more commonly involved than other lobes followed by left upper lobe, right lower lobe, left lower lobe and right middle lobe. Here the P value is significant 0.001.
Radiologically consolidation was the most common lesion found in 90% of active pulmonary tuberculosis. Other lesions were bronchiectasis and fibro cavity found in already treated patient. Now they presents with recurrence. Fibro cavity was the most common lesion of PT sequelae and was found in 61% of them. Pulmonary vasculitis presented with radiologically as consolidation. Here the p value was 0.001 and is significant.
Diabetes mellitus was found in 19% of our study population. It was 16% in a study done by Ronald win b et al[3]. 62.5% of massive hemoptysis had diabetes. Out of the total 18 diabetics 27.7% had massive hemoptysis.
Pseudomonas and Klebsiella were the commonest organism causing secondary infection in our study which was similar to study conducted by Bhalla et al[4].
Cause of hemoptysis was different in developing countries like India when compared to developed countries. Infections are still a major causative factor in developing countries. Due to changing epidemiology of each disease, cause may vary over a period of time in the same geographical area.
Hemoptysis was considered as one of the symptoms suggestive of tuberculosis is now being replaced by other diseases too like bronchiectasis, lung malignancy and pneumonia.
Studies done during the 1940s and 1950s in developed countries showed tuberculosis was the most common

cause of hemoptysis.[49] Abbot OA[49] done a study in USA (Atlanta) reported as Tuberculosis was a most common cause for hemoptysis in 22% of patients closely followed by bronchiectasis (21%) and malignancy(21%) which were ranked second position. Subsequent studies in developed countries during 1977-1985, 1974-1981 and 1980-1995 demonstrated decreasing trend of tuberculosis from 22 to 1%. Pulmonary tuberculosis is now becoming less important cause of hemoptysis in developed countries.

Study from India by Rao in 1960 reported as tuberculosis was the most common cause of hemoptysis. This scenario remains unchanged as evidence from this present study (73.2%) and other published studies from India. [2,5,15,17] In our present study pulmonary tuberculosis (active and sequelae) was the most common cause of moderate to massive hemoptysis and it contributes to 73.2% of patients. Out of this 73.2% active pulmonary TB contributes 44% (30).

Remaining 56% (38) were PT sequelae patients. 79.2% of patients with hemoptysis were diagnosed was tuberculosis in a study by Prasad et al[15] on 2009 and by Singh et al[5] on 2016. Reports from other developing countries also projects pulmonary tuberculosis remains the most common cause of hemoptysis.[50,51] All the active pulmonary tuberculosis patients in our study were confirmed microbiologically from sputum or bronchial wash.

Presence of hemoptysis does not merely indicate presence of active pulmonary tuberculosis. It may occur as an initial clinical manifestation of active pulmonary tuberculosis, during treatment or even after cure of the disease. In the present study pulmonary tuberculosis sequelae was responsible for 40.9% out of 93 patients and the bacilli was absent in biological specimen. Both active pulmonary tuberculosis and sequelae are most common cause of hemoptysis as evidence from this current study. Higher incidence of tuberculosis in present study was due to prevalence of tuberculosis in our country is still high.

In pulmonary tuberculosis sequelae structural damage formed already by organism result in stagnation of secretion leads in to secondary infections and that may cause hemoptysis.[15] Secondary bacterial infections were present in patients with bronchiectasis and pulmonary tuberculosis sequelae of this present study. In these patients anti-tuberculous treatment was not needed to control active bleeding. Secondary bacterial infection is an additional factor for causing hemoptysis in the study patients, justify the role of antibiotics in conservative management.

If a patient had episode of hemoptysis during anti tuberculous treatment, drugs should not be withheld and continued along with other conservative management. He should be investigated further for drug resistant strains after confirming good adherence with drugs. In the present study no patient was diagnosed as drug resistant tuberculosis.

Bronchiectasis was the second commonest cause of life threatening hemoptysis in this present study showing 8.6%. Bhalla et al[4] reported 9.3% of hemoptysis in their study was caused by bronchiectasis in 2017. It was closely similar to our study report. Patel et al[7] reported bronchiectasis in 4% of their 50 patients on 2015. Other studies from India had a incidence of bronchiectasis in up to 6.6% of patients[2,15,17,33,52,53]. Highest incidence of bronchiectasis (14%) than other etiology found in a study by Das et al[1] in north eastern India during 2016-2017 .

It's incidence varies from 4% to 35% in hemoptysis reported by various studies conducted in India[1-7,17]. It is defined as permanent dilatation of airways >2 mm in diameter from their normal state.[23] As upper lobes were more commonly affected by TB, post tuberculous bronchiectasis also common at this site.[24] It is a "sicca" or "dry" type of bronchiectasis because secretions were drained by gravity. It usually presents as repeated episodes of secondary bacterial infection or severe hemoptysis.[23]

Aspergilloma was the third leading cause in our present study. It constitutes 6.5% of 93 patients. Aspergilloma was a cause in 1.39% (3) of hemoptysis patients in a study by Rachakonda et al[6] at Guntur, south India. Our study result was almost similar to Ronald win b et al[3] Study at Thiruvananthapuram, south India which showed aspergilloma was the cause in 4% of their patients.

Incidence is calculated by approximate number of aspergilloma cases occurred per year. Jean-francois regnard et al19 reported 4.3 cases per year in 2000 but it is high in study by CK Park et al[20] who reported 8.4 cases per year in 2002.

It was the cause in 3% of hemoptysis in north east india.1 17% of incidence was seen in a resurvey conducted in great Britain.21 Bhalla et al[4] found one patient having fungal ball radiologically among the 64 hemoptysis cases in a tertiary care centre of north India.

Fungal hyphae that colonizes and grows in a lung cavity is known as mycetoma.[16] Although other fungi like Fusarium and Zygomycetes may produce the formation of a fungal ball, Aspergillus fumigatus, is the most common causative agent of aspergilloma.[16] Hemoptysis is the most common presentation in such cases and it's estimated frequency varies from 5% - 90%.[16]

In the present post tuberculosis era, nontuberculous causes like bronchiectasis, malignancy and pneumonia are the other important causes of hemoptysis in developed countries.

Incidence of malignancy in various developed countries had ranging from 5 – 44%.[54–57] Hemoptysis was a first symptom reported by 6 to 25% of lung cancer patients. About 5% of lung cancer patients with hemoptysis having normal chest x-ray.[27] Massive hemoptysis in a malignancy is associated with 80% mortality in a study done by Jean-Baptiste et al[28]
.Indian studies had no high incidence of lung malignancies as a cause for moderate to massive hemoptysis as on now. Patel et al[7] in their study on 2015 reported as bronchogenic carcinoma was the second most common cause accounting for 14% of their patients. Singh et al[5] in their study on 2016 showed lung carcinoma as second commonest cause found in 7.2%.
Both of the above studies they included patients with mild hemoptysis of <100 ml/ day. Around 84% of lung carcinoma were caused by mild hemoptysis in Singh et al[5] study. Most of the time patients with malignancy had mild hemoptysis which was true by the above studies. Lung carcinoma was a cause in 5.2% of patients in a study conducted by Prasad et al[15] on 2009. Recently Bhalla et al in their study on 2017 reported as lung carcinoma contributes 6.25% of hemoptysis.[4] In the present study result of 5.4% is closely similar to Bhalla et al[4] and Prasad et al.[15] But in developed countries 19% were caused by lung carcinoma reported by Hirshberg et al.[58] Here the inference is lung malignancy also an important cause of hemoptysis in India but not high like in developed countries.
Secondary bacterial infection as a cause of active hemoptysis was diagnosed in 35 patients. The most common organisms were Pseudomonas (20), Klebsiella (14) and Acinetobacter (1) isolated in sputum or bronchial wash culture. Secondary bacterial infection were common in bronchiectasis and PTB sequelae.
Community acquired pneumonia was present in 3.2% of patients in the present study. Indian studies shows it ranging from 1.7% to 25.5%.[2,15,17] Pneumonia was reported in 10.7% of 64 patients in their study by Bhalla et al[4].
Patel et al reported 10% of hemoptysis was due to pneumonia on 2015.[7] It was one of the four main causes of hemoptysis in developed countries as evidence by Hirshberg et al[58] study which showed 16%. In the present study incidence was lower because mild hemoptysis was not included in our study who were the major population in Patel et al[7].
Most of the patients in the present study were managed with conservative treatment and less than 30% requires interventions like bronchial artery embolization and surgery to control ongoing bleeding and to prevent rebleeding. Hemoptysis was successfully controlled by conservative management Definitive treatment of hemoptysis needs medical treatment or surgical excision of diseased portion of the lung.
In the present study moderate and severe hemoptysis associated with good prognosis. Massive hemoptysis had poor outcome. 4 out of 8 (50%) patients were died in massive hemoptysis group.
Recurrent hemoptysis within 6 months was usually due to undetected arteries during embolization or partial embolization of feeding artery or neovascularization from adjacent vessels. Late recurrence after 6 months is usually due to collateral vessel formation or disease progression. If underlying disease was adequately cured many of them may not have recurrence.
Out of 4 death 2 were former smoker and remaining 2 were never smoker. Out of 19 former smoker 2 patients (10.52%) were died and 2 patients (5%) out of 40 never smoker were died in our study Conservative management for massive hemoptysis is associated with mortality rate of 50% to 100%.11 Reported mortality rate of surgery, performed for massive hemoptysis is 35%.22 Bronchial artery embolization is a safe and effective alternative to medical or surgical management.[37]Although BAE have risk of recurrent bleeding, it successfully controls acute life-threatening hemoptysis in 73 to 98% of patients.[44] In present study the mortality was 4.4% with conservative management and 0% with bronchial artery embolization and surgery which could be because of early intervention and care.
All the 4 died patients had taken anti-tuberculous treatmentpreviously. Among the patients who had tuberculosis in the past had a mortality rate of 5.33%. p value of this was 0.416 not significant.
Among the 4 died 50% had multiple lobe involvement and another 50% had left upper lobe involvement. Mortality rate among the multiple lobe involvement is 4.87% (2) and left upper lobe involvement is 10.52% (2). P value was 0.168 and not significant. Out of the 4 patients died 2 had consolidation, 1 had bronchiectasis and remaining one had fibro cavity in CT scan of the Chest. P value was 0.2 and not significant.
Four patients were died from this study by asphyxiation and the etiology were active pulmonary tuberculosis in 2, pulmonary tuberculosis sequelae in 1 and bronchiectasis in 1. P value was 0.001 and is significant.
4 patients in my study were died due to massive hemoptysis and asphyxiation. All the 4 had history of irregular anti-tuberculous chemotherapy in the past and finally cured before came to our hospital. Out of the 4 patients 3 had uncontrolled diabetes mellitus at the time of admission.
4 patients (6.06%) out of 66 patients managed by conservative treatment were died. No one from BAE or surgery were died. But not significant and the p value was 0.246.

Pulmonary tuberculosis (active/sequelae), bronchiectasis and aspergilloma were associated with recurrent hemoptysis in our study. This was significant with p value of 0.021.
Study was conducted in a single centre with small number of patients that may not represent the community. A multi centre study would help to explore other causes of moderate to massive hemoptysis and can extend further evaluation of etiology and newer methods of prevention and treatment of moderate to massive hemoptysis other than pulmonary tuberculosis . 21.05% of recurrent bleeding is associated with death among moderate to massive hemoptysis in our study population.
Mortality rate of present study was 4.3% which was lower than reports from other studies conducted in India. Mortality rate was ranging from 8.2% to 18.8% in previous studies of hemoptysis at India.[15,17] Difference in the study group may had impact on differences in the mortality rate. Study by Prasad et al[15] had a mortality rate of 8.2% and more than 25% of patients in their study had moderate to massive hemoptysis.
Lower mortality in this present study was may be due to interventional managements like bronchial artery embolization and surgery were decided by us sooner. This points out that aggressive management of life threatening hemoptysis could save many lives.

CONCLUSION

Hemoptysis is a non-specific but alarming symptom of underlying disease that should be investigated for better treatment and outcome. Pulmonary tuberculosis is still remain a major cause of hemoptysis in India. Both active pulmonary tuberculosis and post tuberculous sequelae can cause hemoptysis. In our study pulmonary tuberculous sequelae is the most common cause of hemoptysis, that gives current importance to the on going implementation of NTEP program for the control of tuberculosis.
Hemoptysis may occur during anti-tuberculous treatment in patients with pulmonary tuberculosis. Conservative management along with anti-tuberculous treatment is sufficient in these patients.
Hemoptysis also develop in cured and treatment completed patients of pulmonary tuberculosis. Anti-tuberculous treatment should not be started without clinico-radiological or microbiological evidence.
Most common parenchymal lesion predispose to aspergilloma is cavity produced by tuberculosis in our country. Malignancy is one of the four important causes in our study. So mild to moderate hemoptysis of even one episode needs thorough investigation workup.
Blood sugar control in diabetics is more important for the control of active bleeding, to prevent rebleeding and to reduce mortality Early interventional management can reduce recurrence and mortality. Surgery is indicated for massive and recurrent hemoptysis. Surgery is effective in prevention of hemoptysis as our study shows no recurrent hemoptysis post operatively and during follow up period.
Bronchial artery embolization is an effective and safe intervention for the control of acute and massive hemoptysis. This procedure may be repeated in recurrent hemoptysis if they have contraindication for surgery.
Bronchial artery embolization or surgery can be used for definitive management of hemoptysis.

LIMITATIONS OF THE STUDY

Study was conducted in a single centre with small number of patients that may not represent the community.
Study centre being the tertiary referral unit, majority of cases were referral cases from nearby centre after failed control of hemoptysis that may not represent the whole affected population of hemoptysis.
Short term follow-up of 18 months was only done which may not be adequate to assess the treatment response. Prolonged follow up will establish the long term prognosis of each successful management.

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