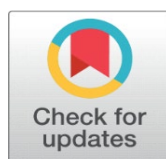


# CHARACTERISTICS OF COMMUNITY ACQUIRED PNEUMONIA AT A SINGLE CENTER IN CENTRAL SRI LANKA DURING COVID-19 PANDEMIC: A DESCRIPTIVE CROSS-SECTIONAL STUDY

Dr. Anushika Luckmy Solanga Arachchige <sup>1</sup>  , Dushantha Madegedara <sup>2</sup>  

<sup>1</sup> Post graduate trainee in Respiratory Medicine, Postgraduate Institute of Medicine, Colombo, Sri Lanka

<sup>2</sup> Chair Professor of Medicine, Wayamba University of Sri Lanka and Consultant Respiratory Physician, Respiratory Disease Treatment Unit, National Hospital, Kandy, Sri Lanka



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## Corresponding Author

Dr. Anushika Luckmy Solanga  
Arachchige,  
<mailto:saluckmy@gmail.com>

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## ABSTRACT

**Introduction and Objective:** Community acquired pneumonia (CAP) is associated with increased mortality and morbidity. The disease severity is multifactorial, co-morbid conditions and advanced age are the most important risk factors. At present, there is a sparsity in published data on CAP in Sri Lankan adults and adolescents. Aim of study to identify complications and outcome of CAP.

**Methods:** A single center descriptive prospective study was carried out in Respiratory Unit 11 in National Hospital-Kandy, Sri Lanka, among diagnosed CAP patients during six months from 1st of September 2020 to 28th of February 2021. Data were analyzed by SPSS (Statistical Package for Social Sciences) 21 package.

**Results:** 105 cases were analyzed; of which 35.2% had complications. Parapneumonic effusion was the commonest complication, whilst pyothorax was the rarest complication. Nine patients (24%) had multiple complications. Prevalence of complications significantly correlated with CURB 65 score (pearson correlation coefficient 0.57, p value 0.001).

93.3% of patients survived with treatment, however 6.6% of them demised with male predominance and all had at least 2 preexisting diseases. Five deaths (71.4%) occurred in the intensive care unit. During follow up, 3.8% were diagnosed with bronchial malignancy, 5.7% pulmonary tuberculosis, 2.8% other chronic infections (melioidosis) and 1.9% chronic organizing pneumonia, respectively.

**Conclusion:** CAP is a major health concern in central Sri Lanka during COVID-19 pandemic. Most CAP patients recovered completely. Mortality 6.6% with male predominance. Parapneumonic effusion was the commonest complication. Number of Complications had significant correlation with CURB 65 score.

**Keywords:** Clinical Characteristics, Community Acquired Pneumonia, Outcome

## 1. INTRODUCTION

### 1.1. BACKGROUND

Pneumonia is an acute inflammation of lung parenchyma with inflammatory exudates [Fauci \(1998\)](#). This is a still common respiratory disease despite the

presence of health facilities [Murray and Lopez \(2013\)](#). It is considered as the 9th leading cause of death across the world since pneumonia carries a significant morbidity and mortality in the population and it is the most common infection causing deaths globally [Wijesooriya et al. \(2018\)](#).

Pneumonia is an umbrella term which belongs to several subtypes owing to the acquisition of disease. Out of all, community acquired pneumonia (CAP) is the commonest type. Hospital acquired pneumonia, ventilator associated pneumonia and health care associated pneumonia are other subtypes. The clinical spectrum of CAP is diverse and ranging from very mild clinical symptoms to serious disease and complications such as respiratory failure, cardiopulmonary compromise, sepsis, multi-organ dysfunction and death.

Host factors such as age, preexisting co-morbidities, underline pulmonary reserve, coexisting pulmonary diseases, immune status, social circumstances and behaviour are contributed to the severity of CAP. Severity is also highly dependent on microbiological factors. CAP is caused by different organisms. *Streptococcus pneumoniae* is known as the main bacterial aetiology followed by *Haemophilus influenzae*, *Staphylococcus aureus*, group A *Streptococcus* and numerous other groups of bacteria [Peto et al. \(2014\)](#). There are many types of respiratory viruses, also important as aetiology. COVID-19 infection commonly overlaps with CAP which may mimic pneumonia. The incidence of *Streptococcus pneumoniae* has been declining in the community, whereas other pathogens such as respiratory virus associated CAP is an emerging global trend. Further, another subset of CAP occurs due to atypical bacteria namely *Mycoplasma pneumoniae*, *Legionella pneumoniae* and *Chlamydia pneumoniae*. Interestingly, pneumonia has numerous extra-pulmonary manifestations which could easily be misrepresented [Ishiguro et al. \(2018\)](#) in clinical practice.

Management of pneumonia is based on the guidelines [Ewig et al. \(2016\)](#), [Lim et al. \(2009\)](#). However, pneumonia management guidelines have not been recently updated globally. The treatment modality of CAP is an appropriate antimicrobial therapy. The challenge is emerging antimicrobial resistance with potential inadequate or zero therapeutic response. Ideally, antibiotics are instituted depending on microbiological clues. In terms of unavailability of necessary microbiological stains, cultures and time lag are major drawbacks for moving to empirical antibiotics derived on preexisting information in the medical literature and guidelines [Mandell et al. \(2007\)](#).

At present, there is a sparsity of Sri Lankan research on CAP in on adult and adolescents. Pneumonia research on Sri Lankan paediatric age category is available [Kudagammana et al. \(2020\)](#). However, as per available limited evidence, morbidity and mortality due to CAP in our country is remarkably high [Health Government \(2023\)](#), [Haniffa et al. \(2009\)](#). Pneumonia related hospital admissions were 26681 in Sri Lanka during the year 2018 [Health Government \(2023\)](#). Furthermore, 3842 deaths due to pneumonia had been reported during the same year. Thus, pneumonia has been ranked as the seventh leading cause for in-hospital deaths [Health Government \(2023\)](#).

## 1.2. OBJECTIVES

The global data on CAP is not precise to apply in Sri Lankan population due to discrepancies in prevalence of co-morbidities, tropical infections, predominant chronic infections (tuberculosis), environmental and socio-economic factors.

Therefore, it is a timely prerequisite to study on this entity and apply to local patients with CAP which prompted us to identify this gap and carry out this study.

We aimed to ascertain factors and associations related to CAP in a sample of patients treated in single center in Central Sri Lanka. Ultimately, the gain was to contribute to the augmentation of the care of CAP, abate pneumonia associated complications and lessen mortality.

## **2. METHODS**

A single-center descriptive cross-sectional study on CAP was carried out in patients admitted in Respiratory Unit 11, National Hospital- Kandy, Sri Lanka for a duration of 6 months from first of September 2020 to 28<sup>th</sup> February 2021. The ethical and administrative approvals were granted by the ethical review committee in National Hospital, Kandy and the Director of National Hospital, Kandy correspondingly.

All adult patients who met the diagnosis of CAP and gave informed written consent were enrolled into the study. Parental consent was obtained for adolescents under 18 years. Consecutive sampling methods were used to acquire study subjects.

Exclusion criteria were age less than 12 years, lack of informed written consent, confirmed COVID-19 infection, hospital acquired pneumonia, noninfective pneumonitis and cases treated in the community.

Standard management and interventions were carried out according to guidelines. The clinical, radiological and lab indices were monitored for satisfactory response. Development of complications and outcome were identified accordingly. Patients were reviewed at outpatient clinic and investigations were arranged depending on the necessity.

## **3. DATA COLLECTION**

Data were collected at hospitalization with an interviewer administered questionnaire.

## **4. STATISTICAL ANALYSIS**

The data were tabulated and analyzed with statistical package for Social Sciences (SPSS) 21 version. Subsequently, generated information was presented as numbers and percentages in a tabulated format and as graphs.

Demographic profile, symptomatology, investigation profile, management and outcome were analysed using descriptive analysis. Chi square test was used to analyse significance of clinical features between young adults (less than 55 years) and elderly (more than 55 years) aged group with CAP. Associated factors for complications, gender and biomass exposure were analysed using chi square test placing the *p* value at 0.05 in 95% confidence interval. Pearson correlation was used to determine bivariate correlation among complications and CRP along with severity index. A *p* value of 0.05 was considered statistically significant.

## **5. RESULTS**

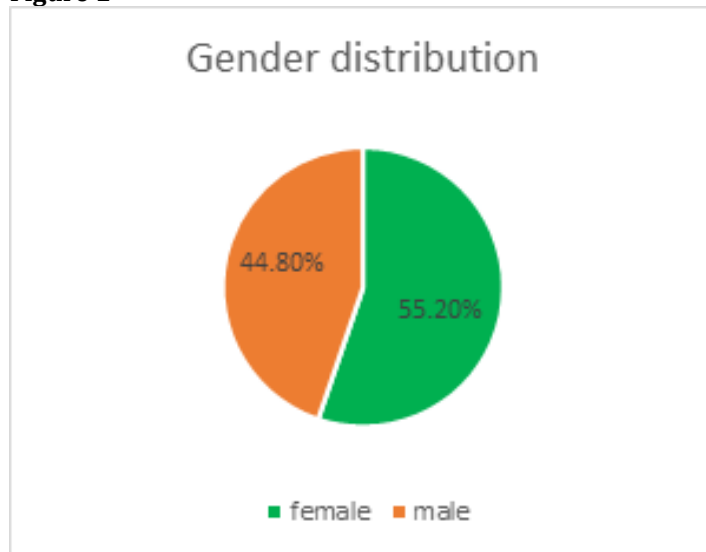
### **5.1. DEMOGRAPHIC PROFILE**

A total of 105 subjects were enrolled. The median age was 60 years (SD 18.87), and mean age was 54.8 years (SE 1.859), ranging from 14 to 88 years. The majority

(58.7%) of patients were above 55 years of age. The study included 58(55.2%) females and 47(44.8%) males [Figure 1](#).

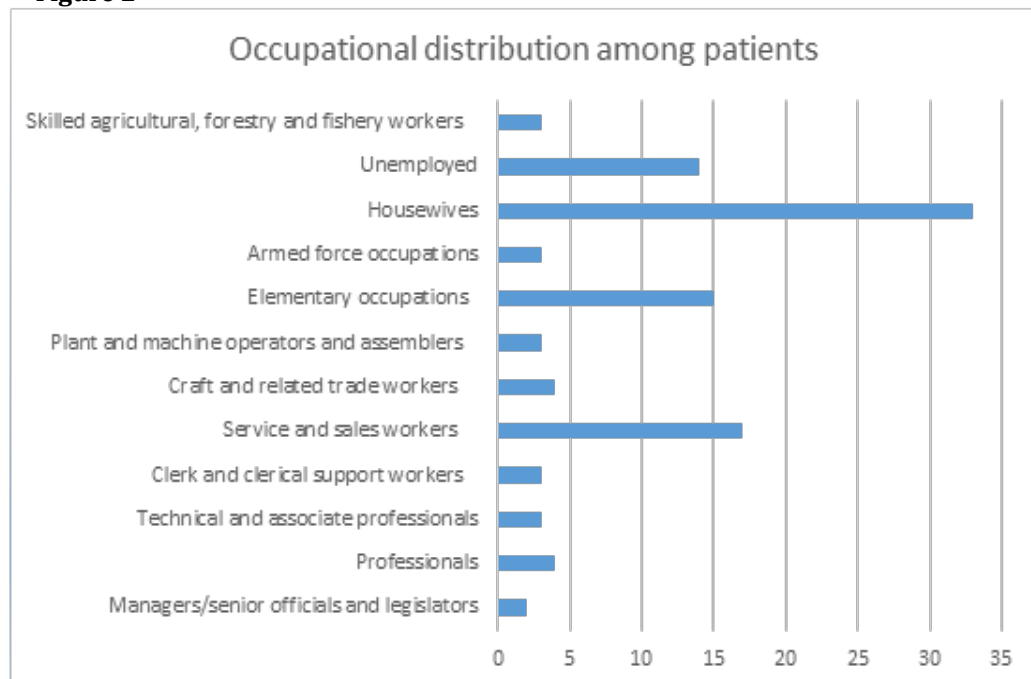
Almost one third of total cases was housewives. About 16% of cases were service and sales workers in contrast to 14.3% of elementary employees. Details of occupations are summarized in [Figure 2](#).

**Figure 1**



**Figure 1** Gender Distribution of Patients

**Figure 2**



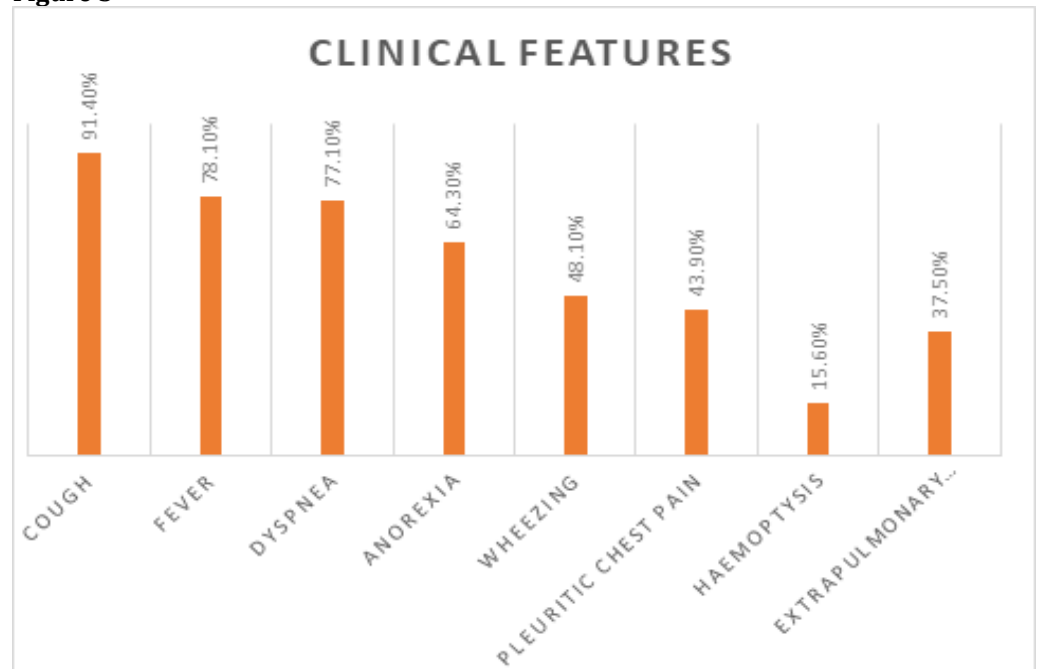
**Figure 2** Occupational Distribution of Patients

## 5.2. CLINICAL PRESENTATION AND HOSPITAL STAY

The most common presenting symptom was cough 96 (91.4%). Out of which, 60.4% of cases had cough with sputum production. In addition, fever and shortness of breath were present in 82(78.1%) and 80(77.1%) patients respectively. Symptoms were demonstrated in [Figure 3](#). However, overlapping symptoms were also encountered in study subjects.

The mean duration of fever, dyspnea and cough at presentation was 4.1 days (SE0.38), 6.5 days (SE0.68) and 10 days (SE9.27), respectively. The mean hospital stay was 7 days (SE0.669).

**Figure 3**



**Figure 3** Prevalence of Symptoms

## 5.3. CO-MORBIDITIES AND RISK FACTORS

Several co-morbidities were identified among patients. Out of which, chronic lung diseases were the most common in 42.9%; bronchial asthma 25.7, chronic obstructive airway disease 9.6%, interstitial lung disease 3% and bronchiectasis 4.6% respectively. Meanwhile 28.6% of cases were diabetics and 22.85% hypertension. In addition, rhinosinusitis was found in 17.1%. Multiple co-morbidities were observed in a significant number of patients. Associated co-morbidities were presented in [Figure 4](#).

Figure 4

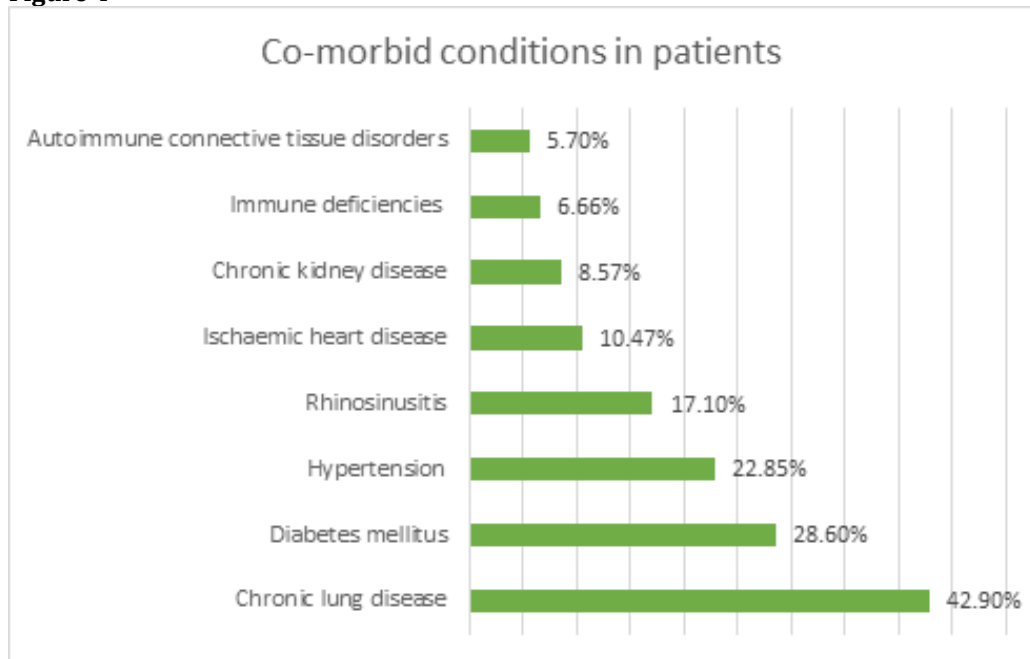


Figure 4 Co-Morbid Conditions Associated with Patients

Out of all cases, history of pneumonia was observed in 12.4%. Twenty-eight percent and 30% of patients reported smoking and alcohol respectively. Many patients (52.3%) had been exposed to domestic biomass fuels. 4.8% of patients reported long distance travel within a period of 2 weeks. Furthermore, 3 pregnant mothers with CAP were included in this study.

Figure 5

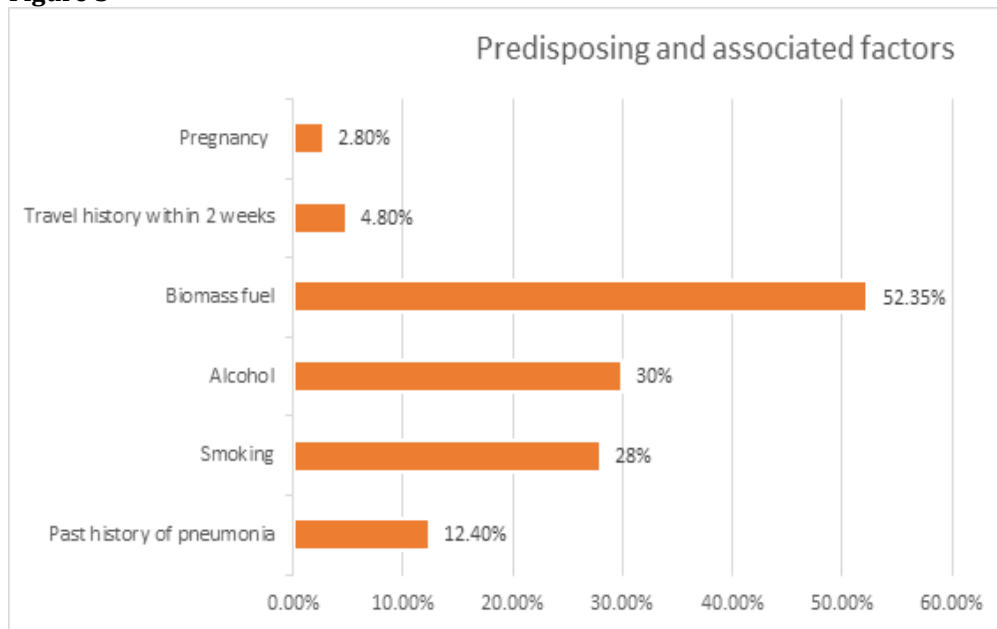
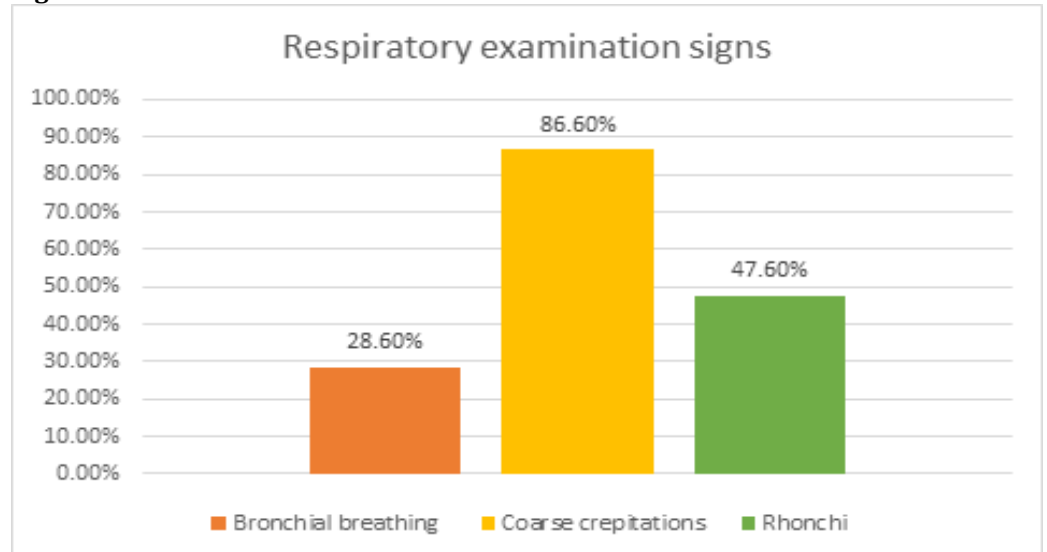


Figure 5 Predisposing and Associated Factors

## 5.4. CLINICAL EXAMINATION

The most common clinical sign was coarse crepitation (86.6%). Out of all, 59.6% of patients had local in contrast to generalized signs (40.43%). Bronchial breathing was detected only in 28.6% and rhonchi was found in 47.6% of cases. Respiratory examination findings were summarized in [Figure 6](#) and [Figure 7](#).

**Figure 6**



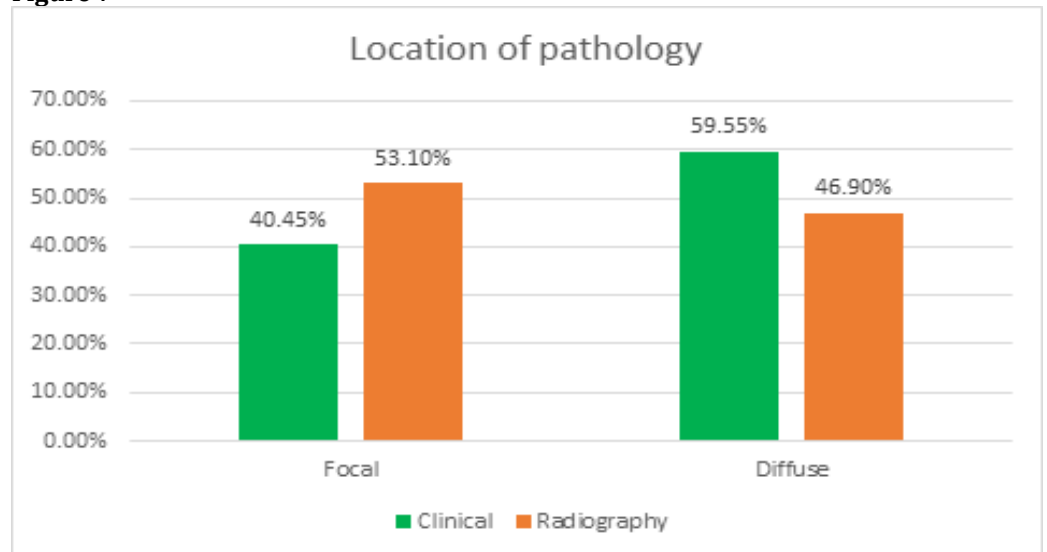
**Figure 6** Presence of Respiratory Signs on Hospital Admission

## 5.5. INVESTIGATION PROFILE

### 5.5.1. RADIOLOGY

Chest radiography was performed on all patients. 22.8% of patients admitted with chest radiographs while others subjected to chest radiography during first 24 hours of hospital admission. Almost 53.1% of patients had radiological changes confined to a single zone in comparison with 46.9% of multizonal opacities. Comparison of radiological findings were presented in [Figure 7](#).

**Figure 7**



**Figure 7** Location of Pathology According to Clinical Examination and Radiology

### 5.5.2. BLOOD INVESTIGATIONS

The mean white cell count was 11.63/cm<sup>3</sup>. C reactive protein had a median of 64 (SD 96.3, range 1.75 to 452) whilst median erythrocyte sedimentation rate remained at 60 (SD 33.3, range 5 to 120). Although initial C reactive protein was significantly correlating with occurrence of complications due to pneumonia (pearson correlation coefficient 0.758, *p* value 0.01), initial erythrocyte sedimentation rate and complications did not illustrate statistically significant correlation (pearson correlation coefficient 0.088, *p* value 0.42). Range of blood urea was 1.03 to 319(SD 62.9) with 4.94 of median.

Sputum bacterial culture was carried out in 7.6% of cases and was positive in one case that grew *Pseudomonas aeruginosa*. Blood culture was performed in 16.1% of cases and only two were positive for *Streptococcus pneumoniae* species. Procalcitonin was done in a minority of (11.4%) cases. H1N1 testing was carried out in 6.6% patients while Mycoplasma antibodies were performed in 2.9% of cases with a single case positivity.

### 5.6. MANAGEMENT AND SEVERITY OF DISEASE

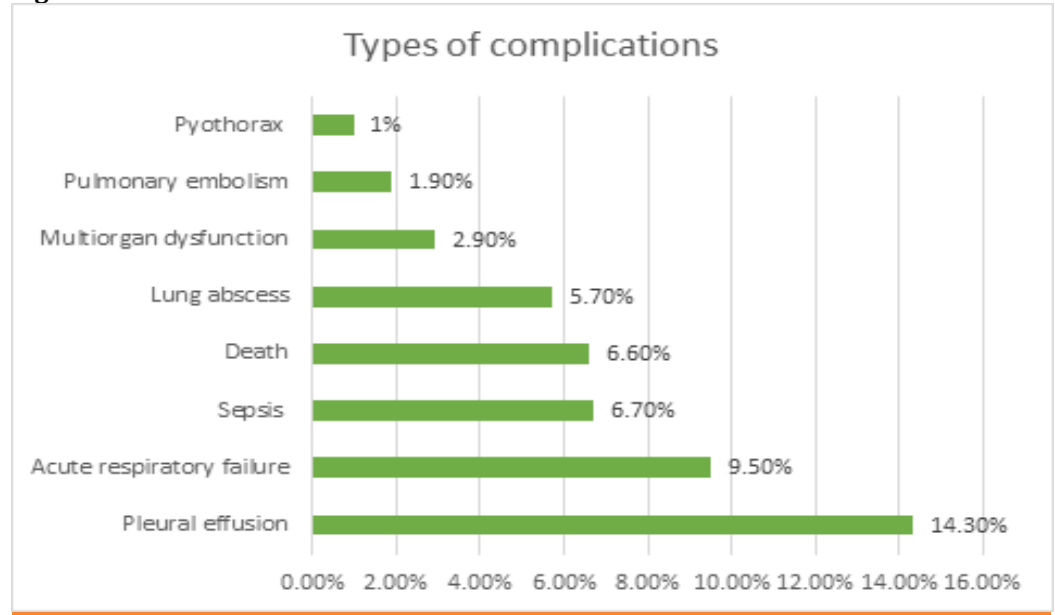
Out of cases with single lobar pneumonia, right side involvement was the commonest in 62.09% of cases. The lower lobe was widely affected with 62.5% in contrast to the other lobes. However, upper lobe was the least affected site (8.3%) in this cohort. Lobar pneumonia was not recognized in 28.6% of total cases and a minority of patients had interstitial pneumonia.

For all, CURB65 score was calculated as the severity assessment tool. CURB65 indicated that 22 (20%) patients had moderately severe CAP and 8 (7.6%) had severe CAP. In ward was the most common place of management accounting for 94.4%. The leading reason (70%) for intensive care admission was acute hypoxaemic respiratory failure compared to septic shock (30%).

One third of the patients (33.3%) were exposed to antibiotics prior to their admission, among which 43% of them were prescribed with beta lactamase inhibitors. However, 10.5% of patients were uncertain about receiving antibiotics. Cephalosporin was the predominant antimicrobial agent (53.3%) during the time frame of in-hospital management involved in this study. Nonetheless, 51.5% of cases were treated with quinolones as well. Patients with moderate to severe complicated CAP and severe CAP received more than one combination of antibiotics.

68% of individuals had uncomplicated CAP in contrast to 35.2% of cases with complications. Pleural effusion was the most common complication, accounted for 14.3% of cases whilst pyothorax was the rarest complication. All the complications were summarized in [Figure 8](#). Nine subjects had multiple complications.



**Figure 8****Figure 8** Types of Complications

There was no significant association between diabetes mellitus and rate of complications (chi value 0.117,  $p$  value 0.819). Also, there was no significant association between smoking and complications due to pneumonia. (Chi value 3.145,  $p$  value 0.10). However, prevalence of complications significantly correlated with CURB 65 score (pearson correlation coefficient 0.57,  $p$  value 0.001). Also, CURB 65 score did not correlate with number of deaths as Pearson correlation coefficient 0.152,  $p$  value 0.12.

## 5.7. OUTCOME

93.3% of patients survived with treatment, however 6.6% of them demised. Complete chest radiography clearance was noted at 1 month, 2 months and 3 months in 47%, 40% and 13% of recovered patients respectively. Out of all patients, 3.8% were subsequently diagnosed with bronchial malignancy, pulmonary tuberculosis was confirmed in 5.7% and chronic infections (melioidosis) apart from tuberculosis was diagnosed in 2.8% accordingly. In addition, 1.9% developed post infectious organizing pneumonia secondary to CAP and successfully managed with intensive steroid therapy. Out of 7 deaths, 4 deaths were males. All demised patients had more than 2 preexisting diseases. Five deaths occurred in the intensive care unit.

## 6. DISCUSSION

CAP is a leading infection in Southeast Asia including Sri Lanka which sharing similar socio-economical statues [Health Government \(2023\)](#), [Haniffa et al. \(2009\)](#). The median age range and mean age were equal to preexisting studies [Lim et al. \(2003\)](#), [Mishra and Behera \(2016\)](#), [Myint et al. \(2012\)](#), [Partouche et al. \(2015\)](#). There was a female preponderance. However, this is an extraordinary feature in contrast to comparable studies done in southeast Asian region other than a French study [Partouche et al. \(2015\)](#). 86% male predominance was demonstrated in a study carried out by Aditya Bikram [Peto et al. \(2014\)](#). According to Lim WS et al, 50.6%

was males and the mean age was 65.4(19.6) years [Lim et al. \(2003\)](#), [Mishra and Behera \(2016\)](#). However, social predisposing factors such as smoking and alcohol consumption were not dominating in the present study since, these habits are not commonly seen among Sri Lankan females.

Out of all, housewives outnumbered remaining economically active population. The most probable cause for this incidence could be the female preponderance in this study sample. Also, field workers involved in service and sales were the most affected economically active group by 16.2% in the study. In addition, 13.3% of patients was unemployed as per employment characteristics of Sri Lanka according to the labour force survey in 2019 [Sri Lanka Labour Force Annual Report \(2019\)](#). However, the association between occurrence of CAP in unemployed personals was remained unclear which needs to be further explored the future. Meanwhile, it was obvious that poor socio-economical background and non-income generating population were more susceptible for CAP in this study. Further, this fact was similar to the published data in the literature [Jahanihashemi et al. \(2018\)](#).

The clinical profile was almost equivalent to the findings of published local and international studies [Lim et al. \(2003\)](#), [Mishra and Behera \(2016\)](#), [Partouche et al. \(2015\)](#), [Eekholm et al. \(2020\)](#) amongst which cough was the most common symptom. Also, cough had the longest duration at the presentation which was around two times more than that of fever. Hence, prolonged cough with recent onset of other respiratory symptoms may be a health burden leading to catastrophic consequences due to CAP. Therefore, this presentation requires early detection and simultaneous investigations. Cough was present among all age groups without statistical significance between elderly and young adults (Chi square value for cough was 2.776,  $p$  value 0.25.) which was true for fever. On contrary, dyspnoea and pleuritic chest pain were more common in older population than young adults and adolescents.

Predisposing factors for adult CAP were evaluated and reported by Torres A et al which revealed annual incidence inclined with age (14 per 100 person-years in adults aged more than 65 years [Torres et al. \(2018\)](#)). Solid epidemiological data is available in terms of pulmonary infections that thrive in polluted environment circumstances [Torres-Duque et al. \(2008\)](#). Biomass has been profusely used in Sri Lankan households as a domestic fuel. This practice is more prevalent in rural communities than in urban areas. Acute respiratory tract infections in children who are associated with indoor biomass smoke was strong evidence according to a review in 2008 [Torres-Duque et al. \(2008\)](#), [Xing et al. \(2016\)](#). As, housewives had an increased exposure to solid substance combustion and a major proportion of CAP patients reported obvious exposure, there was a significant association between gender and biomass exposure (chi square 21.450,  $p$  value 0.001) in this study. This specific association could be attributed to particulate matter (PM) 2.5 which is a noxious substance present in biomass fuel. In addition, PM 2.5 has been recognized as a provoking factor for infections in the human respiratory system [Xing et al. \(2016\)](#). Therefore, future research in this area of interest is important.

Chronic Obstructive Pulmonary Disease was the leading predisposed factor for CAP, in many studies due to downgraded pulmonary immune mechanism [Mishra and Behera \(2016\)](#), [Partouche et al. \(2015\)](#), [Eekholm et al. \(2020\)](#). Also, prevalence of bronchial asthma was 30% in this study. Diabetes mellitus and incidence of CAP was variable among studies [Eekholm et al. \(2020\)](#), [Ishiguro et al. \(2013\)](#). A study published in 2013 observed diabetes mellitus as a major risk factor for CAP [Ishiguro et al. \(2013\)](#). The present study had more than one fourth of diabetes which was expeditiously higher than similar studies despite direct comparison between these

reports is not reproducible. A Spanish study demonstrated occurrence of CAP was twofold high in patients with history of pneumonia (OR 2.73) [Sabatier et al. \(2010\)](#).

In terms of clinical signs, the presence of coarse crepitations was the most sensitive sign in several studies as in this study [Partouche et al. \(2015\)](#). In addition, rhonchi were noted to be a frequent finding in patients than other reports. This observation was more likely due to underlying obstructive airway diseases among the patients and movement of secretions which produced by pneumonia exudates within the bronchial tree. Consolidation features on respiratory examination was demonstrated in 68% of cases in an Indian study whereas our study showed less features of consolidation [Mishra and Behera \(2016\)](#). This contradictory finding was contributed by a significant proportion of antibiotic exposure at the community level leading to an alteration of the distinct sequence of disease process. Furthermore, clinical examination was notably disproportionate to the radiology in some instances, a French study showed 36% of lack of signs in contrast to 64% of positive chest radiographs for pneumonia [Partouche et al. \(2015\)](#). On the contrary, clinical signs could be superior to chest radiography findings owing to the delayed onset of radiological changes, atypical pathogens or poor quality of radiographs. However, prehospitalization antibiotic administration may be a provoking factor for minimal auscultation findings in CAP. The site of pathology in chest radiography was almost constant in present and past results [Mishra and Behera \(2016\)](#). C reactive protein value was a reliable indicator for predicting complications as there was a statistically significant correlation between variables. Erythrocyte sedimentation rate could not be a substitute for prediction of complications.

The major drawback of microbiological confirmation of aetiology was predominant in this cohort. Negligible positivity of sputum bacterial culture was far inferior to the recent literature [Torres et al. \(2018\)](#), [Shah et al. \(2010\)](#), [Self et al. \(2017\)](#). The presumable causes for culture negativity would be prior antibiotic administration, sampling errors, technical constraints, atypical bacterial pathogens and viruses. Additional serological investigations were not cost-effective strategies for the present study. Procalcitonin is a crucial investigation in clinical decision in severe CAP [Shah et al. \(2010\)](#). Nonetheless, suboptimal performance of procalcitonin was a limitation throughout this study period.

A study carried out in France illustrated amoxicillin as the most preferred antibiotic monotherapy prescribed by general practitioners in contrast to beta lactamase inhibitors received by patients in the current study [Partouche et al. \(2015\)](#). Intravenous cephalosporin together with quinolones were instituted for many patients which was replaced by carbapenems depending on clinical deterioration. Therefore, this combination of antibiotics was found to be more sensitive and effective in managing hospitalized CAP in this center. However, this practice was dissimilar to present management guidelines and a center policy had been established [Lim et al. \(2009\)](#). The percentage of treatment escalation into intensive care facility was identical for this study and recently published literature [Mandell et al. \(2007\)](#), [Sabatier et al. \(2010\)](#), [Eshwara et al. \(2020\)](#). Furthermore, reasons for intensive care admissions were comparable to several descriptive studies [Mishra and Behera \(2016\)](#), [Partouche et al. \(2015\)](#), [Ishiguro et al. \(2013\)](#), [Mbata et al. \(2013\)](#). Rate of complications following CAP was nearly constant with preexisting studies along with pleural effusion as the most frequent complication [Eekholm et al. \(2020\)](#), [Xing et al. \(2016\)](#), [Sabatier et al. \(2010\)](#), [Eshwara et al. \(2020\)](#). However, pleural effusion was not a cause for mortality in the study group. As per previous research, complications were dominant in severe CAP with a statistical significance ( $p < 0.001$ ) [Lim et al. \(2003\)](#), [Partouche et al. \(2015\)](#), [Ishiguro et al.](#)

(2013), Shah et al. (2010). In this cohort, the major proportion of patients was in less severe CAP according to CURBS65 score. The minority had severe category of CAP and greater complication rate. On contrary, mortality and severity score of CAP were positively correlated without a statistical significance ( $p$  0.121).

GC Mbata et al reported that 15% of mortality in their study in Nigeria compared with 0.3% in a French study and zero in an Indian study respectively [18, Mbata et al. (2013), Eshwara et al. (2020)]. This was 6.6% in the present report indicating that mortality due to CAP was highly variable and multifactorial possibly standards of health care also play a decisive role.

Since, 14.25% of patients did not respond to the treatment within the expected period and later found to have an alternative aetiology or a secondary cause. Mortality rates among poorly responded cases were reported to be unprecedentedly high as 49% Mandell et al. (2007), Sabatier et al. (2010), Mbata et al. (2013). Hence, periodic assessment after hospitalization is mandatory in terms of arranging prompt investigations.

From the present study, a set of recommendations would be suggested. Establishing a definitive channel between community based preliminary treatment and hospital setting with a proper system of referrals will be a necessary task. Further, adhering to the clinical criteria on CAP would be crucial to improve the outcome. Primary care physicians and emergency staff should be made aware of likelihood as well as common manifestations of CAP. If the presentation is atypical and poorly resolving appropriate consultations should be sought for the best interest of the patient. The policy of antibiotic stewardship needs to be implemented and audits are encouraged for quality assurance. Vulnerable groups such as older people and patients suffering from chronic lung diseases should receive pneumococcal vaccination for prevention of CAP. Future studies need to be planned to investigate female predominance in CAP with possible associations with biomass exposure. Moreover, community-based CAP management and health care accessibility to Sri Lankan population is another potential area of interest.

The major strength of this study was a prospective cross-sectional study which selected a representative study setting of the whole country. Limitations were the inadequate number of microbiological clues and absence of specific investigations secondary to financial inferiority in the health sector. Therefore, deficiency in aetiological diagnosis of CAP is a significant restriction in contemporary study. In addition, community-based CAP management was not considered since it was a hospital-based study.

## 7. CONCLUSION

CAP in adults and adolescents continues to be a significant health concern in Sri Lanka even during COVID-19 pandemic which could have been overwhelmed. Outstanding incidence among females and category of housewives was distinguishable to already published studies. Meanwhile, the relationship between biomass fuel combustion and CAP needs to be deeply elucidated in the future. As a result of aetiologic diagnosis of CAP being a greater challenge, inappropriate antimicrobial administration would be inevitable. Hence, potential threat of antibiotic resistance will be an undeniable hazard in forthcoming years. Therefore, dissemination of microbiology and ancillary laboratory services is a timely requirement at present.

In addition, clinical presentation has a similar pattern described in the literature, therefore a high index of clinical suspicion is mandatory. Chest radiography is the most accessible radiological investigation modality whilst initial CRP is a predictor of complications. The prognosis is satisfactory with timely management in this study although one third of cases was complicated with 6.7% mortality which should be studied at national level and incorporated into the management protocols in health institution with periodic updates along the time frame.

### **CONFLICT OF INTERESTS**

None.

### **ACKNOWLEDGMENTS**

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