

ORGANISMS DETECTED IN EMPYEMA THORACIS AND THEIR SUSCEPTIBILITY PATTERN

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ABSTRACT

Background: Empyema and pleural effusions are commonly encountered entities.

Objective: To determine the types of organisms detected in empyema thoracis and their susceptibility pattern.

Methodology: This was a cross-sectional study carried out at Department of Biochemistry, Allied Hospital, and Faisalabad during July 2017 to March 2018. In this study, the cases of both gender with age more than 15 years and having empyema were included. The samples of pleural fluid were inoculated on Mac-conkey agar, 5% sheep blood agar and were stained for gram staining and were further processed for detection and isolation of different organisms on standard techniques. Susceptible antibiotic testing was done on isolated organisms of the empyema by using modified Kirby Bauer disc diffusion method by detection of AmpC, Metallo-beta-lactamase (MBL), detection of MRSA, ESBL for different degrees of MIC.

Results: In this study, there were total 50 cases of empyema thoracis. Out of these, 31 (62%) were males and 19 (38%) females. The mean age was 47.13±8.34 years. The most common organism detected was Klebsiella, which was seen in 14 (28%) of the cases, followed by Pseudomonas aeruginosa seen in 12 (24%) of the cases. Staph aureus and E coli were seen in 8 (16%) of the cases each. Klebsiella, and Pseudomonas showed maximum susceptibility to Imipenem and Ceftazidime. Staph aureus was susceptible to Linezolid and Colistin.

Conclusion: The most common organism detected was Klebsiella spp, followed by Pseudomonas aeruginosa and Imipenem has shown good sensitivity to various organisms.

Key words: Empyema, Klebsiella, Pseudomonas, Susceptibility.

INTRODUCTION

Empyema and resistant pleural effusions are common entities and their evaluation regarding the cause and in case of infections; the culprit organism detection is the primary goal.¹ The pattern of these organisms and their susceptibility has changed dramatically over last fifty years after the advent of antibiotics.² Gram positive bacteria were the most common ones in the last era isolated from the pleural fluids; but the trends have changed towards detection of more gram negative ones with resistant strains.¹

The emergence of antibiotics led to the historical success against infectious disease and the microbial world has shown remarkable resilience and have adapted to the changed antibiotics.³

Rational antibiotic use is under extensive discussion as its uncontrolled and irrational use led to development of resistance and moreover, horizontal gene transfer provided another mean for the emergence of multi drug resistant organisms like extended spectrum beta lactamases (ESBL).^{4,5} The plasmids responsible for ESBL production frequently carry genes that encode for various resistance mechanisms and multiple ESBL enzymes that target various antibiotic

classes, which dramatically reduce treatment options. Carbapenems, which are currently the treatment of choice for ESBLs, may thus be losing their effectiveness.^{4,5}

The objective of the study was to determine the types of organisms detected in empyema thoracis and their susceptibility pattern.

METHODOLOGY

Study design: Cross sectional study.

Study Setting: Department of Biochemistry, Allied Hospital, Faisalabad. **Study Duration:** July 2017 to March 2018. **Sampling techniques:** Non probability consecutive sampling.

In this study, the cases of both genders with age more than 15 years were included. The empyema was diagnosed on the basis of pleural fluid aspiration and frank pus on analysis for any duration of time. The cases with HIV and those with Tuberculosis were excluded from this study. The samples of pleural fluid were inoculated on Mac-conkey agar, 5% sheep blood agar and were stained for gram staining and were further processed for detection and isolation of different organisms on standard techniques. Susceptible antibiotic testing was done on isolated organisms

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the empyema by using modified Kirby Bauer disc diffusion method by detection of AmpC, Metallo-beta-lactamase (MBL), detection of MRSA, ESBL for different degrees of MIC.

The Data was entered and analyzed by using SPSS-version 23. Frequency and percentages were calculated for categorical data and mean and standard deviation for quantitative data. Ethical approval was sought from hospital ethics committee.

RESULTS

In this study, there were total 50 cases of empyema thoracis. Out of these 31 (62%) were males and 19 (38%) were females. The mean age was 47.13 ± 8.34 years, BMI was 29 ± 3 and duration of empyema was 17 ± 4 days. The most common organism detected was Klebsiella spp, which was seen in 14 (28%) of the cases, followed by Pseudomonas aeruginosa seen in 12 (24%) of the cases. Staph aureus and E coli was seen in 8 (16%) of the cases each as in table I. Klebsiella and Pseudomonas showed maximum susceptibility to Imipenem and Ceftazidime. Staph aureus was susceptible to Linezolid, Colistin and Vancomycin as shown in table II.

Table I: Organisms detected in patients having empyema.

Organism	Number	Percentage
Klebsiella spp.	14	28%
P. aeruginosa	12	24%
Staph Aureus	8	16%
E Coli	8	16%
Enterobacteriaceae	5	10%
S. Pneumonia	2	4%
P. Mirabilis	1	2%

Table II: Organisms detected and susceptibility pattern.

Organism	Susceptible drugs
Klebsiella spp.	Imipenem, Ceftazidime, Amikacin
P. aeruginosa	Imipenem, Piperacillin, Ceftazidime
Staph Aureus	Linezolid, Colistin, Vancomycin
E Coli	Imipenem, Tazocine, Amikacin
Enterobacteriaceae	Imipenem, Tazocine, Amikacin
S. Pneumonia	Ceftazidime, Piperacillin, Imipenem
P. Mirabilis	Imipenem, Amikacin, Azithromycin

DISCUSSION

Empyema is among the very old diseases that are prevalent in the mankind and was also diagnosed in the times of Hippocrates and was always been a problem to treat, and despite modern day facilities; though some improvement has been seen in its management, but yet non response is a big dilemma. The cause of this significant morbidity due to inability of the body's defence system along with anti-microbial therapy is the prevalence of drug resistant strains in the community. Drug resistance is an important issue across the globe and all the centres tend to look for their prevalence bugs and their susceptibility pattern for a better empiric antibiotic administration.⁶

In the present study, the cases with documented positive results on culture reports were included. The overall positive results in terms of bacterial isolation are found to be around 17.7% of the cases in a very large study where 2219 pleural fluid samples were taken and assessed at microbiology laboratory.⁷ In another Indian study the results were slightly lower and were seen in 15.3% of the cases.⁸ While in the developed countries this isolation was even low and according to a study by Mayo Medical Centre, Rochester on 1320 cases yielded a positive culture in 19 (1.4%) cases only.⁹

In this study, the most common organism detected was Klebsiella spp, which was seen in 14 (28%) of the cases followed by Pseudomonas aeruginosa seen in 12 (24%) of the cases. According to a study by Sonali J et al the gram negative bacteria were the most common isolates and were seen in, 267 (88.4%) out of 302 cases.¹⁰ A similar finding was seen in a study by Gupta SK et al where they found this 84.6% of cases.¹¹

According to multiple studies the most common isolates were E.coli, Klebsiella spp, Pseudomonas spp, and Proteus spp) and the number of anaerobic organisms have increased immensely which were not studied in the present study.¹⁰⁻¹³ In a study by Sonali et al the most common organism detected was Pseudomonas aeruginosa, which was seen in 55.3% of the total isolates.¹⁰

In this study, the Imipenem has shown good sensitivity to various organisms; but the data regarding its sensitivity and resistance is widely variable and the studies have shown high resistance against it in Pseudomonas aeruginosa isolates.^{14, 15} Furthermore, it was studied that the carbapenem resistance has gone up from 31-64% in India. The resistance to carbapenems can be explained by

various mechanism i.e. decrease membrane permeability and increased efflux and metallo- β -lactamase.¹⁴⁻¹⁵

CONCLUSION

This study concludes that the most common organism detected was *Klebsiella* spp, followed by *Pseudomonas aeruginosa* in empyema patients and Imipenem has shown good sensitivity to various organisms.

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