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Bacteriological Profile in Pleural fluid and its antibiotic susceptibility pattern among patients admitted in tertiary care teaching hospital in Solapur, Maharashtra

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Abstract
Pleural fluid of infectious etiology is major cause of morbidity & mortality among patients. Aim of the study is to study bacteriological profile in Pleural fluid and to know its antibiotic susceptibility pattern.

Material & Method: Pleural fluid sample were collected by standard procedure using aseptic precautions. All specimens of Pleural fluid from Nov 2017 to Oct 2018 that came for culture & sensitivity to Microbiology department in tertiary care teaching hospital Solapur, were included in the study. All the fluids were subjected to gram staining for provisional report and then inoculated on culture media and incubated overnight at 37ºC. Growth if any was noted and isolate was identified using standard protocols. Antibiotic susceptibility testing was done using Kirby bauer disk diffusion method.

Results: Total sample of Pleural fluid received from Nov 2017 to Dec 2018 were 120 out of which 42 (35%) showed growth while 78 (65%) samples were sterile. Culture positivity rate was 35%. Majority of isolates were Gram negative bacilli 34 (80.95%) of which most common was *Acinetobacter baumanii* 14 (33.33%) followed by *E. coli* 6 (14.28%), *Klebsiella pnemoniae* 4 (9.52%), *Enterobacter aerogens* 4 (9.52%), *Citrobacter koseri* 4 (9.52%) and *Pseudomonas aeruginosa* 2 (4.76%). Among gram positive spectrum, *Staphylococcus aureus* were isolated from 8 (19.04%) samples. Of which MRSA were 6 (14.28%) and MSSA were 2 (4.76%). Males 25(59.52%) were more commonly affected then females 17 (40.50%). Most common age group affected was 31-45 years in males while in females most common age group affected was 16-30 years. Overall among gram negative bacteria maximum resistance was noted for Ampicillin 68.75%, Ciprofloxacin 68.75%, Cefotaxim 68.75% followed by Imipenem 53.13%.High sensitivity was seen for Amikacin 64.70% followed by Piperacillin-tazobactam 58.82%. Overall among gram positive organisms 100% sensitivity was seen for Vancomycin, Gentamicin & Ciprofloxacin. Sensitivity for Erythromycin, Clindamycin & Cotrimoxazole was 75%respectively. Resistance to Cefoxitin was noted in 75% of gram positive isolates.

Keywords: MRSA- Methicillin resistant *Staphylococcus aureus*, MSSA- Methicillin sensitive *Staphylococcus aureus*

Introduction

Sterile body sites if infected with microorganisms can lead to severe morbidity and mortality among patients [1]. These infections have greater clinical urgency as these infections are often life threatening [2[. Different types of microorganisms like bacteria, fungi, virus & parasites are implicated as infectious etiology in pleural effusion. For potentially pathogenic organism even a single colony may be significant [3]. Pleural effusion and empyema are the primary manifestation of intra thoracic disease and are associated with poor outcome [4]. There has been change in the trend of spectrum of pathogens causing pleural space infections. Studies in the past shows that majority of the pleural space infections were due to gram positive organisms but over the time there has been studies showing contrasting results. The present study undertaken to study the bacteriological profile in Pleural fluid and to know its antibiotic susceptibility pattern.

Material and Methods

Pleural fluid sample were collected by thoracocentesis using aseptic precautions. All specimens of Pleural fluid from Nov 2017 to Oct 2018 that came from Medicine, Pediatrics, TB Chest department for Culture & sensitivity to Microbiology department in tertiary care teaching hospital in Solapur, were included in the study. All the fluids were subjected to wet mount and gram staining for provisional report and then inoculated on culture media like blood agar, Chocolate agar and Mac conkey medium and incubated overnight at 37ºC. Growth if any was noted and the isolate was identified using standard conventional biochemical tests along with standard ATCC positive and negative controls for better interpretation of results and quality assurance. Antibiotic susceptibility testing was done using Kirby Bauer disk diffusion method using CLSI guidelines [5].

Results

Total sample of Pleural fluid received from Nov 2017 to Dec 2018 were 120 out of which 42 (35%) showed growth while 78 (65%) samples were sterile. Culture positivity rate was 35%.

Majority of isolates were Gram negative bacilli 34 (80.95%) of which most common was *Acinetobacter baumanii* 14

(33.33%) followed by *E.coli* 6 (14.28%), *Klebsiella pnemoniae* 4 (9.52%), *Enterobacter aerogens* 4 (9.52%), *Citrobacter koseri* 4 (9.52%) and *Pseudomonas aeruginosa* 2 (4.76%).

Among gram positive spectrum, *Staphylococcus aureus* were isolated from 8 (19.04%) samples. Of which MRSA were 6 (14.28%) and MSSA were 2 (4.76%). Males 25(59.52%) were more commonly affected then females 17 (40.50%) as shown in Figure-1

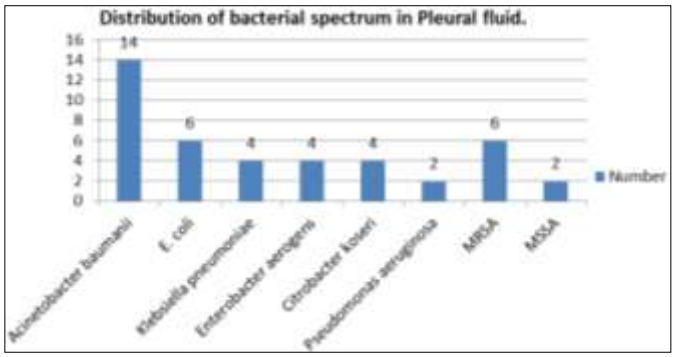

Fig 1: Distribution of bacterial spectrum in pleural fluid

Most common age group affected was 31-45 years in males while in females most common age group affected was 16-30 years. As shown in table -1.

Table 1: Gender & age wise distribution of growth isolates in pleural fluid

Age Group (Years)	Growth In Pleural Fluid In Males (n=25)	Growth In Pleural Fluid In Females (n=17)
0-15	2	3
16-30	4	2
31-45	9	10
46-60	2	2
More than 60	8	0
Total	25	17

Antibiotic susceptibility pattern in gram negative bacteria showed maximum resistance for Ampicillin 68.75%, Ciprofloxacin 68.75%, Cefotaxim 68.75% followed by Imipenem 53.13%.High sensitivity was seen for Amikacin 64.70% followed by Piperacillin-tazobactam combination 58.82%. In case of Pseudomonas aeruginosa 100 % sensitivity was seen for Imipenem, Ceftazadime, cefeperazone, Piperacillin-tazobactam and amikacin.

Table 2: Antibiotic sensitivity pattern of gram negative isolates

Organism	PT (S)	AMK (S)	IMP (S)	CIP (S)	CTX (S)	AMP (S)
Enterobacter aerogens (n=4)	0	0	1	0	0	0
E.coli (n=6)	0	6	2	0	0	0
Citrobacter koseri (n=4)	2	4	2	2	2	2
Klebsiella pneumonia (n=4)	4	4	4	4	4	4
Acinetobacter baumanii (n=14)	4	8	6	2	0	0
Pseudomonas aeruginosa (n=2)	4	2	2	1	1	0

PT- Piperacillin-tazobactam, AMK- Amikacin, IMP- Imipenem, CIP- Ciprofloacin, CTX- Cefotaxim, AMP- Ampicillin, (S)- total no. of sensitive isolates.

Among gram positive cocci (Staphylococcus aureus) 100% sensitivity was seen for Vancomycin, Gentamicin & Ciprofloxacin. Sensitivity for Erythromycin, Clindamycin & Cotrimoxazole was 75%respectively. Resistance to Cefoxitin was noted in 75% of gram positive isolates as shown in table-3.

Table 3: Antibiotic sensitivity pattern of gram positive isolates

Antimicrobial Agent	Total no. of sensitive isolates of *Staphylococcus aureus* (n=8)
Cefoxitin	2 (25%)
Erythromycin	6 (75%)
Clindamycin	6 (75%)
Vancomycin	8 (100%)
Gentamicin	8 (100%)
Ciprofloxacin	8 (100%)
Cotrimoxazole	6 (75%)

Discussion

Total sample of Pleural fluid received from Nov 2017 to Dec 2018 were 120 out of which 42 (35%) showed growth while 78 (65%) samples were sterile. Culture positivity rate was 35%. Study done by Alfageme *et al.* [6] showed higher culture positivity rate between 31-89%, present study is in concordance to the results, thus we report higher culture positivity rate. However study by Shaifali Sharma *et al.* [7] showed culture positivity rate of 28.8% and study done by Mahanty *et al.* [8] showed culture positivity rate of 15.3% which is less as compared to our studies. There is variation in the culture positivity rate many factors may attribute to this like population under study, antibiotic administration practices.

In the present study majority of isolates were Gram negative bacilli 34 (80.95%) of which most common was *Acinetobacter baumanii* 14 (33.33%) followed by *E.coli* 6 (14.28%), *Klebsiella pnemoniae* 4 (9.52%), *Enterobacter aerogens* 4 (9.52%), *Citrobacter koseri* 4 (9.52%) and *Pseudomonas aeruginosa* 2 (4.76%). Among gram positive spectrum, *Staphylococcus aureus* were isolated from 8 (19.04%) samples. Of which MRSA were 6 (14.28%) and MSSA were 2 (4.76%). The results in the present study contradicts with the studies done by various workers like Vikramjeet Dutta *et al.* [2], Shaifali sharma *et al.* [7], Mahanty *et al.* [8], Soniya Saxena *et al.* [9] where majority of isolates were gram positive organism mainly *Streptococcus pneumonia* followed by *Staphylococcus aureus.* Present study is hospital based study and may show variation but the present study contradicts findings with majority of other studies so reporting is necessary to reflect changing bacteriological profile in pleural fluid.

Males 25(59.52%) were more commonly affected then females 17 (40.50%) as shown in Figure 1. Most common age group affected was 31-45 years in males and females as shown in table -1. Studies done Soniya Saxena *et al*. [9] shows males more commonly affected than females (M:F = 2.57: 1) and most common age group commonly affected is 26-45 years which coincides with the present study.

Antibiotic susceptibility pattern in gram negative bacteria showed maximum resistance for Ampicillin 68.75%, Ciprofloxacin 68.75%, Cefotaxim 68.75% followed by Imipenem 53.13%.High sensitivity was seen for Amikacin 64.70% followed by Piperacillin-tazobactam combination 58.82% in case of *Pseudomonas aeruginosa* 100 % sensitivity was seen for Imipenem, Ceftazadime, cefeperazone, Piperacillin-tazobactam and amikacin. While among gram positive cocci (*Staphylococcus aureus*) 100% sensitivity was seen for Vancomycin, Gentamicin & Ciprofloxacin. Sensitivity for Erythromycin, Clindamycin & Cotrimoxazole was 75%respectively. Resistance to Cefoxitin was noted in 75% of gram positive isolates as shown in table-3. Variation in antibiotic susceptibility patterns has been noted in the studies done by various workers from the present study this can be attributed to population under study, geographical differences, institution based variation, socio economic status of the patient, local pattern of antibiotic resistance in the area, local hospital based antibiotic policy and hospital infection control practices of health care workers.

The present study shows variation in the bacteriological profile and antibiotic susceptibility pattern of pleural fluid it may reflect the local trends of bacterial prevalence and antibiotic sensitivity pattern in our area, since it is a hospital based study there may be multifactorial facets that should be kept in perspective. However it is important to report differences in our study from the previous studies done by other research scholars as it may reflect recent trends of shift in the bacteriological profile in pleural fluid and antibiotic sensitivity pattern though it cannot be generalized.

Conclusion

Injudicious use of antibiotics has led to increase in antimicrobial resistance in both gram positive as well as gram negative spectrum of bacteria. It is essential to increase awareness among patients about deleterious effect of overuse/ misuse of antimicrobials and empirical treatment should be encouraged also there is need to develop efficient hospital based antibiotic policy with special reference to sterile fluids like pleural fluid which may guide treating physician for efficient and prompt treatment which may decrease mortality and morbidity significantly. There is also need to follow strict antibiotic stewardship program to prevent spread of antibiotic resistance.

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