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STUDY ON PREVALENCE OF DIFFERENT MICROBIOLOGICAL ORGANISM IN EMPYEMA THORACIS

Pulmonary Medicine

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ABSTRACT

Introduction- An empyema is a collection of pus in the pleural cavity. Staphylococcus aureus is the most common cause of empyema in the developing country, while streptococcus pneumoniae in the developed country. Thoracic empyema remains a significant cause of morbidity and mortality especially in the developing countries like india.

Material and methods A prospective study was conducted from November 2017 To November 2018 in kamla Nehru chest hospital, Department of pulmonary medicine, Dr.SN. Medical College Jodhpur, a tertiary care centre for respiratory diseases in western part of Rajasthan, India where a clinicobacteriological profile was carried out.

Result 106 patients of empyema studied majority 64(60.37%) were non tubercular etiology while Tubercular empyema comprising of 19(17.92%) cases. Among non-tubercular empyema staphylococcus aureus was most common 17(16.03%) followed by gram negative bacilli. Mean year of age for men was 41.81year and for female was 36.93 year. Empyema was right sided in 48(45.28%) cases and left sided was in 58(54.71%) cases.

Conclusion Empyema thoracis remains a significant cause of morbidity and mortality in our country. Tuberculous empyema differs from nontuberculous empyema in the age profile, Clinical presentation, and management aspect.

KEYWORDS

Empyema thoracis , Tuberculous empyema, nontuberculous empyema.

INTRODUCTION-

An empyema is a collection of pus in the pleural cavity caused by microorganisms, usually bacteria[1]. RW Light defined Empyema as pus in the pleural space. Staphylococcus aureus is the most common cause of in the developing country, while streptococcus pneumoniae in the developed country.[2]

Empyema is more common in men, with a male to female ratio of approximately 2:1. It is also more common in the elderly and young children.[3] Approximately 5 to 10% of Para pneumonic effusions develop into empyemas.[4] The mortality of patients with empyema is 15–20%[5,6,7] and higher in immune compromised patients.[8]

Empyema itself is not a primary disease. It is secondary to other disease or a complication of other disease. Empyema is a term derived from the greek word pyon, meaning pus and empyein, meaning pus producing. Thus by the definition the presence of pus in pleural space is consistent with the diagnosis of empyema

MATERIAL AND METHODS

Study Centre

Present study was conducted from November 2017 To November 2018 in kamla Nehru chest hospital, Department of pulmonary medicine, Dr.SN. Medical College Jodhpur, a tertiary care centre for respiratory diseases in western part of Rajasthan, India.

Study design- prospective type of hospital based observational study.

Study Population-

The study was approved by the Ethical Committee of Dr. S.N. Medical College, Jodhpur. Patients of age 15yr to 60yr Admitted in Kamla Nehru Chest Hospital, Jodhpur, who presented with history, signs and symptoms, and radiological findings suggestive of empyema thoraces and willing to participate in the study were enrolled after proper counseling.

The protocol was explained to the patient/care provider before enrolment and informed consent was taken from each patient. Patients were assessed as to their ability to answer the questionnaire used to elicit the history and symptoms of disease and other information needed for the study.

121 Patient were screened for the study, of them 106 met all the inclusion criteria, not having any exclusion. All eligible patients understood and signed informed consent.

Sample- Pleural fluid (pus)

Sample size

All statistical analyses were performed by using SPSS 22.0 software package (SPSS Inc., Chicago, IL, USA). Yates continuity correction test *(Chi square test), Fisher's exact test and Fisher---Freeman---Halton test were used for comparison of qualitative data.

All data were summarized as mean ± SD for continuous variables, numbers and percentages for categorical variables. A p *value* < 0.05 was accepted as statistically significant

METHODS

Patients, with clinical and Radiological findings highly suspicious of empyema thoraces, were scheduled for thoracocentesis

Patient preparation

A detailed evaluation was done before procedure. Investigation such as complete blood count, blood sugar, liver function test, renal function test, sputum examination, chest x ray, usg. thorax done in all patient.

All patients had provided informed consent prior to the procedure. Patients were provided with written information in advance of the procedure and the key aspects, such as risk of the procedure were discussed before final consent.

Collection of specimen

Patients admitted in kamla Nehru chest hospital, Dr. S.N. medical college Jodhpur. Department of pulmonary medicine, a tertiary care

centre for respiratory diseases in western part of Rajasthan,

Procedure of pleural fluid (pus) aspiration:
Firstly patient will be allowed to sitting position with arms and head resting supported on a bed side adjustable table. Next the skin will be anesthetized by 1% lidocaine using 5 cc syringes with 18 gauge needle. Then the site will be confirmed by counting the ribs based on chest x-ray per cussing out the fluid level.

After that insertion needle (50cc) will be inserted on the posterior aspect of the back over the diaphragm but under the fluid level. The top of the dullness will be marked by washable ink. Lastly 20 ml fluid will be collected for the laboratory procedure.

Inclusion criteria
- All cases of empyema thoraces of age 15 year to 60 year admitted in Kamla Nehru Chest Hospital, Dr. S.N. Medical College Jodhpur.

Exclusion criteria
- Pregnant and lactating women.
- Any patient less than 15 year of age.
- Any patient more than 60 year of age.
- Post-surgical empyema.
- Post traumatic empyema.

RESULT
Out of 106 patients of empyema studied majority 64(60.37%) were non tubercular etiology. Tubercular empyema comprising of 19(17.92%) cases. Out of 106 cases 18(16.99%) were diagnosed as pyopneumothorax (P value< 0.0001).

Among non-tubercular empyema Gram positive organisms were 22(20.75%) in which staphylococcus aureus was most common 17(16.03%) followed by streptococcus pneumoniae 5(4.71%).

Prevalence of Gram negative organisms was 42(39.62%). Among them pseudomonas was the most common isolated bacteria 16(15.09%) followed by klebsiella 13(12.26%). Prevalence of e-coli was 12(11.32%). And one case of acenatobacter (.95%) was isolated.

In 42(39.62%) cases pus was sterile for aerobic bacteria. Among tubercular empyema AFB smear was positive in 5(26.31%) cases. CBNAAT was positive in 7(36.84%) cases for MTB. Both pleural fluid AFB smear and CBNAAT was positive in 7(36.84%) cases.

Overall pleural fluid smear for AFB was positive in 12(63.15%). Mean year of age for men was 41.81year and for female was 36.93year. Empyema was right sided in 48(45.28%) cases and left sided was in 58(54.71%) cases.

61(57.55%) cases were resides in rural areas wherein 45(42.45%) patients were resides in urban areas. Most common clinical feature was fever 64(60.40%) P value < 0.0003 followed by shortness of breath in 40(37.37%) cases. P value < 0.0003.

Majority of the patients enrolled in the study were duration of symptoms more than one month. Only 6 patients of empyema thoracis were symptoms of duration less than 7 days.

Smoking 56(53%) were most common addiction associated with empyema followed by alcohol 13% and 7.54% patients had opium addiction. Tobacco chewing was associated with 4.71% patients.

COPD (17.92%) were most common co morbid condition followed by diabetes mellitus. Malignancy associated with 2 cases.

Observation

TABLE – 1 AGE WISE DISTRIBUTION OF CASES

Age in years.	Numbers of person	percentage
15-20	09	08.50%
21-40	54	50.94%
41-60	43	40.56%

Table –2 Gender wise distribution of cases

Gender	Number of Patients	Mean age	Percentages
Male	77	41.81±13.11	72.64
Female	29	36.93±16.56	27.36
Total	106	P=0.0515	100

Table-3 Clinical Feature

Clinical Feature	Number of Patients	Percentage
Fever	64	60.40
Chest Pain	14	13.20
SOB	40	37.73
Non Productive cough	21	19.81
Productive cough	23	21.69

TABLE- 4 Association of addiction

Addiction	Number of cases	percentage
Smoking	56	52.84%
Alcohol	14	13%
Opium addiction	8	7.54%
Tobacco chewing	5	4.71%

TABLE- 5 clinical comparison of tubercular and non tubercular empyema cases

Clinical parameters	Tubercular empyema N = 19	Non tubercular empyema N=64
Mean age in years	33.67	40.88
Fever	14(73.68%)	42(65.62%)
SOB	5(26.31%)	26(40.62%)
Cough	15(78.94%)	25(39.06%)
Past H/o of ATT	12(63.15%)	15(23.43%)

TABLE-6 Culture isolates

Organisms		No (%)
Gram positive bacteria		22(20.75%)
	Staphylococcus aureus	**17 (16.03%)**
	Streptococcus pneumoniae	5 (4.71%)
Gram negative bacteria		42 (39.62%)
	pseudomonas	**16 (15.09%)**
	klebsiella	13 (12.26%)
	E-coli	12 (11.32%)
	acenatobacter	1 (.95%)
No organism grown(sterile)		42 (39.62%)

TABLE- 7 Tubercular Empyema

organism		No (%)
mycobacterium tuberculosis		19 (17.92 %)
	AFB smear positive	5 (26.31 %)
	CBNAAT MTB detected	7 (36.84 %)
	Both AFB smear positive+ CBNAAT MTB detected	7 (36.84 %)

DISCUSSION
Present study was conducted in kamla Nehru chest hospital Dr. S. N. medical college Jodhpur, Rajasthan with an aim to prevalence the different microbiological organisms and their sensitivity in empyema thoracis patients.

This was a prospective observational study where in 106 patients were enrolled having clinical and radiological finding highly suspicious of empyema thoracis.

Thoracic empyema continues to be important cause of morbidity specially in developing countries.[9] pulmonary infections are the commonest cause of thoracic empyema in the western countries followed by surgical trauma.[10-11]

In present study 50.94% patients (54 cases) belongs to the 21-40 year of age group. 43 cases (40.56%) belong to the 41-60 year of age group. And 8.50% cases belong to the 15-20 years of age group. Mean year of age for male was 41.81 years and mean year of age for female was 36.93 years.

In the present study high incidence of empyema were seen in the age group 21-40 years of age. These findings were consistent with the previous studies done by behra and tendon[12-13] and by preetam rajgopal acharya[14]

This may be possibly due to presence of pulmonary tuberculosis in this age group particularly in developing countries like India where prevalence of tuberculosis is high.

Males are more commonly affected than females' male-female ratio

was 2.6:1. Males in general are more prone to mechanical stresses due to their tall stature and strenuous work. Smoking, tuberculosis and COPD are more common in males.

In the present study Smoking 56(53%) were most common addiction associated with empyema followed by alcohol 13% and 7.54% patients had opium addiction. Tobacco chewing was associated with 4.71% patients.

Smoking and alcohol lead to decrease in cell mediated immunity via inhibition of macrophage activity. Smoking also lead to decrease in mucociliary clearance.

Fraalgue M et al. In 2011 conducted a similar study about predictive factors, microbiology, and outcomes of patients with Para pneumonic effusions and found that smoking (68%) and alcoholism (40%) was associated with patients of Para pneumonic effusion and empyema[15]

COPD (17.92%) were most common co morbid condition followed by diabetes. Malignancy associated with 2 cases.

In present study 57.55% (61 patient) cases belongs to the rural areas while 42.45% (45 patients) cases belongs to the urban areas. This may be due to increase risk of pulmonary infection because of low socioeconomic status and lack of oral hygiene in rural areas.

In the present study 88(83.01%) cases are diagnosed as an empyema while 18(16.99%) cases diagnosed as pyo pneumothorax (P value < 0.0001).

Left sided empyema is more common than right sided empyema. This result in the study were in conformity of the previous study on empyema done by Aradhana Toopo.[16]

In the present study fever (60.40%) was the most common symptom followed by dyspnea (37.38%) and cough. Cough was productive in 23(21.69%) cases and was non productive in 21(19.81%) cases.

In group of tubercular empyema cases fever was present in 73.68% patients. While in non tubercular empyema fever was present in 65.62% patients. While shortness of breath was more common in non tubercular patents.

In the previous study done by Kamat reported cough (94%) to be the most common symptom. This was followed by fever (76%) and chest pain (75%).[17]

Another study done by preetam rajgopal acharya[18] found that dyspnea (92.5%) was most common symptom, Followed by fever (87.5%) and constitutional symptoms.

The clinical manifestation of empyema can vary widely, depending on the both the nature of the infecting organisms and the competence of the patients' immune system.

Duration of symptoms was more than one month in majority (61.32%) of the patients. These finding were consistent with the study done by gopal krishan murthy [19]

In the present study majority of the patients enrolled in the study were belong to non tubercular empyema 64 (60.37%), wherein tubercular empyema consist of 19 (17.92%) cases, supported by the other studies such as subhra mitra et al.[20], mayer J.A.[21], peter R.M.[22], pramodkumar et. al.[23]and asish K. mandalet. al.[24]

Study done by Gopal Krishna murty et al.[25] and preetam rajgopal achrya et al.[26] conclude that tubercular empyema was common. In the previous studies from different part of India reveal that tuberculosis accounts for a large number of empyema cases[27,28-33]

In the non tubercular empyema staphylococcus aureus was the most common organism isolated followed by pseudomonas.

The previous Indian studies have reported that staphylococcus aureus was the most common organism isolated in non-tubercular empyema.[34,35,36,37]

Another Indian study done by gopal krshan murthy found that pseudomonas was the most frequent pathogen isolated[38].

Among the patients with tubercular empyema, pleural fluid smear for AFB was positive in 63.15% (12 cases) cases and 36.84% cases was positive for both pleural fluid smear and CBNAAT. 7(36.84%) cases were found in CBNAAT alone.

Goyal et al.[39] also reported high pleural fluid smear positivity for AFB (71.69%). While malhotra et al.[40] in their study reported smear positivity in 20 of their 41 cases of tuberculous empyema.

Present study shows that non tubercular empyema patients had protein mean value 3.2 gm/dl and glucose value 30.5mg/dl. Which were 4gm/dl and 25mg/dl in tubercular empyema. TLC average was 15075/mm^3 in non tubercular empyema while 14133/mm^3 in tubercular empyema. ADA mean was 81.5 in non tubercular empyema and 92 in tubercular empyema.

Study done by gopal krishan murthy found that tubercular empyema patient had glucose mean value of 52.2gm/dl and mean value of protein was 3.4mg/dl. While mean values of glucose and protein in non tubercular empyema was 40.4 mg/dl and 3.4gm/dl respectively.

TLC average was 1026.6 in tubercular empyema and 1500.2 in non tubercular empyema cases. ADA mean was 58.6 in tubercular empyema and 276 in non tubercular empyema

Summary

Present study was conducted in kamla Nehru chest hospital Dr. S. N. medical college Jodhpur, Rajasthan with an aim to prevalence the different microbiological organisms and their sensitivity in empyema thoraces patients.

This was a prospective observational study where in 106 patients were enrolled having clinical and radiological finding highly suspicious of empyema thoraces.

- Most of the patients 54(50.94%) were in the age group 21-40 year of age.
- Empyema thoracis is more common in male than female with male to female ratio 2.6 : 1.
- Most common etiology was non tubercular (60.37%) followed by tubercular empyema (17.92%).
- Majority of non tubercular empyema were shown to gram negative organisms among them pseudomonas was the most common 16(15%) followed by klebsiella 12(12.26%).
- Among gram positive organisms staphylococcus aureus was the most common organism 17(16.03%) isolated followed by streptococcus pneumoniae.
- Tubercular empyema was found in 19(17.92%) cases. regarding tubercular empyema pus was positive for AFB smear in 12 (63.15%) cases. And pus was positive for both CBNAAT and AFB smear in 7(36.84%) cases.
- ADA was 81.5 in non tubercular empyema and 92 in tubercular empyema.
- Mean duration of illness was more than one month in majority of patients.
- Smoking was the most common addiction associated with empyema.
- COPD were the most common co-morbid condition followed by diabetes.
- Majority of tubercular empyema belong to productive age group with mean year of 33 years.
- Present study shows that non tubercular empyema patients had protein mean value 3.2 gm/dl and glucose value 30.5mg/dl. Which were 4gm/dl and 25mg/dl in tubercular empyema. TLC average was 15075/mm^3 in non tubercular empyema while 14133/mm^3 in tubercular empyema.

CONCLUSION

Empyema continues to be prevalent in our country particularly in the lower socioeconomic status due to the delay in seeking medical care, inappropriate antibiotics and dosages and duration of antibiotic treatment.

Empyema thoracis remains a significant cause of morbidity and mortality in our country. Tuberculous empyema differs from nontuberculous empyema in the age profile, Clinical presentation, and management aspect.

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