



TO STUDY PREVALENCE OF CAUSATIVE ORGANISMS FOR NON-TUBERCULAR CHEST INFECTIONS IN DIABETICS VERSUS NON- DIABETICS

Respiratory Medicine

Krishna Kant Tripathi	Junior Resident, Department of TB & Respiratory Diseases S.N. Medical College Agra (U.P.) India
Gajendra Vikram Singh	Professor and head, Department of TB & Respiratory Diseases S.N. Medical College Agra (U.P.) India
Santosh Kumar	Professor Department of TB & Respiratory Diseases S.N. Medical College Agra (U.P.) India
Sachin Kumar Gupta*	Assistant Professor, Department of TB & Respiratory Diseases S.N. Medical College Agra *Corresponding Author

ABSTRACT

Aim and objectives: The present study was carried out in Department of TB and respiratory diseases SNMC Agra (1) To find out most common non tubercular causative organism and it's anti-bacterial profile for chest infections in diabetic and non-diabetic patients (2) Compare the prevalence of organisms between these two. **Materials and method:** The prospective comparative study was done on 200 patients who presented with fever, cough with expectoration or with breathlessness and also subjected to sputum smear and CBNAAT and chest x ray PA view to exclude mycobacterium tuberculosis patients from study. These patients were allocated in two groups Group A contained patients who were known diabetic and recently diagnosed for DM. Group B includes nondiabetic patients presented with chest infections. These group subjected to different investigations like sputum gram staining, fungal staining and culture sensitivity. **Results:** It was observed from the table that prevalence of klebsiella pneumoniae is significantly higher in diabetics ($p=0.007$), and prevalence of pseudomonas was significantly reported ($p=0.0063$) in non-diabetics. It was observed that prevalence of resistance among antibiotics were more in diabetic patients compared to non-diabetic patients. It was also observed that prevalence of multidrug resistance was more in diabetic population. **Conclusion:** Clinical presentation, microbial characteristics, antimicrobial susceptibility and immediate outcome of CAP differed in diabetics and non-diabetics. Bacteria isolated from sputum sample of CAP with diabetes were resistant to almost all recommended antibiotics used for CAP Pulmonary complications were relatively more in diabetics.

KEYWORDS

Diabetics, nondiabetics, community acquired pneumonia, antibiotics

INTRODUCTION

Chest infections are major causes of mortality and morbidity in both developing countries and developed countries. After diarrhea, pneumonia is acute infectious disease with significant morbidity and mortality. It affects all age groups. Due to over usage and mis usage of oral and intra venous antibiotics, patients are infected with multidrug resistant pathogens.

This can lead to healthcare associated Chest infections. Due to lack of knowledge, lack of facilities, pneumonia most often misdiagnosed, under estimated and mistreated. One other reason for poor outcome of patients is, failure to assess the severity of the disease and to treat patient as outpatient despite in hospital setup or in intensive care unit. Pneumonia is more common in immuno compromised like Diabetes, HIV and patient with chronic lung disease.

Diabetic patients have a greater frequency and severity of infection. The reasons for this include incompletely defined abnormalities in cell-mediated immunity and phagocyte function associated with hyperglycemia as well as diminished vascularization. Hyperglycemia aids the colonization and growth of a variety of organisms (Candida and other fungal species). Many common infections are more frequent and severe in the diabetic population, whereas several rare infections are seen almost exclusively in the diabetic population.

AIM:

To study prevalence of causative organisms for non-tubercular chest infections in diabetics versus non- diabetics presenting to the department of tuberculosis and respiratory diseases, s.n medical college agra

OBJECTIVES:

1. To find out most common non tubercular causative organism and its anti-bacterial profile for chest infections in non-diabetic and diabetic patients 2. Compare the prevalence of organisms between these two.

MATERIALS AND METHODS

The proposed study is a hospital based observational and prospective study

Study Population -

Known case of diabetes mellitus and non diabetic patients presenting with respiratory complaints like fever, cough with expectoration, breathlessness to department of Tuberculosis & Respiratory diseases and department of medicine S. N. Medical College Agra.

Study Period -

the study was carried out from January 2021 to august 2022.

Inclusion Criteria:

1. Patients who have given written informed consent 2. Age >12 years, 3. Patients Admitted in S.N medical college Agra with having clinical features like fever (temperature > 37.8 degree celcius), cough (less than 4 weeks), production of purulent sputum, chest pain, breathlessness, 4. Chest Xray or CT scan suggestive of respiratory infection,

Exclusion Criteria:

1. Patients who have not given written informed consent 2. Seriously ill patients, 3. Sputum positive for AFB or have clinically diagnosed tuberculosis, 4. Immuno compromised patients (other than Diabetes mellitus) or on immunosuppressive medications.

OBSERVATION AND RESULTS

Table -1 Analysis Of Gender And Demographic Profile In Study Population

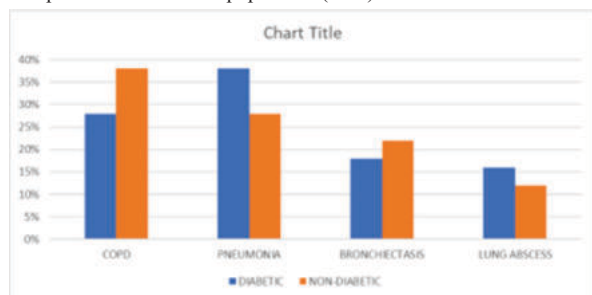
	MALE	FEMALE
GENDER	140(70%)	60(30%)
DEMOGRAPHIC PROFILE	Urban 64(45.7%) Rural 76(54.2%)	Urban 38(63.3%) Rural 22(36.6%)

It was observed that prevalence of respiratory infections were more common in males as compared to females. Out of total 200 patients, 98 patients (49%) were from rural area and 102 patients (51%) were from urban area. Among male patients 45.7% were from urban area and 54.2% were from rural area. Whereas female patients 63.3% were from urban area and 36.6% were from rural area.

Table 2: Incidence of various lower respiratory tract infections

Disease	No. of diabetic cases (%)	No. of non-diabetic cases (%)
COPD with secondary infections	28 %	38%
Pneumonia	38%	28%
Bronchiectasis	18%	22%
Lung abscess	16%	12%
	Total =100	Total =100

It was observed that most common primary disease was COPD in non-diabetic patients and pneumonia was most common disease in diabetic population. Lung abscess is more common in diabetic (16%) as compared to non-diabetic population (12%).

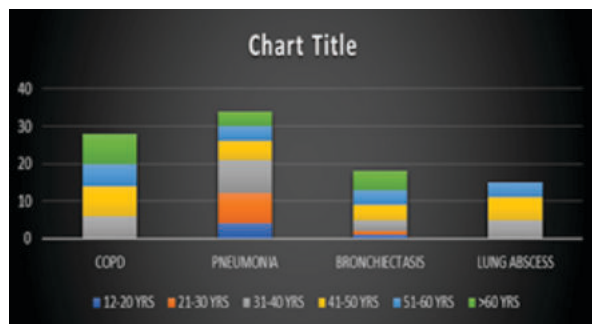


Observation Chart -2

Observation Table-3

Table Showing Age Wise Incidence of various infections in study population

DISEASE	12-20 yrs dm/non-dm	21-30 Yrs dm/non-dm	31-40 Yrs dm/non-dm	41-50 Yrs dm/non-dm	51-60 Yrs dm/non-dm	>60 yrs Dm/non-dm
COPD	0/0	0/0	6/8	8/9	6/9	8/12
PNEUMONIA	4/4	8/6	9/5	5/7	4/3	4/3
BRONCHIETASIS	1/0	1/0	4/4	4/6	4/7	5/5
LUNG ABSCESS	0/0	0/0	5/3	6/3	4/4	1/2



Observation Chart -3

Chart showing age-wise incidence of various Lower Respiratory Tract Infections

It was observed that the incidence of various chest infections was higher in Diabetic population compare to non-diabetic population. It was also observed that the incidence of various lower respiratory tract infections was less before the age of 20. Most of the cases were of 21-60 years of age group. Maximum cases of COPD were found between 41-50 years of age group. In cases of pneumonia the age group maximally effected was 21-30 years and in cases of bronchiectasis the age group effected was 31-50 years

Table-4: Comparative Table Showing Result Of Sputum Culture Of Study Subjects

ORGANISM ISOLATED	DIABETIC (N=100)		NON-DIABETIC (N=100)	
	N	%	N	%
P. AERUGINOSA	14	14 %	30	30 %
K. PNEUMONIAE	31	31 %	15	15 %
S. AUREUS	6	6 %	5	5 %
E. COLI	8	8 %	11	11 %
S.PNEUMONIAE	13	13 %	6	6 %
NO GROWTH	28	28 %	33	33 %

It was observed that prevalence of klebsiella pneumoniae was significantly higher in diabetics ($p=0.007$), and prevalence of pseudomonas was significantly lower ($p=0.0063$) in non-diabetics. Other organisms which were more common in diabetics after klebsiella were pseudomonas (14%), E.coli (11%), Strept pneumoniae and Staph aureus.

In nondiabetic population organism isolated other than pseudomonas were klebsiella (15%), E. coli (11%), S pneumoniae (6%) and Staph aureus (5%). 28% of diabetics, and 33% of non diabetics had sterile sputum culture.

Sensitivity Pattern Of Isolated Bacteria From Sputum Culture To Different Antimicrobial Agents In Both Groups.

It was observed that all isolate of pseudomonas (100%) of from non-diabetic(30) & diabetic(14) patients were sensitive to colistin .it is also observed that 85 % sensitive to piperacillin-tazobactam, amoxiclav & cotrimoxazole and resistant to ciprofloxacin(42%), gentamycin(35%) & Meropenem (57%) in diabetic patients. Significant difference (p value =0.0006) was noted in relation to meropenem sensitivity in both study group, in non-diabetics all isolates all sensitive to meropenem.

DISCUSSION:

In the present study 200 patients were taken from the Department of TB and Respiratory Medicine department of Sarojini Naidu medical college Agra .

In this study, the male to female ratio was 7:3. In another study carried out by Narang et al, (1976) this ratio was found to be 11: 5.1 and Kallan et al (1981) found it as 2.6:1.in another study Deshmukh et al with 138 TB – DM patients revealed that 82.6% of the study population was above 45 years and there was a male preponderance. The higher incidence in males may be due to smoking, occupational exposure or alcohol intake etc. Also males seek treatment more commonly as compared to female.

Most of the aged diabetic patients presented with atypical pneumonia. Altered mental status and hypotension were the predominant clinical features in diabetic patients with CAP. On the other hand non-diabetic subjects presented with typical respiratory symptoms of pneumonia.

Prevalence of lower respiratory tract infections in smokers was found to be 36% in our study. Vishwanathan R, (1964) found this incidence as 28.5% more in smokers as compared to non-smokers (0.4-6%). Doll and Hill (1964) in their epidemiological study reported that mortality in chronic bronchitis was significantly higher amongst smokers than non- smokers; it was directly proportion to the amount of tobacco smoked. Higgins, (1959) showed that the frequency of persistent cough was as high as 42% in heavy smokers of 55-64 years. Our study is comparable to these studies.

In our study we could isolate organisms from 72% of sputum samples of DM patients and 67% in non-diabetic patients by sputum culture. A study conducted in Spain that included sputum culture as a diagnostic tool could detect 42% causative pathogen from CAP patients. Other studies could isolate organisms from 46% patients having CAP. They included both diabetic and non-diabetic patients in their study. Streptococcus pneumoniae was the most frequent causative organism in both DM and non DM patients followed by Haemophilus influenzae, Staph aureus, and other atypical organism like Chlamydia . Our findings differ from their study in terms of etiological diagnosis of CAP. In our study most common organism in klebsiella pneumoniae and pseudomonas aeruginosa in non-diabetic population. The aetiology of CAP depends on the geographic areas, the study population and the utilized microbiological lab test.

In our study we could isolate organisms from 72% of sputum samples of DM patients and 67% in non-diabetic patients by sputum culture. Kulpathi et al, (1979) found that the growth of bacteria was seen in 18 cases out of 35 cases i.e. 51.4%, Kallan et al, (1981) found that the incidence of sputum positivity was 64%. So the present study is comparable with these observations. Lee KH, Hui KP et al, (1996) found the causative organism in 68% cases, the most common organism was K pneumoniae (15%). Over all Gram-negative organisms were identified in 47% of cases. Bates JH et al, (1992) also showed that a specific etiological diagnosis is made in only about half patients. Ishida T. Hashimoto T et al, (1998) found that causative organisms were determined from sputum culture in 61% of cases,

Takasugi M et al. (1994) found that the result of sputum culture positivity was 58.8%. The present study is also in accordance with these studies.

In our study incidence of staphylococcus aureus was 6% (n=100) in diabetic patients and 5% in non-diabetic patients Awasthi et al, (1963) found this incidence as 2%, Kulpathi et al, (1984) as 9% and Kallan et al, (1981) as 6%. So the present study is comparable to these studies.

Some important microbiological characteristics came out when we compared two groups of subjects. Klebsiella pneumoniae was the most frequent isolated organism for the diabetic patients followed by pseudomonas, Strept.pneumoniae, E.coli and staph aureus on the other hand Pseudomonas aeruginosa was the commonest bacteria causing chest infections in non-diabetic subjects followed by klebsiella pneumoniae, E.coli, strept pneumoniae & staph aureus. Saibal MAA et al 2012 in their study concluded that klebsiella pneumoniae was the most commonly isolated organism from sputum sample of diabetic patients in their study.

Gram negative bacilli were found 53 % (n=100) in diabetic population of which klebsiella pneumoniae was the most common organism found (31%). Other gram negative bacilli found were P.aeruginosa (14%) and E.coli (8%). S.V. Madhu et al, (1990) found the incidence of Gram-negative bacilli as 52%. So the present study is comparable to these studies. It was observed from the study that prevalence of klebsiella pneumoniae is significantly higher in diabetic population ($p=0.007$), and also observed that prevalence of pseudomonas was significantly reported ($p=0.0063$) in non-diabetic population. Also in one study by Prof. D. Ranganathan et al 2008 according to that Majority of CHEST infections of Non Tuberculous etiology were due to Gram Negative Organisms – Pseudomonas, Klebsiella, H. Influenza (40%). So the present study also comparable with that No growth was observed in 28% cases of diabetic population and 33 % cases of non-diabetic population

From these studies it is evident that the incidence of lower respiratory tract infections caused by Gram negative bacilli is increasing. Study by Kulpathi et al, (1979) showed the incidence of lower respiratory tract infection by K pneumoniae as 33.5% and Esch.coli 20%. Peter Kishimbo et al 2020 similarly found in their study Out of 353 sputum samples 72 were positive for the bacterial pathogens with five patients having more than one pathogen. The majority 64 (83.1%) of the isolates were gram negative bacteria. Common bacteria isolated were Klebsiella pneumoniae 23/77(29.9%), Streptococcus pyogenes 10/77 (13.0%), Pseudomonas aeruginosa 9/77 (11.7%) and Escherichia coli 7/77 (9.1%). The present study is also in accordance to these studies.

More than one organism was also isolated. Most of the Gram-negative bacteria were isolated from the sputum of diabetic patients. We found different groups of bacteria have predilection for causing CAP in two different groups of patients.

Our study disclosed sensitivity pattern of isolated strain of bacteria from diabetic and non-diabetic chest infections patients. It is alarming that resistant bacteria are emerging from both groups of patients, specially the strain isolated from the sputum of diabetic patients.

Beta-lactam antibiotics and Macrolides are used as the first line regimen for the treatment CAP in our country but emerging strains are more resistant to these conventional antibiotics

CONCLUSION

Clinical presentation, microbial characteristics, antimicrobial susceptibility and immediate outcome of CAP differed in diabetics and non-diabetics. Frequency of atypical presentation were significantly higher in diabetics. Klebsiella pneumoniae was the most frequent causative pathogen for chest infections in diabetic patients, whereas pseudomonas was the most frequent causative agent for non-diabetic patients. Bacteria isolated from sputum sample of CAP with diabetes were resistant to almost all recommended antibiotics used for CAP. Pulmonary complications were relatively more in diabetics and they required referral to intensive care unit more than that of nondiabetics. So, diabetic patients with respiratory infections require extra attention.

REFERENCES:

1. Peleg AY, Weeraratna T, McCarthy JS, Davis TM. Common infections in diabetes: Pathogenesis, management and relationship to glycaemic control. Diabetes Metab Res Rev. 2007;23:3–13. [PubMed] [Google Scholar]

2. American Diabetes Association (ADA) Standards of medical care in diabetes-2011. Diabetes Care. 2011;33:S11–61. [Google Scholar]
3. Cano M, Iglesias P, Pérez G, Díez JJ. Influenza A virus (H1N1) infection as a cause of severe diabetic ketoacidosis in type 1 diabetes. Endocrinol Nutr. 2010;57:37–8. [PubMed] [Google Scholar]
4. Centers for Disease Control and Prevention (CDC) The Pink Book: Chapters Epidemiology and Prevention of Vaccine Preventable Diseases. 12th Edition. 2011. Apr. [Last Accessed on 2011 Oct 12]. Available from: <http://www.cdc.gov/vaccines/pubs/pinkbook/pink-chapters.htm>.
5. Kornum JB, Thomsen RW, Riis A, Lervang HH, Schönheyder HC, Sørensen HT. Type 2 diabetes and pneumonia outcomes: A population-based cohort study. Diabetes Care. 2007;30:2251–7. [PubMed] [Google Scholar]