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"MANAGEMENT OF CHRONIC EMPYEMA THORACIS IN A TERTIARY CARE HOSPITAL, DIBRUGARH, ASSAM".

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Abstract:

Empyema, an infection of pleural space, often follows lung infections or trauma and is caused by gram-negative or anaerobic bacteria. This study evaluates the management, clinical profile, diagnostics, and complications of chronic empyema thoracis in a tertiary care hospital, Dibrugarh, Assam. A hospital-based prospective study was conducted between June 2023, to May, 2024 with a sample size of 70 using 95% confidence interval (CI) and 10% margin of error. Inclusion criteria required patients > 12 years and with chronic empyema. Patients needed to show symptoms > 6 weeks or present with evidence of pus on aspiration, bacteria in culture or Gram stain or abnormal biochemical parameters. Exclusion criteria included patients with lung malignancies, bronchopleural fistulas, previous thoracic surgery, or pregnancy. Ethical clearance was obtained and informed written consent was taken. Data collection involved a pre-designed proforma. Statistical analysis was conducted using SPSS (version 20.0). Discrete data were presented as numbers and percentages. Continuous data were expressed as mean ± standard deviation. Mean age was 44.23 ± 11.10 years. Most cases occurred in 41-50 years (24.28% male, 7.14% female) with cough (77.14%), chest pain (65.71%). Tachypnoea (64.28%) was the most frequent sign. Laboratory findings showed protein rise in 61.42%. Imaging confirmed right-sided empyema in 54.28%. Complications

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occurred in 31.42%. Cough, chest pain, fever, and dyspnoea are the main symptoms. Aggressive surgical intervention and close monitoring are key to management. Early drainage is beneficial for early-stage empyema, while thoracotomy and decortication are needed later.

Keywords: Empyema, Lung infections, Management

Main text

Introduction: Empyema is an infection of the pleural space, often caused by lung infections leading to pleural effusion and subsequent empyema. Historically, streptococcal and pneumococcal bacteria were common causes, but now, gram-negative and anaerobic organisms are more prevalent.[1] It can also result from trauma, thoracic surgery, abscess rupture, or oesophageal perforation. Symptoms include fever, malaise, weight loss, cough, and dyspnoea. Diagnosis involves pleural fluid analysis, chest X-rays, and CT scans. Treatment requires complete drainage of infected fluid, antibiotics, supportive care, and possibly fibrinolytic agents. In severe cases, surgical interventions like open drainage or VATS (Video Assisted Thoracoscopic Surgery) decortication are needed.[2] Chronic empyema is managed with drainage, gauze packing, or muscle transposition, while bronchopleural fistulas increase the risk of empyema.[3] The study aims to evaluate management methods for chronic empyema in various age groups in a tertiary care hospital, Dibrugarh, Assam.

Methodology: A hospital-based prospective study was conducted over one year (June 2023 to May, 2024) with a sample size of 70, calculated using a 95% CI and a 10% margin of error in the department of General Surgery, in a tertiary care hospital, Dibrugarh, Assam. Inclusion criteria required patients > 12 years and with chronic empyema. Patients needed to show symptoms > 6 weeks or present with evidence of pus on aspiration, bacteria in culture or Gram stain or abnormal biochemical parameters (pH < 7.2, LDH > 1,000 IU/L, glucose < 40 mg/dl). Exclusion criteria included patients those with lung malignancies, diagnosed bronchopleural fistulas, previous thoracic surgery, or pregnancy. Ethical Approval Obtained from the Institutional Ethics Committee (H). Informed Consent was taken from all participants. Data Collection includes history and clinical examination (detailed patient history, clinical examination, and proforma completion), radiological investigations (chest X-ray, ultrasound,

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CT scan, and MRI for select patients) and blood Investigations (routine blood work, coagulation profile, renal, and liver function tests). Treatment depends on presentation timing, complications, patient fitness, and resources. Most patients underwent open thoracotomy, decortication, rib resection, and open drainage. VATS was unavailable. Surgical intervention was performed under local or general anaesthesia. Preoperative medications were administered. Postoperative monitoring and chest tube removal were based on drainage. Patients were discharged when symptom-free. Follow-up for mild cases was monthly for three months; severe cases were monitored as needed. Data was analysed using SPSS version 20.0. Discrete data was presented as numbers and percentages, while continuous data was presented as mean ± standard deviation.

Results: In this study of 70 patients, 58 (82.86%) were male and 12 (17.14%) were female. The highest incidence was in the 41-50 years age group (24.28% in males, 7.14% in females). The mean age of presentation was 44.23 ± 11.10 years. Most patients (50%) were from low-income groups, and 55.71% had poor nutritional status. (Table 1)

Table: 1: Sociodemographic characteristics of study participants

Variable		Frequency (n)	Percentage (%)
Sex	Male	58	82.86
	Female	12	17.14
Age	≤ 20	6	8.57
	21—30	9	12.86
	31—40	16	22.86
	41—50	22	31.43
	51—60	10	14.29
	> 60	7	10.00
Socio economic status	High Income Group	4	5.71
	Middle Income Group	21	30.00
	Low Income Group	35	50.00
	Economically Weaker Section	10	14.28
Nutrition	Good	11	15.71
	Fair	20	28.58

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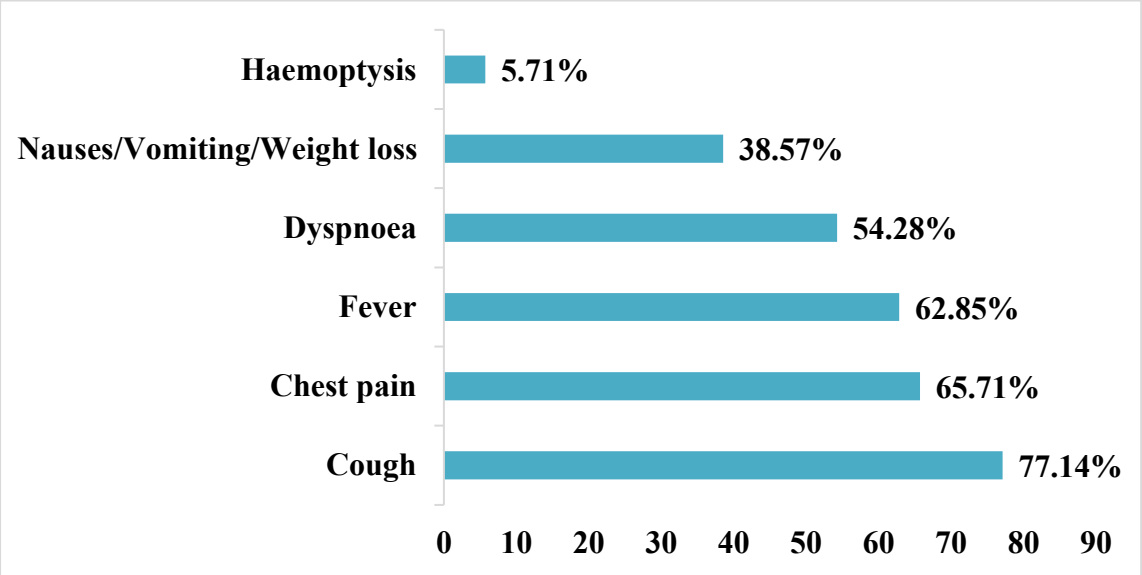
	Poor	39	55.71

The most common symptoms were cough (77.14%) and haemoptysis was seen in 5.71%. (Figure 1)

Figure 1: Common symptoms of empyema thoracis among study participants



The most frequent sign was tachypnoea (64.28%) while hypotension was seen in 10.00% patients. (Figure 2)

Figure 2: Common signs on general examination

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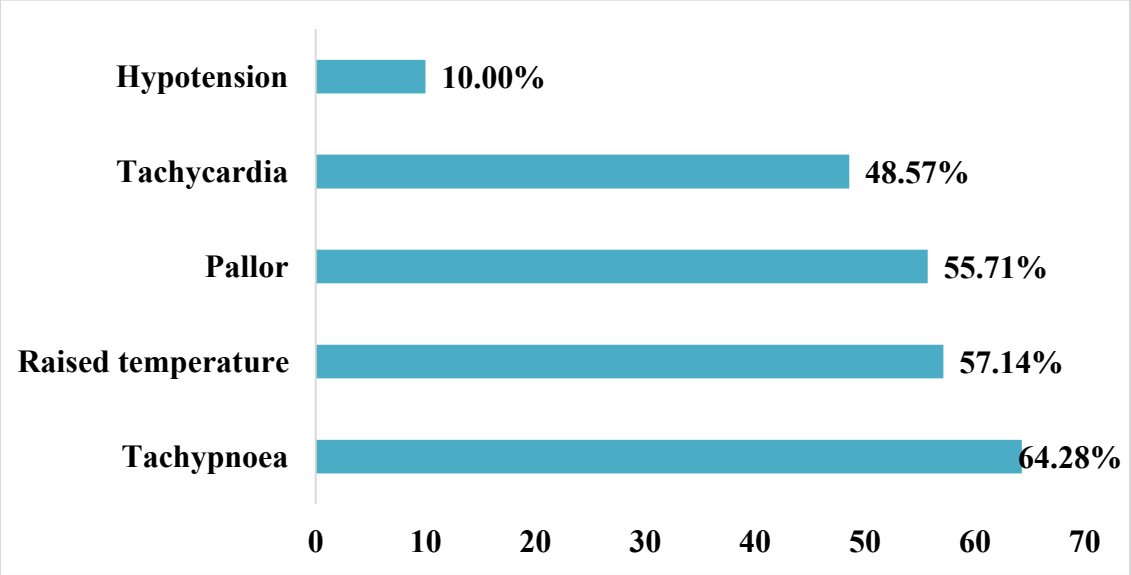
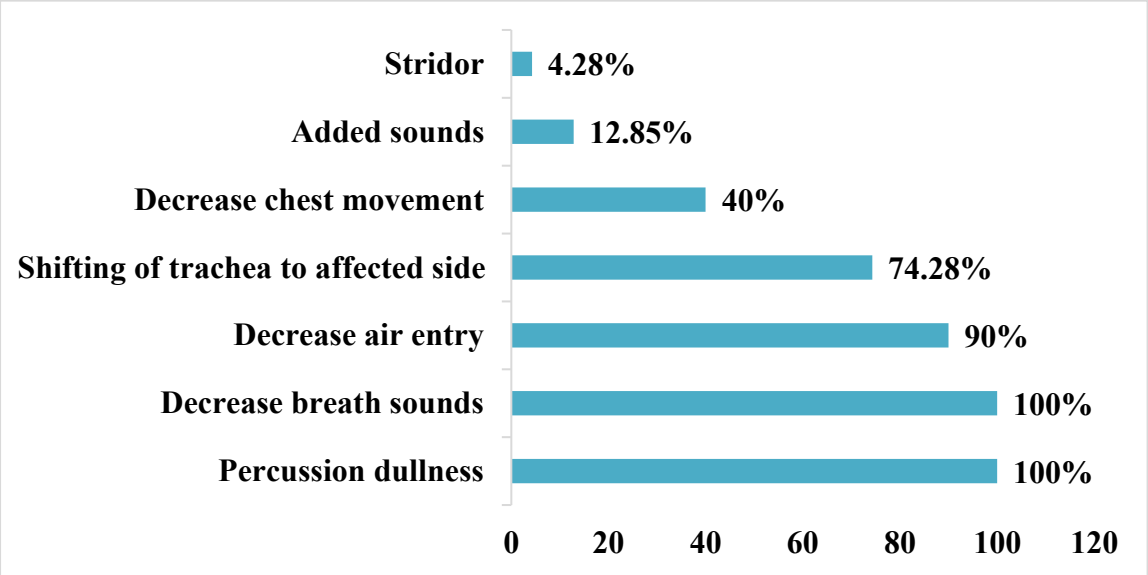


On systemic examination, dull percussion and decreased breath sounds were found in all patients (100%), with tracheal shift in 74.28%. (Figure 3)

Figure 3: Common signs on chest examination



The blood investigation reveals low haemoglobin in 55.71% of cases, elevated total leukocyte counts in 38.57%, and high random blood sugar in 7.14%. Laboratory findings included purulent pleural fluid with pH <7.2 and elevated lactate dehydrogenase in all patients (100%). Gram stain and culture sensitivity were positive in 58.57%, with 42.85% showing aerobic

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gram-positive organisms. The radiological investigation indicates that the right side was affected in 54.28% of cases, the left side in 41.42%, and bilateral involvement was observed in 4.25% of cases. (Table 2)

Table 2: Laboratory and radiological findings

Investigations			Number	Percentage
Blood investigation	Low Hb%		39	55.71
	TC>11000cells/mm^3		27	38.57
	High RBS		5	7.14
	Sr. Creatinine>1.1mg/dl		3	4.28
	Sr.Serum Na^+<135mmol/dl		7	10.00
	Serum K^+ <3.5mmol/dl		4	5.71
Pleural fluid analysis	Appearance	Cloudy/coagulam/hazy/ thik/purulent	70	100.00
		Yellow	70	100.00
	pH<7.2		70	100.00
	Protein>3.0g/dl		43	61.42
	Lactate dehydrogenase>1000IU/ml		70	100.00
	Leucocytes>25000		42	60.00
	Organisms isolated on pus culture	Aerobic Gram positive	30	42.85
		Aerobic Gram negative	11	15.71
		Mycobacterium	12	17.14
		No growth	17	24.28
Radiological investigation	Side affected	Left sided	29	41.42
		Right sided	38	54.28
		Bilateral	3	4.25
	Chest x ray	Diagnosed as pleural effusion	70	100
	CT thorax	Diagnosed as empyema	70	100

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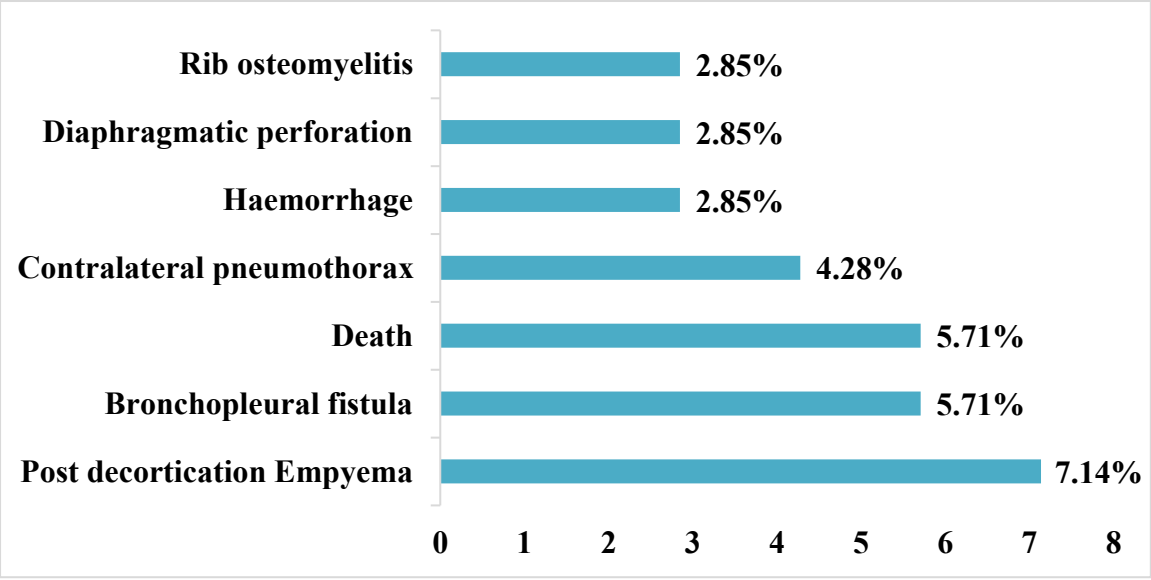
Treatment included thoracotomy and decortication in 44.28%, rib resection and open drainage in 27.14%, tube thoracostomy in 21.42%. The average hospital stay for decortication was 14.48 ± 3.56 days. The overall average was 13.20 ± 3.41 days. (Table 3)

Table 3: Treatment and duration of hospital stay

Procedure	Number	Percentage	Hospital stay Mean (days) ± SD
Open Thoracotomy and decortication	31	44.28	14.48 ± 3.56
Rib resection with open drainage	19	27.14	11.57 ± 3.23
Tube Thoracostomy	15	21.42	13.46 ± 3.38
Thoracocentesis with antibiotics	3	4.28	10.60 ± 3.18
Decortication with Thoracoplasty	2	2.85	15.8 ± 3.83

Complications occurred in 31.42% of patients, including excessive haemorrhage (2.85%), post-decortication empyema (7.14%), and deaths (5.71%). The mortality rate in the open thoracotomy with decortication and rib resection with open drainage was 2.77%. (Figure 4)

Figure 4: Complication of chronic empyema



Discussion:

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This study investigated the clinical presentation, microbiological profile, management, and outcomes of empyema patients over 12 years of age, revealing key insights into this challenging condition.

The mean age of our cohort (44.23 ± 11.10 years) aligns with findings from McCormack et al., who reported a mean age of 48.2 years.[4] However, our observed male predominance (82.85%) and male: female ratio of 4.8:1, while consistent with McCormack's 3.7:1, contrast with studies by Singh et al. and Goyal et al., which noted a higher incidence in younger males (18-40 years).[4,5,6] This discrepancy may reflect variations in regional demographics, etiological factors, or referral patterns.

The clinical presentation of our patients, characterized by cough, chest pain, fever, and dyspnoea, mirrors findings reported by Andrade Alegre R et al. and Acharya PR et al. [7,8]

Notably, our systemic examination findings, including dull percussion, reduced breath sounds, and tracheal shift, corroborate observations from Atay S et al., Gomes MM et al., and Kuan YC et al., reinforcing the reliability of these physical signs in diagnosing empyema. [9,10,11]

Microbiologically, our study identified gram-positive organisms as the most prevalent (42.85%), followed by Mycobacterium tuberculosis (17.14%) and sterile cultures (24.28%). These findings are consistent with McCormack et al.'s results, although the specific distribution of organisms may vary due to regional differences in infectious disease epidemiology.[4]

The surgical management of empyema in our study highlights the diverse approaches employed. Thoracotomy and decortication (44.28%) and rib resection with open drainage (27.14%) were the most common procedures, reflecting the severity of cases. These findings are comparable to Umar A et al.'s study, which also reported a significant proportion of patients undergoing these interventions. The selection of surgical technique likely depends on the stage of empyema, the presence of complications, and the patient's overall condition.[12]

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The 31.42% complication rate observed in our study, encompassing haemorrhage, pneumothorax, post-decortication empyema, and bronchopleural fistula, aligns with findings reported by Andrew NI et al., highlighting the substantial risks inherent in empyema management.[13] While our overall mortality rate was 5.71%, which is relatively low, it's crucial to acknowledge the variability in mortality rates reported across different studies. For instance, Godfrey et al. documented a significantly higher 15% one-year mortality rate.[14] Conversely, studies by Singh GV et al., Rao et al., and Kundu et al. reported mortality rates ranging from 3.4% to 7%, which are consistent with our results.[5,15,16] Furthermore, David G et al.'s study demonstrated similar mortality rates across various treatment modalities.[17] This wide range of reported mortality rates underscores the influence of factors such as patient demographics, disease severity, and treatment strategies on outcomes.

The mean hospital stay of 13.20 ± 3.41 days in our study is within the range reported by Biswas A et al. (15.50 ± 3.91 days) but shorter than that reported by Huang HC et al. (24.8 ± 31.7 days).[18,19] This variation may be attributed to differences in surgical techniques, post-operative protocols, and patient demographics. The 90-day readmission rate of 30.55% in our study, comparable to Semenkovich TR et al.'s findings, highlights the ongoing challenges in managing empyema and the need for comprehensive follow-up care.[20]

Conclusion: Our study revealed a significant male predominance, with the highest incidence in 41-50 age group, low socioeconomic status and poor nutrition. Cough and tachypnoea were the most common presenting symptoms. Laboratory findings consistently showed purulent pleural fluid with low pH and elevated LDH, and aerobic gram-positive organisms were the most frequently isolated pathogens. Thoracotomy and decortication were the primary treatment modalities. Complications occurred nearly one third of patients. These findings emphasize the importance of early diagnosis, appropriate surgical intervention, and vigilant post-operative care in managing empyema.

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Any conflicts of interest: None

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