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Original Research Article

A Cross-Sectional Study of Clinical and Etiological Profile of Non-Tubercular Lower Respiratory Tract Infections in Patients with Diabetes Mellitus

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Conflict of interest: Nil

Abstract:

Introduction: Diabetes Mellitus is a major and increasing public health clinical problem. Non-Tubercular Lower Respiratory Tract Infections in Diabetes Mellitus are often misdiagnosed. The present study was therefore conducted to assess the occurrence of Lower Respiratory Tract Infections in Diabetes Mellitus patients and also to impart an effective treatment to those patients.

Aims and Objectives: To determine the clinical profile, pathological, and radiological findings of patients of non-tubercular Lower Respiratory Tract Infection (LRTI) in Diabetes Mellitus.

Materials and Methods: It was an institution based cross-sectional observational study of 50 patients admitted in the IPD of respiratory medicine, CNMCH, Kolkata(W.B) fulfilling the inclusion and exclusion criteria, from the period between February 2020 to August 2021.

Results and Analysis: In our study it was found that males were affected more with LRTIs having DM. The HbA1C level was between 7-10 (%) for most of the patients (68%) and 62% patients had diabetes mellitus for more than 5 yrs. It was also found that 78% patients had cough, 84% had fever. In our study it was found that *Klebsiella sp*. was the most frequently isolated organism (14%) in sputum samples. 48% patients had lower lobe involvement, 36% patients had consolidation, the final diagnosis being community acquired pneumonia (CAP) of bacterial origin in 34% cases and 14% had COVID pneumonia.

Conclusion: Patients with Diabetes mellitus have indeed a very high chance of having non-tubercular lower respiratory tract infections, of both bacterial and viral aetiology and associated morbidity. *Klebsiella sp.* being the most frequently isolated organism. Bilateral lower lobes of lung are most commonly affected in LRTIs with DM.

Keywords: Diabetes Mellitus, Respiratory tract infection, Community acquired pneumonia, Pleural fluid.

Introduction

Diabetes mellitus (DM) is an "iceberg" disease [1].Diabetes Mellitus is a major and increasing public health clinical problem. Infections play a significant role in morbidity and mortality of diabetic patients [2]. Diabetes was responsible for 6.8% of total global deaths in all age groups in 2010[3]. Studies revealed that defect in the function of neutrophils, lymphocytes, and monocytes were the reason for increased infections in diabetics [4,5]. Lower Respiratory Tract Infections in Diabetes Mellitus are often misdiagnosed. Non tubercular lower respiratory tract infection is a disease that is affecting human beings for long time. So proper diagnosis of the etiological agent and correlation with the clinical condition is very much necessary to impart an effective treatment to the patients. The present study was therefore conducted to assess the occurrence of Lower Respiratory Tract Infections in Diabetes Mellitus patients.

Main objectives of the study was to determine the clinical profile, pathological, and radiological findings of patients of non-tubercular Lower Respiratory Tract Infection (LRTI) in Diabetes Mellitus.

Materials and Methods

It was an Institution based cross-sectional observational study in the Dept. of Respiratory Medicine, Calcutta National medical College and Hospital, Kolkata (W.B) with 50 patients and all were admit-

ted in Respiratory Medicine Ward (both male and female) having symptoms and signs of lower respiratory tract infections with controlled or uncontrolled diabetes mellitus.

Inclusion Criteria

Diabetics ≥ 14 years of age with symptoms or signs of lower respiratory tract infections.

Exclusion Criteria

1. Tuberculosis patients
2. Patients with other immune compromised states (HIV, auto-immune disorders, lymphoproliferative disorders) or using immune compromising drugs (corticosteroids, anti-cancer agents).

Detailed history, clinical examination and laboratory examination was done. Sputum samples were collected and assessed for acceptability as per Bartlett's Criteria (Table 1) where Score of ≤ 0 indicated contamination. Then gram-staining followed by culture sensitivity tests by Blood Agar/ MacConkey Agar, or Sabouraud's Dextrose Agar if prior staining shows fugal elements, were done of those samples. Antimicrobial susceptibility pattern for bacterial isolates was tested by Kirby Bauer disc diffusion technique according to CLSI 2019 Guidelines.

Table1: Bartlett's criteria

No. of Neutrophils/10X LPF	**Grade**
<10	0
10-25	+1
>25	+2
Presence of Mucus	+1
No. of Epithelial Cells/10X LPF	
10-25	-1
>25	-2

Pleural fluids were evaluated for- cell type, cell count, protein, sugar, LDH, gram stain, culture & sensitivity, ADA. Viral samples for COVID-19 were taken and Reverse-Transcriptase Polymerase Chain Reaction (RT-PCR) was done in two steps process.

Other tests like Digital Chest X-Ray, CT scan of Chest, Blood parameters like CBC, ESR, CRP, LFT, RFT, FBS, PPBS, HbA1C were also done as and when required.

Patients were treated as per the clinical, etiopathological and radiological features. Bacterial pneumonia patients were managed as per 2019 ATS Guidelines prescribed for CAP[6].

Management of para pneumonic effusion or empyema was done as per British Thoracic Society 2010 Guidelines[7,8].

The onset of pandemic of viral infection SARS CoV-2 (COVID-19) led to initiation of Diagnostic and treatment guidelines. In this research study, standard management protocols, as guided by the (World Health Organization), Govt. of West Bengal and All India Institute of Medical Sciences, New Delhi, were followed.

Fungal infections were treated as per ESCMID-ECMM-ERS 2017 Guidelines [9].

Results and Analysis

In our study (Table 2), 18.0% patients were

Table 2: Distribution of Age in group (years)

Age in group(years)	**Frequency**	**Percent**
≤40	4	8.0%
41-50	9	18.0%
51-60	10	20.0%
61-70	21	42.0%
71-80	6	12.0%
Total	50	100.0%

41-50 years old, 20.0% patients were 51-60 years old, and 42.0% patients were 61-70 years old.

It was seen in our study (Figure1) that, 17 (34.0%) patients had diabetes of 1-5 yrs., 14 (28.0%) had diabetes of 6-10yrs., 9 (18.0%) had diabetes of 11-15 yrs.

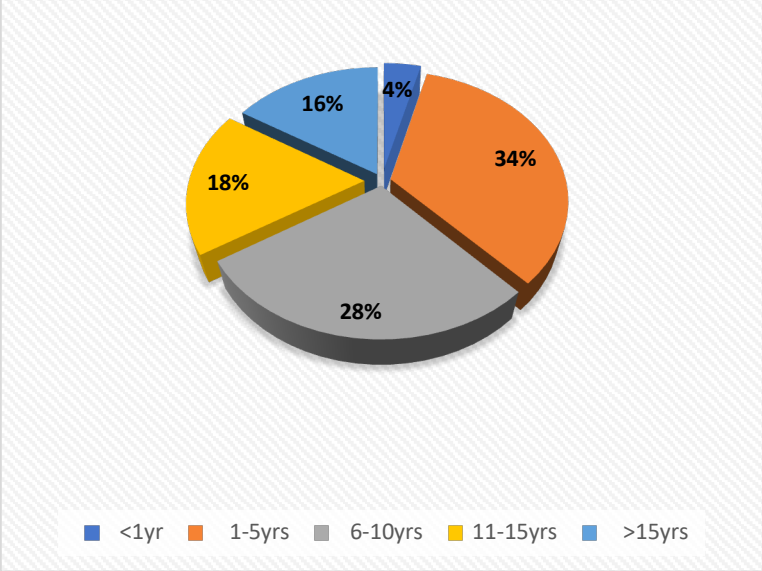

Figure 1: Distribution of Duration of Diabetes (years)

In our study (Figure2), 34(68.0%) patients had HbA1C between 7-10 (%).

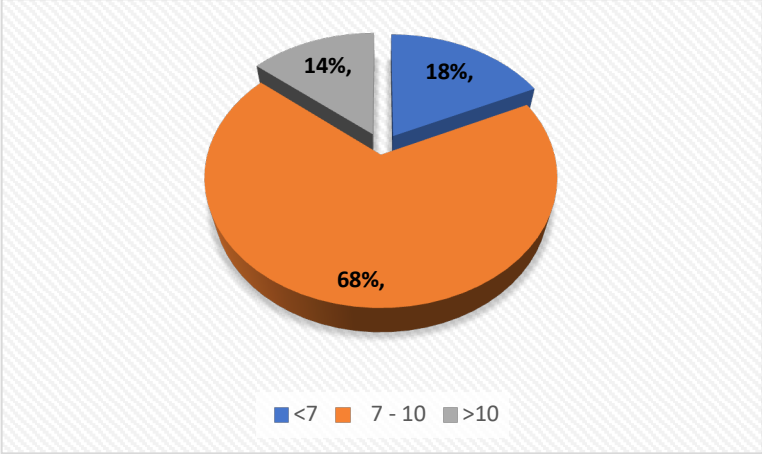

Figure 2: Distribution of HbA1Cvalues (%)

Table 3: Distribution of mean HbA1C(%)

	Number	Mean	Standard Deviation (SD)
HbA1C (%)	50	8.2980	1.6130

It was found (Table 3) in our study, that the mean HbA1C (Mean ±SD) of patients was 8.2980±1.6130.
In our study (Table 4), 38.0% patients had habit of smoking. 6.0% patients had aspiration; 34.0% patients were alcoholic.

Table 4: Distribution of Risk factors and comorbidities

Risk factors and Comorbidities	Frequency	Percent
Hypertension	20	40%
Past history of Pulmonary TB	14	28%
Coronary Artery Disease	07	14%
Chronic Kidney Disease	04	08%
Smoking	19	38%
Aspiration	03	06%
Alcoholism	17	34%

In our study (Table 5), 78.0% patients had cough, 66.0% patients had sputum production,84.0% patients had fever, 80.0% patients had shortness of breath.

Table 5: Distribution of Symptoms

Symptoms	Frequency	Percent
Cough	39	78%
Sputum Production	33	66%
Fever	42	84%
Chills & rigor	31	62%
Chest pain	15	30%
Haemoptysis	06	12%
Shortness of breath	40	80%
Vomiting	08	16%
Loss of appetite	11	22%

In our study (Figure 3), 2 (4.0%) patients had *Escherechia coli* (E.COLI*),* 1(2.0%) patients had *Haemophilus influenzae* (H. influenzae), 2 (4.0%) patients had *Klebsiella Oxytoca (*KLEB.OXYT*)*, 5 (10.0%) patients had *Klebsiella pneumoniae* (KLEB.PNEU*)*, 1 (2.0%) patient had MRSA, 2 (4.0%) patients had MSSA, 2 (4.0%) patients had *Pseudomonas aeruginosa* and 2 (4.0%) patients had *Streptococcus pneumoniae*(STREPTO. PNEUMO) in sputum culture.

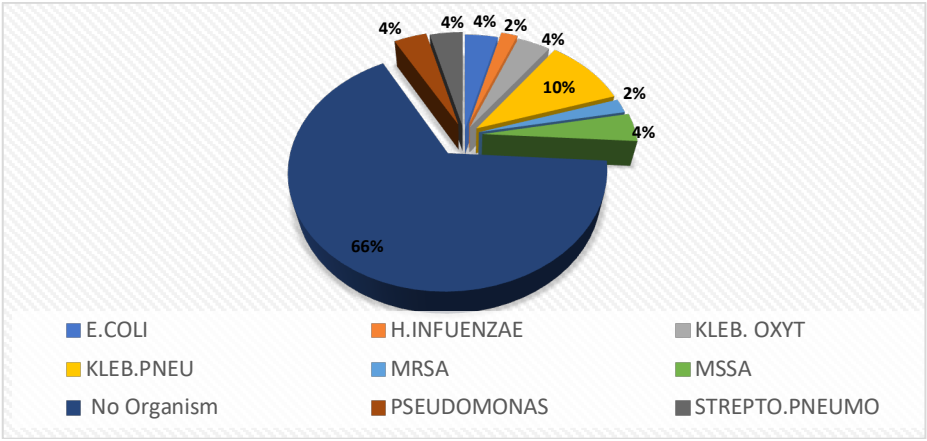

Figure 3: Distribution of Culture of sputum samples

In our study (Figure4), 1 (2.0%) patients had *Streptococcus pneumonia* (STREP. PNEU), 3 (6.0%) patients had *Klebsiella oxytoca* (KLEB.OXYT), 1 (2.0%) patient had Klebsiella pneumoniae (KLEB. PNEU), 4 (8.0%) patients had MSSA and 1 (2.0%) patient had *Escherichia coli (*E.Coli) in pleural fluid Culture.

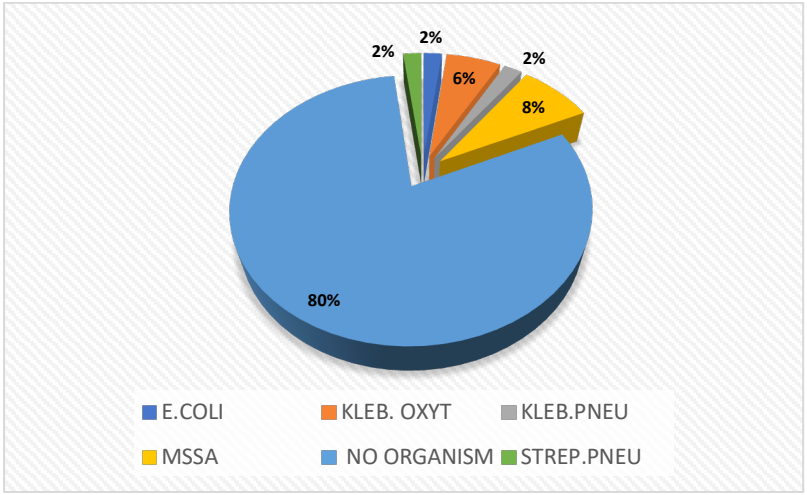

Figure 4: Distribution of Culture of pleural fluid samples

In our study (Figure 5), 7 (14.0%) patients were positive for RT-PCR for SARS CoV2.

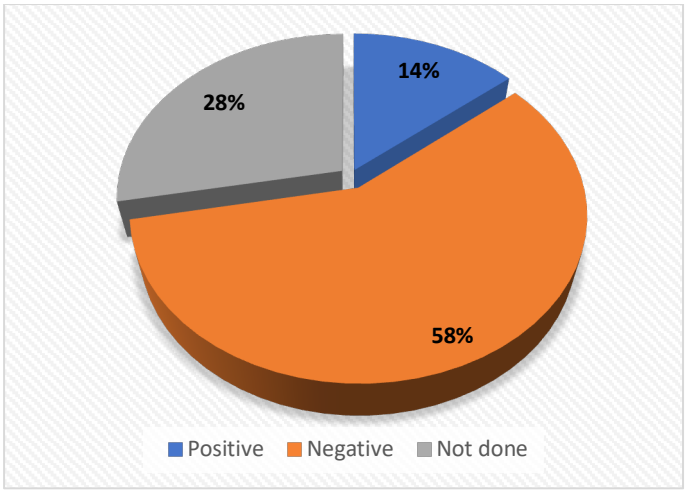

Figure 5: Distribution of RT-PCR for SARSCoV2

In our study (Figure 6), 23 (46.0%) patients had bacteria, 7 (14.0%) patients had virus and 1 (2.0%) patient had fungus as pathogens isolated from different samples. No organism was isolated in 38% cases.

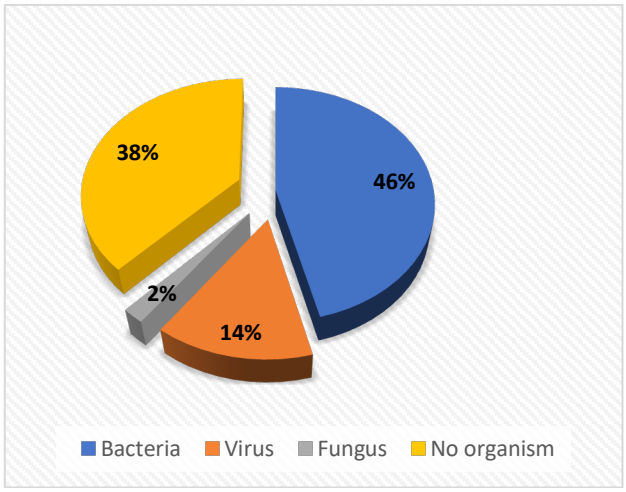

Figure 6: Distribution of Pathogens Isolated

In our study (Figure 7), 13 (26.0%) patients had right lower lobe involved, 11 (22.0%) patients had left lower lobe involved, and 17(34.0%) patients had pleural cavity involved in lungs in CT Scan.

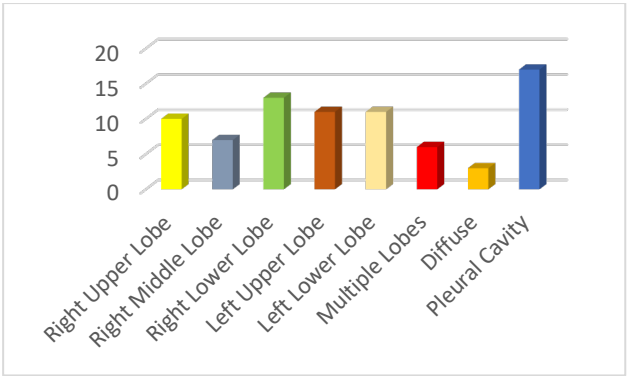

Figure 7:

In Our Study (Figure 8), 17 (34.0%) Patients had CAP Of Bacterial Origin, 14 (28.0%) Patients had CAP +Para-pneumonic Effusion, 7 (14.0%) Patients had COVID Pneumonia, 6 (12.0%) Patients had Lung Abscess as final diagnosis.
In our study (Figure 9), 18 (36.0%) patients had CURB-65 score 1, 15 (30.0%) patients had CURB-65 score 2.

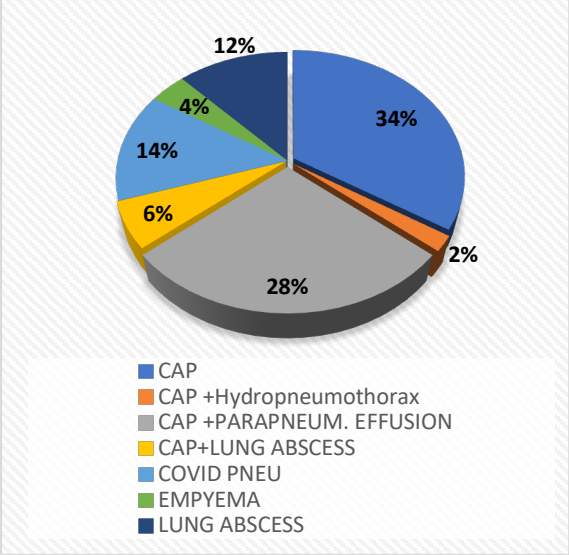

Figure 8: Distribution of Diagnosis

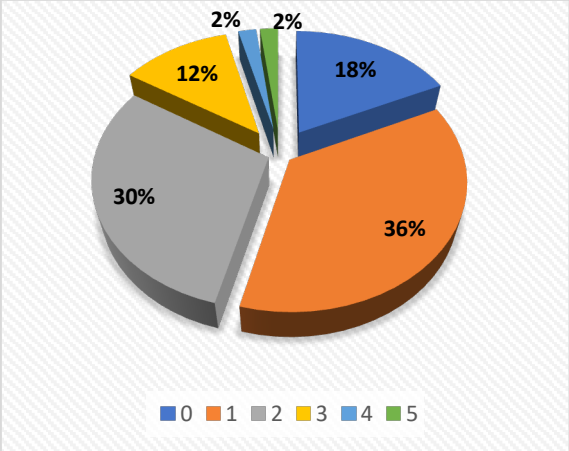

Figure 9: Distribution of CURB-65 Score

Discussion

We found in our study (Table 2) that, most of the patients were above 50 years of age.

In our study (Figure1) it was found that, majority of patients (62%) were having diabetes for more than 5 years. This result corroborates previous finding by Bettegowda S et al. (2014)[10] where majority (92%)of patients had diabetes of more than 5 years duration .

In our study (Figure 2), 68% patients had HbA1C between 7%-10%, that corroborates with Chandra N et al (2017)[11].

The mean value (mean ±standard deviation) of HbA1C in our study (Table 3) was 8.2980± 1.6130 which was a little higher than the findings of Ibrahem RA et al. (2018) [12].

Our study (Table 4) showed that 38% were smokers and 34% were alcoholic who had LRTIs with DM. The finding corroborates with Pimpaldara RP et al. (2017)[13], Almirall J et al. (2008) [14] , but was different from Vasanthapriyan MR et al. (2017) [15].

In our study (Table 5) 78.0% patients had cough, 66.0% patients had sputum production, 84.0% had fever, 80.0% patients had shortness of breath, the findings having similarity with the that of Nandini M et al. (2018)[16].

Our study (Figure 3) showed that, Klebsiella was the most frequent organism isolated from sputum samples as well as pleural fluid samples (Figure 4), the finding being different from that of Nandini M et al (2018) [16], but was similar to that of Niyas M et al (2016)[17], and Sowmya AV et al (2016)[18].

In our study (Figure5), it was found that 14.0% patients had RT-PCR for SARS CoV2 positive. This is probably due to the emergence of the pandemic during the study period.

It was found in our study (Figure 6), that out of the 50 samples, 46% cases had bacterial isolates, in 14% cases there were viral isolates, the findings

being dissimilar with Ruiz M et al.(1999)[19] where sputum yield was 32%, and was different from that of Nandini M et al (2018)[16], who found that 70% were bacterial isolates.

Our study showed (Figure 7) that, 48% patients had lower lobe involvement, the finding having higher values than Vishwarkarma P et al. (2021)[20]. We also found that 34% patients had pleural effusion in CT scan which had similarity with Kozeil H et al. (1995) [21].

It was found from our study (Figure 8) that the final diagnosis was community acquired pneumonia (CAP) due to bacteria in 34% cases, CAP + parapneumonic effusion in 28% cases. Bacterial Pneumonia was present in 70 % cases in our study.

In our study (Figure 9), It was found that most (84%) of the patients had CURB-65 score ≤ 2, the findings being much different from Saibal M et al. (2012)[22]. The low CURB-65 score for most of the patients in our study was due to admission of serious patients in isolation ward and not in respiratory medicine ward during the COVID-19 pandemic, and the patients under study were admitted through OPD.

Management and outcome- After properly assessing patients, they were managed conservatively followed by specific therapy. Out of 50 patients in our study, 2 patients were shifted to Intensive Therapeutic Units (ITU). The rest were managed in the Respiratory Medicine ward. 1 (2%) patient died in the ITU, and the rest 49 patients were discharged.

Summary

Most of the patients were above 50 years of age. 62% were having diabetes for more than 5 years duration. 68% patients had HbA1C between 7%-10%. *Klebsiella* was the most frequent organism isolated from sputum samples. 48% patients had lower lobe involvement. Bacterial Pneumonia was present in 70 % cases in our study.

Conclusion

It is concluded that patients with diabetes mellitus have indeed a very high chance of having non-tubercular LRTIs and associated morbidity. Effective therapeutic and preventive interventions would help detect and manage non-tubercular lower respiratory tract infections in patients with diabetes mellitus more efficiently and promptly.

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References

1. Park; Park's Textbook of preventive and social medicine. 20th edition, M/s Banarsidas Bhanot, Jabalpur, 2009: 341-45.
2. Muller LM, Gorter KJ, Hak E, Goudzwaard WL, Schellevis FG, Hoepelman AI et al.; Increased risk of common infections in patients with type 1 and type 2 diabetes mellitus. Clin Infect Dis., 2005; 41:281-88.
3. Roglic G, Unwin N. Mortality attributable to diabetes: estimates for the year 2010. Diabetes Res ClinPract 2010; 87(1): 15-9.
4. Gallacher SJ, Thomson G, Fraser WD, Fisher BM, Gemmell CG, MacCuish AC; Neutrophil bactericidal function in diabetes mellitus: evidence for association with blood glucose control. Diabet Med., 1995; 12:916-20.
5. Delamaire M, Maugendre D, Moreno M, Le Goff MC, Allannic H, Genetet B; Impaired leucocyte functions in diabetic patients. Diabet Med., 1997; 14:29-34.
6. Metlay J et al., Diagnosis and treatment of Adults with Community Acquired Pneumonia. Amercian Journal of Respiratory and Critical Care Medicine.2019;200(7): e45-e67.
7. Light R.W.,(2013). Pleural Diseases (6th edition).Lippincott Williams &Wilkins;209-46
8. Davis HE, Davis RJ, Davies CW, et al. Management of pleural infection in adults: British Thoracic Society Pleural Disease Guideline 2010. Thorax. 2010; 65(suppl 2): ii41-ii53.
9. Ullmann AJ et al., Clinical Microbiology and Infection .March 2018;24(1): e1-e38
10. Bettegowda S, Iyengar VS, Gosain V, Naik V, Vuyyuru S, Bandreddi G. Clinical profile and spectrum of infections in type 2 diabetes mellitus patients: a retrospective study from rural tertiary care hospital of south Karnataka, India. Scholars Journal of Applied Medical Sciences. 2014; 2:3331-36.
11. Chandra N, Premkumar K, Subbalaxmi M, Umabala P, Raju YS. Incidence of infections in hospitalized subjects with diabetes mellitus. Journal of Clinical and Scientific Research. 2017;6(4):216-24.
12. Ibrahem RA, El Najjar M, Korani MA, Abdel M. Diabetes Mellitus Prevalence and Burden among Community Acquired Pneumonia Patients. International Journal of Public Health. 2018 Mar; 7(1):8-12.
13. Pimpaldara RP, Vasava M,; Lower respiratory tract infections in diabetes mellitus. Indian journal of Immunology and Respiratory Medicine. July-September 2017;2(3); 78-81.
14. Almirall J, Bolibar I, et al: New evidence of risk factors for community acquired pneumonia: a population-based study. European Respiratory Journal. 2008; 31(6): 1274-84.
15. Vasanthapriyan MR, Dhanalakshmi V. Study on non-tuberculous aerobic bacterial profile of lower respiratory tract infections in hospitalised geriatric population in a tertiary care hospital. Journal of Evolution of Medical

and Dental Sciences. 2017Jul 10;6(55):4161-67.
16. Nandini M, Devi MR, Bhaskar CJ. A Study of clinical and an etiological profile of lower respiratory tract infections in patients with diabetes mellitus. Journal of Evidence-based Medicine and Healthcare. May 21, 2018;5(21).
17. Niyas M, Kumar S, et al.; Community-acquired pneumonia in type 2 diabetes mellitus: a study of clinical and bacteriological profile. J Evid Based Med. Health C, 2016; 3(17): 656-61.
18. Sowmya AV, Jayalakshmi G et al., Community-acquired pneumonia–current scenario among immunocompromised patients in a tertiary care hospital. International Journal of Bioassays. 2016; 5(1): 4715- 19.
19. Ruiz M Ruiz M, Ewig S, et al.; Etiology of community-acquired pneumonia: impact of age, comorbidity and severity. Am J Respir Crit Care Med. 1999;160:397-405.
20. Vishwakarma P, Usman K, Garg R et al.; Clinical and Radiological Presentations ofVarious Pulmonary Infections in Hospitalized Diabetes Mellitus Patients: A Prospective, Hospital-Based, Comparative, Case Series Study, Pulmonary Medicine, 2021; 2021:1-5.
21. Kozeil H, Kozeil MJ; Pulmonary complications of diabetes mellitus. Infect DisClin North Am .1995;9:65-95.
22. Saibal MAA, Rahman S, et al.; Community acquired pneumonia in diabetic and non-diabetic hospitalized patients: presentation, causative pathogens and outcome, Bangladesh Medical Reseancil Bulletin. 2012; 38 (3): 98–103.