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Pulmonary Medicine

Bacteriological Profile in Cases of Empyema, Paraneumonic Effusion and To Study the Antibiotic Sensitivity Pattern

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Abstract **Original Research Article**

Parapneumonic effusions and empyema are usually due to infective etiology. Many bacterial infections can causing them, can be gram positive and gram negative organisms. Appropriate interventions like aspiration of the pleural fluids, culture, specific antibiotics go a long away in good cure. Necessary drainage and appropriate antibiotics leads to excellent prognosis. A Total of 100 cases of clinically diagnosed cases of empyema and Para pneumonic effusions were studied for bacteriological profile, antibiotic resistance .Incidence of empyema was more common in males. Age group of 25-45. In our total 100 cases 25 were culture positive, 75 were sterile on routine culture, but when inoculated in BHI Broth 40 were culture positive. There was a 15% increase in the bacterial yield. 'Pseudomonas is the commonest organism causing empyema followed by Kliebsiella. Gram positive organisms responded to vancomycin while Gram Negative organisms to Imipenum.

Keywords: Pseudomonas, ESBL, GNB. Blood Agar Media MAC Conkey Agar Media, Brain Heart Infusion.

SUMMARY

The Present study was carried out in department of Microbiology Govt. General and Chest Hospital, OMC, Hyderabad in 2006.100 cases of Empyema, para pneumonic effusion was studied for bacterial logical profile and culture sensitivity. Incidence of Empyema is higher in males in the age group of 25y to 45y. Smoking is major risk factor. 25 cases yielded positive culture, 75 patients had no growth of microorganisms on blood ager medium. These patients pleural fluid was inculcated in BHI broth and 40 cases were culture positive. Bacterial yield was increased by 15% when inhalator on BHI broth. Pseudomonas, Aerugunosa, was spredaminon pathogen, next klebsells, Pneumonia. In staphylococcus species, 50% were MRSA, 35.2% were ESBL organisms. Antibiotics effecting on gram-positive were vancymocin, Linozolid, Ciprofloxacillin. Antibiotic effective against gram negative were, Imepemem, Ciprofloxillin, Aztreneom, Piperacilan –Tazobsetum.

MATERIAL & METHODS

Prospective study of 100 clinically diagnosed cases of Para pneumonic effusion and empyema cases were subjected to aspiration, culture and antibiotic sensitivity. The study has Ethical committee approval.

Inclusion Criteria

- Clinical cases of pneumonia with parapneumonic effusion,
- Patients with pneumonia in COPD, DIABETIS
- Empyema Patients
- Empyema in Lung Abscess
- All Patients Were Above 15 Years of Age
- Patients With exudative Pleural Effusion with PH <7, Glucose <40mgs/DL,

Exclusion Criteria

- Patients with tubercular effusion
- Transudate e ffusion pleural effusions of connective tissue disorders are excluded

PROCEDURE –METHODS

PLEURAL EFFUSION ASPIRATED AND IS DIVIDED INTO 3 SPECIMENS

Specimen1 –for biochemical analysis

Specimen 2 for Microscope, aerobic culture

Specimen 3 - Inoculation in to BHI METHOD, Detection of MRSA & ESBL

Gram positive control --Staphylococcus aureus ATCC25923

Gram negative control –Escherichia coli ATCC25923

Inoculation of pleural fluid in BLOOD agar, Macconkey agar, Chocolate agar Enterobacteriaceae produce ESBL enzymes were tested by Disc diffusion method /combined disc method.

Antibiotic sensitivity was perfrmed on Mueller Hinton agar by Kirby Bauer disc diffusion technique as per CLSI GUIDELINES.

RESULTS

The present study was undertaken on 100 cases clinically diagnosed as pleural effusion and empyema at Government General and chest Hospital, Hyderabad.

Age Wise Distribution

Among 100 cases, prevalence of empyema in patients, aged between 15 and 25 were 17 (17%). Between 26-35 were 35(35%), between 36-45 were 20(20%), between 46-55 were 14(14%), between 56-65 were 10(10%), between 60-75 were 4(4%). More common in age group 26-45 years.

Table-1: Age wise distribution

Age	No.	% Percentage
15-25	17	17%
26-35	35	35%
36-45	20	20%
456-55	14	14%
56-65	10	10%
66-75	4	4%

Gender Distribution

Among 100 cases, 72(72%) were males and 28(28%) were females

The ratio between M:F is 2.57:1

Table-2: Gender distribution

Sex	No. of Cases	%Percentage
Male	72	72%
Female	28	28%
Total	100	100

Risk factors associated with empyema thoracis (N=100)

52 patients (52%) are with history of smoking, followed by 22% with Diabetes Mellitus 18% alcoholism and 8% with COPD

Table-3: Risk factors associated with empyema thoracis

Risk factors	No. of patients	%Percentage
Diabetes Mellitus	22	22
Smoking	52	52
COPD	8	8
Alcoholism	18	18

Percentage according to Clinical symptoms

Almost (95%) of the patients presented with fever, this was followed by cough (92%), dyspnoea (89%) and pleuritic pain (83%) and constitutional symptoms (48%).

Culture report in pleural fluids (N=100)

Out of 100 samples, 25(25%) were culture positive 75(75%) show no bacterial growth, by standard culture techniques.

Table-4: Culture report in pleural fluids (N=100)

S. No	Culture	No	Percentage
1	Culture Positives	25	25%
2	Culture negatives	75	75%

Culture report in pleural fluids inoculated in BHI bottle (N=100)

Out of 100 samples, 40(40%) were culture positive 60(60%) show no bacterial growth, by standard culture techniques.

Table-5: Culture report in pleural fluids inoculated in BHI bottle (N=100)

S. No	Culture	No	Percentage
1	Culture Positives	40	40%
2	Culture negatives	60	60%
3.	Total isolates	100	100%

Comparison of Total no. of isolates in pleural fluid culture and BHI broth :

Out of 25 isolates the major pathogen isolated was Pseudomonas aeruginosa 48% followed by Klebsiella pneumonia 16%, Staphylococcus auresus 16%, and proteus species 12% and Escherichia coli 8%.

Out of 40 isolates the major pathogen isolated was pseudomonas aeruginosa 45% followed by klebsiella pneumonia 20%, staphylococcus aureus 15%, and proteus species 12.5%, and Escherichia coli 7.5%.

Prevalence of Methicillin Resistant Staphylococcus aureus

Among the total 6 Staphylococcus aureus, 3(50%) were MRSA and 3(50%) were MSSA.

Table-6: prevalence of MRSA

Total S.aureus	No. of MRSA	% of MRSA
6	3	50%

Prevalence of Extended spectrum Beta Lactamase=

Among the total 34 GNB, 12 (35.2%) were ESBL and remaining 64.8 % were non ESBL.

Table-7: Prevalence of ESBL

Total GNB	No. of ESBL	% of ESBL
34	12	35.2%

Total no. of ESBLs among different organisms

Out of 8 isolates of klebsiella pneumonia 7 were ESBLs, among 18 isolated of pseudomonas aerugionsa 4 were ESBLs, followed by 1 ESBL out of 3 Escherichia coli.

Table-8: ESBLs among different organisms

Organisms	No. of isolates	No. of ESBL
Pseudomonas aeruginosa	18	4
Klebsiella pneumonia	8	7
Proteus species	5	**0**
Escherichia. Coli	3	1

Antibiotic sensitivity pattern of GPC

Vancomycin was 100% sensitivity among staphylococcus aureus, followed by Linezolid, Azithromycin 83.3% and 83.3% respectively. Gentamicin and contrimaxazole showed least sensitivity with 16.6% among 6 cases.

Table-9: Antibiotic sensitivity pattern of GPC

Antibiotics	AMP	AMC	AZM	CD	COT	LZ	CX	VC	CIP	GEN	CAZ	AK
S.aureus	33.3%	66.6%	83.3%	66.6%	16.6%	83.3%	50%	100%	66.6%	16.6%	50%	33.3%

DISCUSSION

Community acquired pneumonia, Aspiration pneumonia, B Bronchiectasis can lead to para pneumonic effusion and Empyema. The Micro organisms responsible for Empyema & para pneumonic effusion is important to plan effective antibiotic treatment. Appropriate antibiotic regimen and aspiration of pus in the patients will lead to good recovery. Men are more effected then women. People with comorbid conditions like alcoholism diabetes, immunosuppression can lead to more cases of parapneumonic effusion. In our prospective study 100 cases ofclinically diagnosed parapneumonic effusion and Empyema were studied for bacteria logical profile and antibiotic resistance. Pleural fluid of all this cases were subjected to routine culture and some case very inoculated BHI broth, to improve the wiled of culture. Common age group is study was 25 y to 45y, while in Acharya *et al*., [1]. It is 21y -41y. Gupta *et al*., [2] 21-30 y in our study males 72% and females 28% is the ratio of 2.5:7.

The Dr. Sowmya Sexana *et al*., [3] reported 72% males and 28% females. Smoking was seen in 52% cases, Diabetes, in 202% cases, Alcoholism in seen in 18% and 8% in COPD. The main symptoms are fever in 95% and cough in 92%, chest pain 90%, Shortness of Breath 83% and anorexia 48%

Table-10: Clinical symptoms association among various studies

Study	Year	Cough	Dyspnoea	Chest Pain	Fever	Constitutional Symptoms
Kamat *et al*., [4]	1985	94%	53%	75%	75%	5%
Vardhan *et al.*, [5]	1998	58%	28%	66%	76%	---
Acharya *et al*., [1]	2007	92.5%	92.5%	80%	87.5%	62.5%
K Y Tsang *et al.*, [6]	2007	78%	70%	70%	84%	8%
Kundu *et al*., [7]	2010	82.6%	100%	--	100%	---
Dr. Girish *et al*., [8]	2016	74.1%	56.4%	75.8%	88.7%	79%
Mandapakala Gopala Krishna Murthy *et al*., [9]	2016	92%	84%	60%	88%	44%
Present Study	2016	95%	89%	83%	95%	48%

In our study 25 samples are culture positive and 75 samples are culture negative. Western studies like Fanner *et al.*, [10], 15.5, Berne's *et al.*, [11] 1.4, Jain Sonali *et al*., [12] 17.7%. The low yield of the culture is due to administration of antibiotics. Culture of pleural fluid in BHI improved the yield. 40% were culture positive, BHI inoculation increased the wild by 15%. BHI method is statically proven to be better than standered culture p value .02. Major microorganism studied in 48 hours were pseudomonas, aerugniosa, klebisila pneumonia, proteus and staphylococcus aureus in 4-5 days. 85% were aerobic GNB and 15% were

GPC. In GNB streptococcus pneumonia and streptococcus pyogens were predominant organs. In routine culture among 25 isolates, pseudomonas is 48%, klebsilenes 16%, stagh Aureus 16%, propteulla 12%.

Isolates in BHI Media were pseudomonas48%, klebisila 20%, stagh Aureus15%, proteus12%, E.colis 7.5%

The percentage of GNb in our study is 85%while Gupta SK *et al*., [13] 66 reported 84.6%, Jain Sonali *et al*., [12] in 2013 repoted 88.4%.

Pseudomonas aeruginosa 45% was a commonest organism and is also same in other studies like Jaint Sonali *et al*., [12] and Mandupaka Gopal Krishna Murthy *et al.*, [9] pseudomonas was reported as common organism inn Jain Sonali *et al.*, [12] In the present sudy ESBL production was very high in kliebsiellla pneumonia followed by Pseudomonas Aerugunosa, & E.Coli Prevalence of MRS was seen in 3 cases out of 6 cases.

The antibiotic sensivity pattern was done according to Kirby Bauer" S disc diffusion method according to CLSI 2015 GUIDELINES. Antibiotic sensitivity for Pseudomonas is Imipenem which is 100%, Ceftazidime is 87%. Kliebsiella is sensitivity to Imipenam is 100% & ciprofloxacillin is 75%. E.coli & Prteus are also vry sensitive to Imipenam. GPC isolated are 100 % sensitive to Vancomycin, next to lizolid 83%.

CONCLUSION

Parapneumonic effusion and Empyema occur very frequent in community acquired pneumonia, bronchiectasis, and COPD. Pleural effusion analysis is excellent diagnostic method to study the etiology of bacteria. Aspiration of pleural fluid and culture in the pleural fluid in blood agar, BHI will help in indication of bacteria. Appropriate antibiotic theorpy after culture sensitivity good help in recovery of patients. BHI broth inoculation will give culture result in 7 days for preteus, S.aereus. GNB organisms are sensitivity to Imipenem 100%, second common drug being Ciprofloxacilln, Aztreonim, Cetraxzitame. We recommend Imipenem first line of drug for empirical treatment of Empyema. Culture of MRSA need specified drug treatment like vancomysin, linezolid for better results.

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