

Thoracic empyema: Cause and Treatment Outcome at Gondar University Teaching Hospital, Northwest Ethiopia

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Background: Despite improved antimicrobial therapy and multiple options for drainage of infected pleural space, thoracic empyema (TE) continues to cause significant morbidity and mortality. The objectives of this study were to assess the causes and treatment outcome of patients with thoracic empyema.

Methods: Patients aged ≥ 13 year with TE who were admitted to Gondar University Teaching Hospital, Northwest Ethiopia, from Nov 1999 to Dec 2007 were included. Retrospectively, medical records were reviewed and demographic and clinical data were collected.

Results: Records of 81 patients were analyzed; majority (82%) were below the age 50 year. The mean duration of symptoms prior to presentation and hospital stay was 97.4 and 38 days, respectively. HIV/AIDS was detected in 60%. Causes of empyema were pulmonary tuberculosis (56%), pneumonia (36%) and lung abscess (7%). Closed chest tube was inserted in 86% of cases and was successful in 93% of them. Case-fatality was 12% and poor outcome occurred in 26%.

Conclusions: Early identification of TE and aggressive management with antibiotics or antituberculosis, drainage with chest tube, and surgical treatment when closed tube drainage fails is recommended to improve the high mortality and morbidity.

Introduction

Thoracic empyema (TE) is characterized by bacterial organisms seen on gram stain or aspiration of pus on thoracentesis. Despite improved antimicrobial therapy and multiple options for drainage of the infected pleural space, TE continues to cause significant morbidity and mortality. TE is commonly caused by pneumonia, lung abscess, tuberculosis, and chest trauma and predisposing factors include alcoholism, malignancy, Diabetes mellitus and HIV infection¹⁻¹¹. The mortality rate of TE in different studies ranges from 4.7% to 24 %^{2-5,8-11}. Antibiotic therapy and drainage of the pleural space remain the first line of therapy for TE¹¹. Early adequate operative drainage in patients with TE results in low morbidity, shorter stays in hospital, and good long term outcome⁸. In our set up the available methods for drainage are therapeutic aspiration and intercostal drainage tube connected to water seal. There was one study done in Ethiopia which studied retrospectively patients with TE who were treated in Tikur Anbessa Hospital where chest surgery service is available³. To the best of our knowledge there is no study done in Gondar University Teaching Hospital (GUTH) in patients with TE. This study was designed to assess the clinical presentation, cause, predisposing factors, treatment and out come of patients with TE who presented to GUTH, Northwest Ethiopia.

Patients and Methods

In this hospital-based retrospective study patient aged 13 years and above who were admitted to Gondar University Teaching Hospital with the diagnosis of thoracic empyema from November 1999 to December 2007 were included. The diagnosis of thoracic empyema was based on the finding of gross purulent exudate or pleural fluid culture or Gram stain showing organisms. The study was started after getting ethical clearance from the Research and Publication Office of the University of Gondar. Confidentiality was assured by assigning each patient record a unique number.

Medical records of eligible patients were manually searched and datasheet was prepared to collect the following data: age, gender, address, presenting symptoms and signs, duration of illness, predisposing factors, investigations, chest x-ray, treatment, complications, duration of hospital stay and outcome at hospital discharge and cause of death. Successful chest tube drainage was defined as clinical and

radiological improvement. Poor outcome included both deteriorated and dead patients. Tuberculous empyema was diagnosed based on clinical presentation, suggestive investigations, chest x-ray and favorable response to antituberculosis drugs. The data were analyzed using SPSS version 13.0 for Windows (SPSS, Chicago IL, U.S.A.).

Results

Data from 81 patients with empyema thoracis were analyzed. There were 47 males and 34 females. The ages ranged from 16 to 90 with a mean of 36.6 years and a peak was in the 21-30 age group. The presenting symptoms are shown in Table 1. Right-side chest findings slightly outnumbered left-side chest findings (Table 3).

More than one type of chest x-ray findings were detected in some patients. Pleural fluid was frank pus in 74 (91.4%) of patients and the mean pleural fluid cell count was 16,038 cells/mm³ (range 340 - 110,650). Gram staining of the fluid was revealing in 29(36%) of cases: Gram positive (n=21), Gram negative (n=2), and both types of organisms (n=6). Acid-fast staining of the empyema showed mycobacterial species in 2 patients. Culture of the empyema grew bacteria in 12(15%) of cases: *S. aureus* (n=5), streptococcus species (n=3), proteus species (n=2), pseudomonas species (n=1) and *Klebsella Ozenae* (n=1).

Pathological examination was done in 9 patients and revealed inflammatory empyema. Sputum acid-fast staining and fine-needle aspiration of lymph node showed evidence of tuberculosis in one patient each.

Table 1. Presenting Symptoms.

Symptoms	Number of Patients	%
Cough	79	97.5
Fever	76	93.8
Sputum production	67	82.7
Weight loss	64	79.0
Chest pain	63	77.8
Shortness of breath	61	75.3
Night sweating	58	71.6
Chills	27	33.3
Haemoptysis	22	27.2
spontaneous drainage of empyema	5	6.2

Table 2. Physical Signs Identified.

Physical sign	Number of Patients	%
Signs of pleural effusion	59	72.8
Signs of hydropneumothorax	22	27.2
Crepitations	22	27.2
Signs of consolidation	21	25.9
Tracheal/mediastinal deviation	19	23.5
Lymphadenopathy	12	14.8
Change in mentation	4	4.9
Cyanosis	4	4.9
Pleural friction rub	2	2.5
Wheezes	2	2.5

Table 3. Chest X-ray Findings in 78 Patients.

Chest x-ray Findings Suggestive of:	Number of Patients	%
Fluid	44	56.4
Hydropneumothorax	35	44.9
Consolidation	10	12.8
Parenchymal infiltrates	7	9.0
Collapsed lung	6	7.7
Fibrotic changes	3	3.8
Hilar mass	2	2.6
Cavity	2	2.6
Milliary pattern	1	1.3
Pleural thickening	1	1.3

Peripheral blood examination showed leukocytosis in 7.4%, in leucopenia 26.5%, anaemia in 65.6% and high erythrocyte sedimentation rate (ESR) in 96.9% of cases with mean value of 94 mm in the first hour. Serology test for HIV was done in 53(65.4%) and it was positive in 32(60.4%) cases. Chest ultrasound showed loculated empyema in 7 patients and subphrenic abscess in 1 case.

Causes of empyema were pulmonary tuberculosis in 45 (55.6%), pneumonia in=29 (35.8%), lung abscess in 6 (7.4%) and subphrenic abscess in 1 (1.2%) of the cases. Of the 32 patients with HIV infection, 20 (62.5%) had empyema due to tuberculosis.

Treatment

Anti-tuberculosis and antibiotics were respectively given to 45 (55.6%) and 77 (95.1%) of the patients. Seventy (90.9%) cases required 2 or more types of antibiotics and the duration of treatment ranged from 1 to 49 days with a mean of 25days. Chest tube was inserted in 70 (86.4%) and it was successful in 65 (92.9%) of the cases. The mean interval in days between admission to hospital and chest tube insertion was 2.1 days with a range of 0 to 13 days. The mean duration of stay of chest tube before removal was 14 days (range 3 to 66). Chest tube reinsertion was required in 9(13%) patients and the indications for reinsertion were recollection of empyema in 7 and pneumothorax in 2 patients. Chest physiotherapy was given to 46(56.8%) cases.

Outcome

Outcome at hospital discharge was cure or improved in 60 (74.1%), deterioration without death in 11 (13.6%) and death in 10 (12.3%). The cause of death was septic shock in 7 and respiratory failure in 3 of the cases. Among the deceased 7 (70%) were males. HIV test was done in 6 of the patients who died; 3 had tested positive. Poor outcome that is the sum of those who died and those who deteriorated was 21(26%). In patients with poor outcome HIV test was done in 13 patients and it was positive in 7 of them.

The following sequelae were observed at discharge: collapsed lung (n=9), empyema necessitante (n=8), pneumothorax (n=5), fibrothorax (n=4), and bronchopleural fistula (n=4). After hospital discharge, 33 (46.5%) patients had one or more follow up visit(s).

Discussion

The objectives of our study were to analyze the clinical presentation, causes, treatment and outcome of patients with thoracic empyema admitted to Gondar University Teaching Hospital. The types of treatment that were given to these patients were antibiotics, antituberculosis, aspiration(s), and intercostal drainage tube connected to water seal. Surgical treatment (decortication etc) was not available. Most other thoracic empyema studies showed male preponderance.¹⁻⁴ Similarly in our series

58% were males. Majority of our patients (81.5%) were below the age 50 which is consistent with other studies done in Africa.²⁻⁴ This mainly reflects the Ethiopian demographics that projected that 95.6% of the population would be \leq 59 year old in 2005.¹²

In this study there was marked delay at presentation of patients to our hospital. The mean duration of symptoms prior to presentation was 3.2 months which is long compared to other studies done in Zambia⁴ and Pakistan⁵ which was 1.4 and 1.5 months, respectively. The mean hospital stay was 38 days which is consistent with other studies^{3,11} which was 43.2 and 37days, respectively. A shorter mean hospital stay (19.8days) was observed in another study.¹ Previous study has suggested that delay to drainage of an infected pleural space is associated with increased morbidity and hospital stay.⁸

The commonest cause of thoracic empyema in our series was pulmonary tuberculosis (55.6%) which is similar to other studies done in Africa which ranges from 48.7% to 63.2%.²⁻⁴ In a study done in India, pulmonary tuberculosis caused thoracic empyema in 21% of cases.⁶ The second commonest cause identified in our study was pneumonia(35.8%) which is the commonest etiology of thoracic empyema in other studies ranging from 46.7% to 94.9%.^{1,5,8,10,11} The commonest serous associated disease identified in our study was HIV/AIDS (60.4%) which is similar to a study done in Zambia (66.7%).⁴ Associated malignancy which occurred in 23% of patients in one study¹¹ was not identified in our cases which is similar to a study done in Tanzania.² Late referral for surgical management of empyema thoracis had a significantly greater incidence of anemia.⁸ The high incidence of anemia in our patients (65.6%) might be explained by the marked delay at presentation and the high incidence of associated HIV/AIDS.

Thoracostomy tube drainage success rate from previous studies ranged from 46.6% to 86%.^{3,5,10,11} In our series the success rate was 86.4%. Previous studies showed that the mortality of thoracic empyema ranges from 4.7% to 24%.^{2-5,8-11} Mortality rate may be as high as 10% in healthy patients and 50% in elderly and debilitated patients.⁵ The hospital mortality rate in our study was 12.3%; it may have been lower due to younger age group. In a prospective study of patients with pleural infection, early and aggressive treatment with chest tube drainage and antibiotics was associated with good outcome (mortality 4.7%) and emphasizes the need for rapid and effective intervention in this disease.⁹ The high percentage of patients with poor outcome (26%) probably indicates the marked delay at presentation, the unavailability of surgical treatment when closed tube drainage fails and the high prevalence of HIV/AIDS.

Conclusion

Most of our patients were young males and presented with cough, fever, expectoration and weight loss. There was marked delay at presentation and the commonest cause was pulmonary tuberculosis followed by pneumonia. Underlying HIV/AIDS was found in 60% of cases.

High mortality and poor outcome was noted in our series 12.3% and 26%, respectively. Early identification of thoracic empyema and aggressive management with antibiotics or antituberculosis, drainage with chest tube, surgical treatment when tube drainage fails is recommended to improve mortality and morbidity.

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