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CULTURE AND SENSITIVITY PATTERNS OF THE CAUSATIVE ORGANISMS ISOLATED FROM THE PATIENT OF EMPYEMA THORACIS

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Abstract;
Background; empyema thoracis is defined as an accumulation of pus within the pleural space and has been associated with a high death rate. The aim of the study was to find out the Culture and sensitivity patterns of the causative organisms isolated from the patient of Empyema Thoracis.

Material and method; the current descriptive cross-sectional study was carried out at the department of Pulmonology, GMMMC hospital Sukkur from January 2023 to November 2023 after taking approval from the ethical committee of the institute. A total of 224 individuals of both genders age ranged from 20-60 years were enrolled in this study. All the individuals were evaluated for empyema thoracis. Historical data on demographics was documented. Every patient had a tube tharacostomy pleural drainage surgery, and empiric antibiotics were started to treat the pleural infection. For antibiogram antibiotics used were Amoxicillin, Gentamicin, Amikacin,, Cefotaxime, Ciprofloxacin, Co-amoxiclav, and Moxifloxacin. Based on results, they were classified as sensitive or resistant. All the data was analyzed through SPSS.

Results; A total of 224 were examined. Out of the total patients 33.9% had culture positive results. Of the individuals who tested positive for culture, 48 were men and 26 were women. Culture sensitivity results evaluated that Out of the 224 individuals, 61 (27.2. %) showed sensitivity to cefotaxime, ceftriaxone, ciprofloxacin, and moxifloxacin; 58 (25.8%) to gentamycin; 57 (25.4%) to cephradine and Co-amoxiclav; and 48 (21.4%) to amoxicillin.

Conclusion: From the current study it was concluded that Less than one-third of individuals with empyema thoracis have positive empyema fluid cultures and most of the organisms are sensitive to the majority of routinely used antibiotics.

Key words; Empyema Thoracis, antibiogram, antibiotics

Introduction

The definition of empyema is an accumulation of pus in the pleural space. (1) Over the past few decades, the range of species isolated from empyema has changed. (2) Prior to the development of antibiotics, Streptococcus pneumoniae was the most frequently isolated bacteria. A significant proportion of culture-positive effusions in the 1990s produced aerobic microbes. (2) In about 11% of pulmonary tuberculosis cases, empyema develops as a result of the progression of a primary tuberculosis pleural effusion, direct infection extension into the pleural space from thoracic lymph nodes, vertebra, or sub diaphragmatic focus, and haematogenous spread(3).1.3 percent of community-acquired pneumonia cases progress to empyema.(4) Even with advancements in antibiotic treatment and a variety of drainage techniques, thoracic empyema still results in substantial morbidity and fatality rates. Around fifteen percent of these people pass away.

The prevalence of it in both adults and children is increasing (5, 6). For individuals with empyema, early removing should be taken into consideration due to its high death rate. (7) Up till recently, little is known regarding the microbiology and drug susceptibility patterns of patients suffering from empyema in tertiary level hospitals. The current study was conducted to determine the Culture and sensitivity patterns of the causative organisms isolated from the patient of Empyema Thoracis.

Materials and method

the current descriptive cross-sectional study was carried out at the department of Pulmonology, GMMMC hospital Sukkur from January 2023 to November 2023 after taking approval from the ethical committee of the institute. A total of 224 individuals of both genders age ranged from 20-60 years were enrolled in this study. All the individuals were evaluated for empyema thoracis and diagnosed their pleural fluid drawn from the pleural cavity using a standard needle connected to a syringe. All the participants fulfilled the inclusion criteria were registered and those who have taken antibiotics two weeks before the study or having malignant chest diseases were excluded from the study. Historical data on demographics was documented. Every patient had a tube tharacostomy pleural drainage surgery, and empiric antibiotics were started to treat the pleural infection. For sensitivity testing and culture, five milliliter pus specimens were obtained in disposable, sterilized syringes. Later on, antibiotics were substituted based on a sensitivity and culture report. For antibiogram antibiotics used were Amoxicillin, Gentamicin, Amikacin,, Cefotaxime, Ciprofloxacin, Co-amoxiclav, and Moxifloxacin. Based on results, they were classified as sensitive or resistant.

Data analysis

SPSS version 25 was used to analyze the data. Frequencies and percentages were used to describe categorical data including gender, demography, the kind of cultivated microorganisms, and the susceptibility to antibiotics. The mean and standard deviation were used to explain quantitative data like age. Gender and age-based stratification was used to assess drug sensitivity and culture. A chi-square test was employed to assess the cultural and sensitivity variances among various age and gender cohorts.

Results

The ages of the patients ranged from 20 to 60 years old, with a mean age of 41.73 ± 12.95 years. A total of 224 were examined in which 152 (67.8%) were male and 72(32.1%) were female. Out of the total patients, 150 (66.9%) had culture negative, while 74 (33.9%) had positive results. Of the individuals who tested positive for culture, 48 were men and 26 were women. A total of 224 patients evaluated .out of these, 5(2.2%) had polymicrobial infections with positive culture growth, 10(4.4%) had *Streptococcus pneumoniae*, 15(6.6%) had *S.aureus*, 9(4.0%) had *E.coli*, 4(1.78%) had *Streptococcus milleri*, 17(7.5%) had Bacteroides, 6(2.6%) had Klebseilla pneumonae, 4(1.7%) had Peptococcus, and 4(1.7%) had other infections (Pseudomonas and Proteus).

Culture sensitivity results evaluated that Out of the 224 individuals, 61 (27.2. %) showed sensitivity to cefotaxime, ceftriaxone, ciprofloxacin, and moxifloxacin; 58 (25.8%) to gentamycin; 57 (25.4%) to cephradine and Co-amoxiclav; and 48 (21.4%) to amoxicillin.(Figure i.)

Discussion

In the current study we investigated the diversity of microorganism and antibiotic sensitivity pattern in the individuals with empyema thoracis. In the present study, just 33.9 percent of the bacterial cultures produced positive results. The sample included in our study was primarily male (67.8%). Of the organisms on the list, *staphylococcus aureus* was ranked second most often showed growth (6.6%), after bacteroides (7.5%). The medicines cefotaxime, ceftriaxone, ciprofloxacin, and moxiflaxacin each showed the highest degree of sensitivity (27.20%). A number of studies have shown that distinct organisms may be isolated from culture of empyema fluid among different individuals. Research from Pakistan, India, and Canada showed an overwhelming majority of men (68.2%, 75.4%, and 64%, respectively).our results are similar with those studies (8-10). The most likely cause for the possible X-linked cause of this male preponderance genes that produce immunoglobulins, making the male population more susceptible to these kinds of diseases (11, 12). 52.7% of the participants in certain Pakistani studies had positive cultures, with Pseudomonas being the most prevalent isolate (18.8%) and having higher susceptibility to antibiotics such as amoxicillin/clavulanic acid, tigecycline, clarithromycin, colistin, vancomycin, fosfomycin, and ertapenem against bacterial pathogens. (8) According to a research by Tareen et al., the most prevalent agents were gram-negative enteric rods (91%) and the only other organism that was recovered was Streptococcus pyogenes(5.4%).(13)These results are not consistent with what we found.

The difference in the study population might be the cause. The high degree of antibiotic resistance that exists to antibiotics seen in our study and other comparable studies is concerning about these findings. (14) Antimicrobial resistance is a major issue on a worldwide scale, with developing nations particularly affected. The most likely cause of this issue appears to be the overuse of antibiotics.(15) The literature advises treating empyema as soon as possible to prevent the horrible side effects of the condition.(16) Early treatment start might also lessen pain and economic hardship. However, the majority of people do experience persistent empyema, and early therapy is not always viable. Surgical thoracotomy or video-assisted thoracoscopic surgery (VATS) plus decortication become required procedures at the advanced stage. (17) Attempts to determine possible risks are necessary to lessen the development of empyema.

Old age, severe pneumonias, immunocompromised states, bronchiectasis, certain neurological conditions, diabetes mellitus, and chronic obstructive lung disease are among the most prevalent risk factors.(18) As the effectiveness of treatment greatly depends on better management of the related comorbidities, it is advised to control the associated comorbidities as best as possible.(19)

Limitation

There are various limitations of the current study. Because it was expensive and time-consuming, we did not analyze cultures for mycobacterium tuberculosis as well as certain unusual microorganisms and many patients were already taking antibiotics.

Conclusion

From the current study it was concluded that Less than one-third of individuals with empyema thoracis have positive empyema fluid cultures and most of the organisms are sensitive to the majority of routinely used antibiotics.

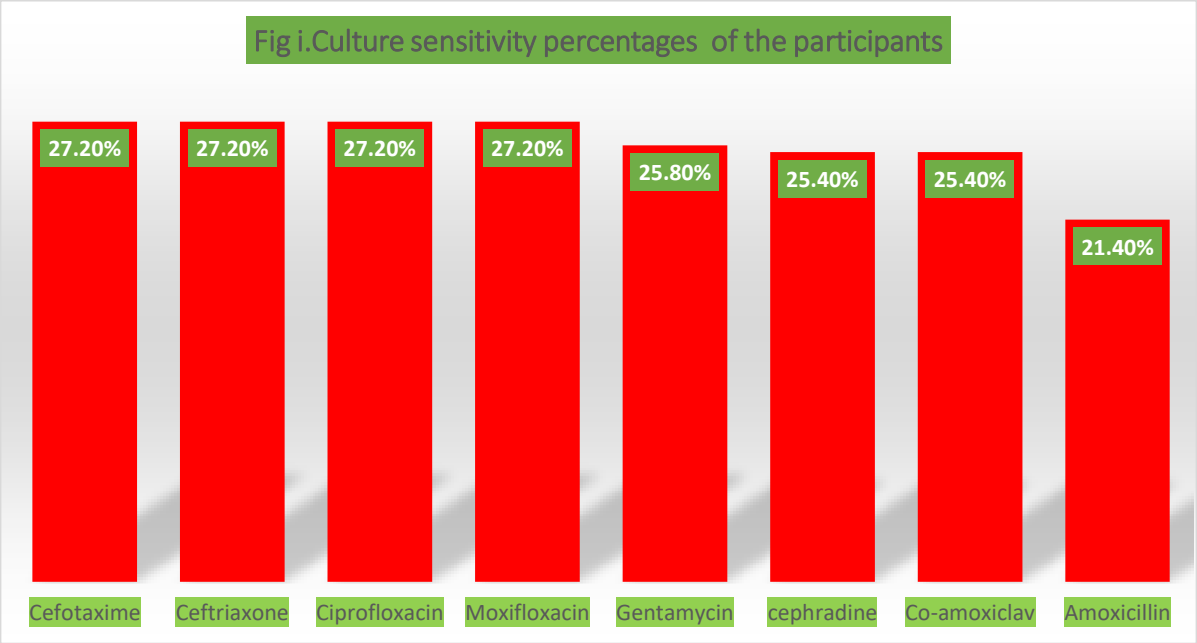

Table 1. Percentages of cultured microorganisms with gender wise stratification				
Cultured microorganisms	Status	Male N (%)	Female N (%)	Total N (%)
Poly microbial	Yes	3(1.3)	2(0.8)	5(2.2)
	No	41(18.3)	20(8.92)	61(27.2)
	NA (other than poly microbial)	108(48.21)	50(22.32)	158(70.5)
	Total	152(67.85)	72(32.1)	224(100)
S. pneumoniae	Yes	5(2.2)	5(2.2)	10(4.4
	No	39(17.4)	17(7.5)	56(25)
	Na (other than S. pneumonia)	108(48.21)	50(22.32)	158(70.5)
	Total	152(67.85)	72(32.1)	224(100)
S.aureus	Yes	8(3.5)	7(3.1)	15(6.6)
	No	36(16.0)	15(6.6)	51(22.7)
	NA other than S.aureus)	108(48.21)	50 (22.32)	158(70.5)
	Total	152(67.85)	72(32.1)	224(100)
E.coli	Yes	5(2.2)	4(1.7)	9(4.0)
	No	39(17.4)	18(8.0)	57(25.4)
	NA (other than E.coli)	108(48.21)	50(22.32)	158(70.5)
	Total	152(67.85)	72(32.1)	224(100)
Streptococcus milleri	Yes	2(0.8)	2(0.8)	4(1.6)
	No	42(18.7)	20(8.9)	62(27.6)
	NA (other than S.milleri)	108(48.21)	50(22.32)	158(70.5)
	Total	152(67.85)	72(32.1)	224(100)
Bacteriodes	Yes	10(4.46)	17(7.5)	17(7.5)
	No	34(15.1)	5(2.2)	39(17.4)
	NA	108(48.21	50(22.32)	158(70.5)
	Total	152(67.85	72(32.1	224(100)
Klebsiella pneumoniae	Yes	4(1.7)	2(0.8)	6 (2.6)
	No	40(17.8)	22(9.8)	62(27.6)
	Na (Other than k. pneumoniae)	108(48.21)	50(22.32)	158(70.5)
	Total	152(67.85)	72(32.1)	224(100)
Peptococcus	Yes	2(0.8)	2(0.8)	4(1.6)
	No	40(17.8)	20(8.9)	60
	NA (other than. Peptococcus)	108 (48.21)	50(22.32)	158 (70.5)
	Total	152(67.85)	72(32.1)	224(100)
Other(pseudomonas,proteus	Yes	2(0.8)	2(0.8)	4(1.6)
	No	42(18.7)	22(9.8)	62
	NA(other than	108(48.21)	50 (22.32)	158(70.5)
	Total	152(67.85)	72(32.1)	224(100)

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