

Empyema Thoracis in Zaria; a Preliminary Report

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Abstract

Aims and Objective

To study the nature and pattern of presentation of empyema thoracis (and the association between duration or time of presentation and educational level and level of income respectively), the aetiology, and different treatment outcomes.

Materials and Methods

A prospective study of all patients who presented with Empyema Thoracis between January 2008 to May 2010 was carried out at ABUTH Zaria. The diagnosis of empyema thoracis was entertained from either the presence of pus in the pleural space or the culture of actively multiplying bacteria in a serous Data was analysed with SPSS 15.

Results

A total of 26 patients were managed, 19(73.1%) men, 7(26.9%) women. There were 4(15.4%) acute and 22(84.6%) chronic empyema. One male had bilateral chronic empyema giving 13 right-sided, and 14 left-sided empyema. Tuberculosis was responsible for 26.9% of the cases, 38.4% were post-pneumonic, while postoperative, and AIDS were each responsible for 11.5% and trauma 7.7%. Five patients had decortication, 2 had rib resection and open drainage, and the remainder were managed on tube thoracostomy. Two patients were discharged against medical advice, 6 were lost during follow-up. Fourteen (53.8%) were educated (1 acute and 13 chronic). Twelve (46.2 %) were uneducated (3 acute and 9 chronic). Fourteen patients (2 acute and 12 chronic) earned average or above average income while 12 (46.2%) earned below average income (2 acute and 10 chronic). There was no association between duration of presenting complaints and level of education or level of income (Fisher's exact test was, 0.306 and 1.000, respectively) at a P value of 0.05

Conclusion

Empyema thoracis is persistent and prevalent in our environment despite improvements in diagnosis, treatment and prevention. Most patients present late and this is not related to income or level of education. The commonest organism isolated from empyema fluid in developing countries is staphylococcus aureus but most empyema fluid are sterile due to prolong antibiotic use. The factors responsible for delayed presentation, the pattern of presentation and the pathology and outcome of treatment is part of an ongoing study.

Key Words: Empyema Thoracis, Presentation, Aetiology, Treatment

Introduction

Empyema thoracis is the presence of pus or actively multiplying bacteria in the pleural space^{1,3}. It could complicate pneumonia, pulmonary tuberculosis or pleural effusion of whatever cause, it could follow a penetrating chest injury or result from extension of sepsis in contiguous organs like lung or liver abscesses among others. Patient may present with history of trauma to the affected side of the chest, fever, pleuritic chest pain, dyspnoea(complication of pneumonia), drenching night sweats and positive contact with a patient with chronic cough(suggestive of tuberculosis)⁵. These patients are often gravely ill and nutritionally drained. They may be scoliosed (bent to the affected side) in chronic cases

and in some cases may have a discharging sinus(empyema necessitans) especially in tuberculous cases. This problem is persistent and prevalent in our sub-region despite the availability of potent antibiotics^{3,4}. Some of the reasons for late presentation as proffered in previous studies include poverty and ignorance^{5,6}. However patients may in general present early at peripheral hospitals or clinics and only resort to referral to specialist centers when their diseases persist⁶. The reasons for the prevalence, the nature and pattern of presentation are the basis for this ongoing study.

Aims and Objective

To study the nature and pattern of presentation of

empyema thoracis (and the association between time or duration of presentation and educational level and also the association between time or duration and level of income), the aetiology, and different treatment outcomes.

Patients and Methods

A prospective study of all patients who presented with Empyema Thoracis between January 2008 to May 2010 was carried out at ABUTH Zaria. The biodata including the level of education and average income of patients were obtained. The level of education was taken as those who have attained a minimum of secondary education and could communicate easily in English language while the average income was taken as earning a minimum of \$50 per month (equivalent to Nigerian minimum wage of 7500 naira). The evaluation of patient included obtaining clinical history followed by thorough physical examination. The diagnosis of empyema thoracis was made based on the presence of homogenous opacity on plain chest radiography and the aspiration of pus from the pleural space or the culture of actively multiplying bacterial from serous effusions. Patients Data was analysed with SPSS 15.

Results

A total of 26 patients were managed, 19(73.1%) males, 7(26.9%) females (see Table 1).

Table 1: Sex Distribution of Patients with Empyema in Zaria (January 2008-May 2010)

Sex	Freq	%	Valid%	Cumulative %
Male	19	73.1	73.1	73.1
Female	7	26.9	26.9	100.0
Total	26	100.0	100.0	

Table 2: Age Distribution of Patients with Empyema in Zaria (January 2008- May 2010)

Age	Freq	%	Valid %	Cumu %
0-9	2	7.7	7.7	7.7
10-19	3	11.5	11.5	19.2
20-29	6	23.1	23.1	42.3
30-39	4	15.4	15.4	57.7
40-49	8	30.8	30.8	88.5
50-59	3	11.5	11.5	100.0
Total	26	100.0	100.0	

Cumu % - cumulative percent

There were 4(15.4%) acute and 22(84.6%) chronic empyema. One male had bilateral chronic empyema giving 13 right-sided, and 14 left-sided empyema. Tuberculosis was responsible for 7(26.9%) of the cases, 11(38.4%) were post-pneumonic, while postoperative, and AIDS were each responsible for 3(11.5%) and trauma 2(7.7%) (See Table 3).

Table 3: Percentage Distribution of Empyema in Zaria According to Aetiology (January 2008- May 2010).

Aetiology	Freq	%	Valid %	Cumu %
TB	7	26.9	26.9	26.9
POST-PN	11	42.3	42.3	69.2
TRAUMA	2	7.7	7.7	76.9
POST-OP	3	11.5	11.5	88.5
AIDS	3	11.5	11.5	100.0
Total	26	100.0	100.0	

TB (Tuberculosis), POST-PN (Post-Pneumonic), POST-OP(Postoperative).

Microbiology of the pus isolated Staphylococcus aureus in one of the acute patients and Klebsiella specie and Candida specie in another (both posttraumatic) while in the remaining two acute cases the pus was sterile. Tuberculosis was isolated from the sputum of one chronic patient and confirmed by histology in another while the remaining five cases of tuberculosis made significant improvement when empirically treated with antituberculous drugs (therapeutic trials). Staphylococcus aureus and Enterobacteriaceae were isolated in one of the tuberculosis patients and Staphylococcus aureus and Candida specie in another tuberculosis patient. All the postpneumonic empyema were sterile, bringing the total isolate to 5(19.23%) either by microscopy/culture or histology (i.e. positive in five patients). Five (19.23%) patients had decortication, 2(7.7%) had rib resection and open drainage, and the remainder were managed on tube thoracostomy only 19(73.08%).

Table 4: Distribution of Empyema in Zaria according to Duration of Symptoms.

Duration of Symptom	Freq	Percent	Cumulative percent
< 1 month	4	15.38	15.38
1-3 months	9	34.62	50.0
4-6 months	4	15.38	65.38
7-9 months	3	11.54	76.92
10-12 months	3	11.54	88.46
> 12 months	3	11.54	100.0

Two patients were discharged against medical advice (without treatment). Six were lost to follow-up. Fourteen (53.85%) were educated (1 acute and 13 chronic). Twelve (46.2%) were uneducated (3 acute and 9 chronic). Fourteen patients (2 acute and 12 chronic) earned average or above average income while 12 (46.2%) earned below average income (2 acute and 10 chronic).

Table 5a: 2x2 Contingency Table for Duration of Presenting Complaint and Level of Education.

Duration of Presenting Complaint	Level of Education		Total
	Educated	Not educated	
Acute	1	3	4
Chronic	13	9	22
Total	14	12	26

Table 6a: 2x2 Contingency table for Duration of Presenting Complaint and Level of Income.

Duration of Presenting Complaint	Level of income		Total
	Below Average	Average	
Acute	2	2	4
Chronic	12	10	22
Total	14	12	26

There was no association between duration of presenting complaints and level of education or level of income (Fisher's exact test was, 0.306 and 1.000, respectively) at a P value of 0.05. (see Tables 5a, 5b and 6a, 6b respectively).

Table 5b Chi-Square Test for Table 5a

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	1.583(b)	1	.208		
Continuity Correction(a)	.508	1	.476		
Likelihood Ratio	1.624	1	.203		
Fisher's Exact Test				.306	.239
Linear-by-Linear Association	1.522	1	.217		
N of Valid Cases	26				

- a. Computed only for a 2x2 table
- b. 2 cells (50.0%) have expected count less than 5. The minimum expected count is 1.85.

Table 6b: Chi-Square Tests for table 6a.

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	.028(b)	1	.867		
Continuity Correction(a)	.000	1	1.000		
Likelihood Ratio	.028	1	.867		
Fisher's Exact Test				1.000	.641
Linear-by-Linear Association	.027	1	.869		
N of Valid Cases	26				

- a Computed only for a 2x2 table
- b 2 cells (50.0%) have expected count less than 5. The minimum expected count is 1.85.

Discussion

Despite the full understanding of the pathophysiology of empyema thoracis, the management remains a formidable challenge in our environment⁷; mainly because most people present late and majority of the sufferers are paupers. Before the basic principles of management were outlined by Ewart Graham's commission in 1918, the average mortality was 30.2% and the range as high as 70% in places where open drainage was practiced⁸. When the principles Dr. Graham elucidated were applied by the Empyema Commission, the mortality was reduced to 3.4%. These principles include (1) careful avoidance of an open pneumothorax in the acute stage (2) prevention of chronic empyema by the rapid sterilization and obliteration of the infected pleural space and (3) careful attention to the nutrition of the patient. The principles remain true and unchanged till this day. The reasons for the marked disparity in sex distribution as seen in this study (male to female ratio of 2.7:1) and others remain largely unknown⁴. Could it be related to risky social habits or occupational hazards. Could occupational hazards and life styles or habits explain why 69.3% of the patient fell between the age ranges of 20-49 years (See Table 2). The mean duration of presenting complaint of 6.31 months is a proof that most of our patients presented late (See Table 4). Virtually all those who presented early were either post-traumatic or post operative patients. Similar to our finding, Ekpe et al found a male to female ratio of 3.5:1 in pediatric age group, but a higher illiteracy rate of 61% amongst parents of the patients⁵. In an attempt to explain this pattern of presentation and outcome of treatment, we carried out a chi-square test of association. The result therefore shows that irrespective of the level of education or income, patients with empyema present late unless when associated with trauma (Fisher's exact test was, 0.306 and 1.000, respectively at a P value of 0.05). While Odelowo et al had reported a finding of 98.3% of their patients having no, low or medium income we found 53.85% of our patients to have below average income⁹. Odelowo et al's apparently high rate is as a result of merging patients with average (medium) income with that of those with no or low income. The low isolate from pus microscopy and culture 5(19.23%) may be related to prolonged antibiotic use. Like Hassan and Mabonguje, *Staphylococcus aureus* was the commonest isolate, 3(11.5%) albeit they had a higher percentage of 39% in paediatric age group from the same institution in 1992¹⁰. This shows that the bacteria spectrum has change little in the index institution for almost two decades. This pattern is similar to that noted by previous researchers and Gupta et al affirmed that this is the commonest

pattern in the tropics and subtropics. While like Hassan and Mabogunje we found no significant difference in the sidedness of empyema (right-51.85%, left-48.15%), Gupta et al, recorded 61.6% right, 33.3% left and 5% bilateral in their analysis of 60 pediatric patients, while Ekpe et al found 50% versus 33.33% right to left-sided empyema (16.66%)^{5,11}. The significance of this finding is yet to be fully explained, though Ekpe et al alluded to a higher incidence of aspiration pneumonia by Aderole in pediatric age groups^{2,5}. Though none of our patients died, this may be related to the low operative rate (26.92% for chronic empyema), proper patient selection and adherence to the basic principles of management. Adherence to these basic principles has proven in this (73.08%) and past studies that most empyema including some chronic cases can be managed by just tube thoracostomy appropriate antibiotics and good nutrition. The average operative mortality in other studies was between 6-7%^{11,12}.

Conclusion

Empyema thoracis is persistent and prevalent in our environment despite improvements in diagnosis, treatment and prevention. Most patients present late and this is unrelated to level of education or income. The assertions from the statistical analysis may be inconclusive for the simple reasons that the sample size is small and this is a preliminary report. For unknown reasons males and people in the middle ages seem to be more affected. *Staphylococcus aureus* is the commonest pyogenic organism isolated but most empyema fluid are sterile probably due to prolonged antibiotic use. Most empyema thoracis including some chronic cases, are managed by tube thoracostomy, appropriate antibiotics and good nutrition only. The factors responsible for delayed presentation, the pattern of presentation and the pathology and outcome of treatment are part of an ongoing study.

References

1. Locicero J. Benign and Malignant Disorders of the Pleura. In: Baue AE, Geha AS, Hammond GL, Laks H, Naunheim KS. Eds. Glenn's Thoracic and Cardiovascular Surgery vol.1, 6th Ed; Appleton and Lange, Stanford Connecticut 1996: 537-555.
2. Aderole WI. Pleural Effusion, Pneumothorax and Bronchiectasis. In Azubuike JC, Nkanginieme KEO Eds. Pediatrics and Child Health in a Tropical Region. Owerri. African Educational Services, 1999, p. 246-53.
3. Anyanwu CH. Empyema. In: Badoe EA,

- Archampong EQ, da Rocha-Afodu J.T.(eds) ; Principles and Practice of Surgery, Including Pathology in the tropics. 3rd edition. Ghana Publishing Corporation, Tema 2000; 429-431.
4. Anyanwu CH, Egbue M. Management of Pleural Sepsis in Nigerian Children. *Thorax* 1981;36:282-5.
 5. Ekpe EE, Akpan AM. Poorly Treated Broncho-Pneumonia with Progression to Empyema Thoracis in Nigerian Children. *TAF Preventive Medicine Bulletin*, 2010;9(3):181-186.
 6. Ekortal A, Ndom P, Sacks A. A study of Patients who appear with far advanced cancer at Yaounde General Hospital, Cameroon, Africa. *Psychooncology* 2007 Mar; 16(3):255-7.
 7. Baranwal AK, Singh M, Marwaha RK, Kumar L. Empyema thoracis: a 10-year comparative review of hospitalised children from south Asia. *Arch Dis Child* 2003; 88:1009-1014.
 8. Odell JA. Management of empyema thoracis. *Journal of the Royal Society of Medicine* Vol. 87; August 1994: 466-470.
 9. Odelowo EO, Adedoyin MA, Andy JJ, Olamijulo SK. Empyema Thoracis in Nigeria: experience with a Policy of Conservative Operative Management. *Int Surg* 1989 Oct-Dec; 74(4):247-52
 10. Hassan I, Mabogunje O. Paediatric Empyema thoracic in Zaria, Nigeria. *Ann Trop Paediatric* 1992; 12(3):265-71.
 11. Gupta AK, Lahoti BK, Singh S, Mathur RK, Mishra H, Wadhera S. A Study on Comprehensive Management of Acute and Chronic Empyema Thoracis in the Pediatric Age Group and their Outcome. *The Internet Journal of Surgery*. 2008. Vol. 14 No. 1. ISSN 1528-8242.
 12. Mandal AK, Thadepalli H, Alope K. Mandal AK, Chettipally U. Outcome of primary empyema thoracis: therapeutic and microbiologic aspects. *Ann Thorac Surg* 1998;66:1782-1786.