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ORIGINAL ARTICLE

Community-acquired pneumonia and its predictors of mortality in rural southwestern Nigeria: A-five year retrospective observational study

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ABSTRACT

Introduction: The predictors of community-acquired pneumonia (CAP) mortality are important outcome measures in epidemiological studies and clinical trials. There is an observed paucity of data regarding the predictors of mortality of CAP in Nigeria. Few studies from the urban centres have been reported in the literature, with none from the rural centres. The objective of this study is to ascertain the clinical presentations, risk factors, and predictors of mortality among patients admitted for CAP in rural Southwestern Nigeria.

Methods: A retrospective observational study using a data form and a standardised questionnaire reviewed the 176 patients admitted to Southwestern Nigeria hospital between January 2015 and December 2019. The data were analysed using SPSS Version 22.0. The results were presented in descriptive and tabular formats.

Results: A total of 176 patients were studied. Their mean age was 53.3±16.8 years. There were more males, 112 (63.6%), than females. The most common clinical presentations were cough, fever and sputum expectoration. The case fatality rate was 9.1% and its predictors were older aged patients [Adjusted Odds Ration (AOR), 4.135: 95% Confidence Interval (CI) (1.389-12.315); p =0.005], hypoxia [AOR, 11.118: 95% CI (2.607-47.405); p<0.001], tobacco smoking [AOR, 3.632: 95% CI (1.459-9.039); p=0.008], chronic obstructive pulmonary disease (COPD) [AOR, 10.111: 95%CI (2.370-43.139); p <0.001], and human immunodeficiency virus (HIV) [AOR, 9.444: 95% CI (4.304-20.725), p<0.001].

Conclusion: The case -fatality rate was 9.1%, and its predictors were older age patients, patients with hypoxia, tobacco smoking, COPD, and HIV. This study strengthens the argument on the higher prevalence of CAP and its mortality in rural Southwestern Nigeria. The findings may provide an impetus for prospective research on these outcomes.

Introduction

Community-Acquired Pneumonia (CAP) is an acute infection of the pulmonary parenchyma associated with acute infection symptoms with the presence of a new infiltrate on a chest radiograph acquired outside of a hospital setting [1]. According to World Health Organization (WHO) data, three to four millions people die annually from CAP worldwide [1,2]. CAP is the leading cause of mortality in the United States, accounting for 5-15% deaths among hospitalised patients [1]. The burden is much higher in developing countries where pneumonia constitutes the most common cause of hospital admissions [1,3]. The disease remains a cause of significant mortality, with intra-hospital mortality figures in Nigeria ranging from 7.4% to 26% [4,5,6]. Mortality due to CAP is often related to the severity of the infection and associated co-morbid ailments. Reports from previous studies have shown that human immunodeficiency virus (HIV) Infection, chronic obstructive pulmonary disease (COPD), diabetes mellitus, and congestive heart failure are the common co-morbid ailments linked with CAP mortality in developing countries

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[5,7]. Other studies have also identified the ageing population to have a poor prognostic index with CAP infection [7,8]. The aging population may exhibit structural and immunologic deficits which impair the host's defence against pulmonary infection[9]. Patient demographics (such as age and gender), physiological parameters at admission (such as hypotension, tachycardia, low saturation pressure of oxygen (SPO2), and severe tachypnoea), and other complications are other contributing predictors of CAP mortality worldwide [7,9].

Despite the high burden of CAP in developing countries globally, there is an observed paucity of data regarding the pattern and predictors of CAP mortality in Nigeria. Few related studies from the tertiary hospitals located in urban centres have been reported in the literature, with little or none from the rural areas where the majority of the populace resides. Prevalence and predictors of CAP mortality are important outcome measures in CAP epidemiological studies and clinical trials [6,9]. Therefore, data on CAP mortality are necessary to enhance healthcare providers' readiness towards meeting patient expectations, leading to improved health care delivery and better outcomes. Thus, the study aims to ascertain the clinical presentations, risk factors, and predictors of mortality among patients admitted for CAP in a tertiary hospital in rural Southwestern Nigeria.

Method

The study was conducted at the adult emergency centre (EC) of Federal Teaching Hospital, Ido- Ekiti, Ekiti State, Southwestern Nigeria. The study area is located in a rural community about 15km from Ado-Ekiti, the State capital and it has a total land area of 332km^2. There was a total population of 159,114, at the last population census in 2006, with an annual growth rate of 3.2%, meaning the 13th year projected population (by 2019) would be 225,305 [10]. The people are mainly farmers and traders in the informal sector, with a relatively small portion of the working population and retirees in the formal sector [11]. Apart from the study centre, two other tertiary hospitals are located in the state capital. The study centre has 180 beds and serves as a referral centre to patients from private and government-owned health facilities in its environs. The EC of the hospital offers emergency services to medical and surgical patients with 24 beds spread across male (14) and female (10) wards. The department runs three shifts from Monday to Friday and 48 hours call on Saturdays and Sundays.

The medical team at the EC included consultant physician specialists, medical officers, and nurses supported by other healthcare workers. During the study period, the department of medicine had twelve consultant specialists, including one respiratory consultant, who were all responsible for the medical cases. The respiratory consultant would be invited to take over the management of all patients diagnosed with a potential CAP following initial diagnosis, resuscitation and commencement of treatment.

This was a descriptive, retrospective review of hospital records of CAP admissions from the EC between 1st January 2015 and 31st December 2019. This included all CAP patients registered and admitted on beds from the EC between 2015 and 2019.

CAP patients whose data were incomplete, not available or whose initial diagnosis of CAP was later changed to other cause were not included in the study.

The instruments for data collection were designed and developed by the researchers. The research instruments included a data form and a standardised questionnaire, which contained the variables to be measured based on the previous literature approach to CAP surveillance [5].

The data form and the standardised questionnaire were used to obtain information from the case records of each patient on admission or discharged in the nursing report books. Information retrieved included the date and year of admission, demographic profile, presenting complaints, admission vital signs (such blood pressure, respiratory rate, heart rate, SPO2, and body temperature) and clinical findings on chest examination (such as crepitation and bronchial breath sounds). Other information included the co-morbid ailments and risk factors as documented in their folders. Case fatality was also recorded for those patients who died of the illness. The data were collected by two trained casualty officers, a nursing officer, one resident doctor from the respiratory unit and cross-checked by the principal investigator.

All data collected were checked for completeness, entered into Epi info version 7, and later exported to SPSS version 22.0 for analysis. Continuous variables were expressed as meanstandard deviation, while categorical variables as frequencies and percentages. Comparison of categorical data was performed using Pearson's chi-square test, and $p < 0.05$ was considered statistically significant. A multivariate logistic regression model was used to identify the predictors of CAP mortality.

The institution's Ethics and Research Committee (ERC) approved the study on August 25th, 2020, with approval number (ERC/2020/08/25/402A).

Table 1
Demographic profile of CAP in the studied patients (N = 176).

Variable	Frequency N = 176	Percentage (%)
Age group (in years)		
< 65	102	58.0
≥ 65	74	42.0
Mean age ± SD	*55.3±16.8*	
Sex		
Male	112	63.6
Female	64	36.4

SD = standard deviation

Table 2
Clinical presentations of CAP in the studied patients (N = 176).

Variable	Frequency N = 176	Percentage (%)
Clinical presentation (s)		
Cough	168	85.5
Fever	144	81.8
Sputum	144	81.8
Dyspnoea	119	67.6
Chest pain	46	26.1
Headache	34	19.3
Vomiting	26	14.8
Myalgia	16	9.1
Haemoptysis	8	4.5

Results

From January 2015 to December 2019, there were 5944 admissions from the EC (medical admissions 3501 (59.1%) vs. surgical admissions 2443 (40.9%). Among the medical admissions, 183 (5.2%) patients were admitted on beds having been confirmed by chest x-ray imaging to have suffered a CAP. Of these patient admitted for CAP 176 (96.0%) had complete data and were therefore analysed in this study.

The mean age of the patients was 53.3±16.8 years (range 40-90 years). There were more males, 112 (63.6%) than females (Table 1).

The most common clinical presentations were cough, 168 (85.5%), fever, 144 (81.8%), and sputum expectoration, 144 (81.8%). These were followed by dyspnoea, 119 (67.6%), and chest pain, 46 (26.1%); some patients presented more than one symptom (Table 2).

On analysis of patients vital signs half of the patients, 88 (50.0%), were febrile, and the majority, 164 (93.2%), had tachypnoea at admission. Only 16 (9.1%) presented with hypotension (Systolic blood pressure (SBP) <100 and Diastolic blood pressure (DBP) <60 mmHg) while more than one-third, 68(38.6%) had hypoxia(SPO2<95%) (Table 3).

The most common unhealthy habits were tobacco smoking, 38(21.6%), and alcohol consumption, 32 (18.2%). Similarly, the most common co-morbid ailments were COPD, 72 (40.9%), diabetes, 34 (19.3%), and congestive heart failure, 28 (15.9%) (Table 4).

Table 3
Admission vital signs in the studied patients (N= 176).

Variable	Frequency N = 176	Percentage (%)
Temperature (°C)		
35.0 – 37.2	88	50.0
>37.2	88	50.0
Respiratory rate (c/s)		
< 20	12	6.8
≥ 20	164	93.2
Systolic blood pressure (mmHg)		
< 100	16	9.1
100 – 139	142	80.7
≥ 140	18	10.2
Diastolic blood pressure (mmHg)		
< 60	16	9.1
60 – 80	157	89.2
> 80	3	1.7
SPO_2 (%)		
< 95	68	38.6
≥ 95	108	61.4
Heart rate (b/min)		
60 – 100	68	38.6
>100	108	61.4
Crepitation		
Yes	139	79.0
No	37	21.0
Bronchial breath sounds		
Yes	28	15.9
No	148	84.1
Pallor		
Yes	34	19.3
No	142	80.7
Altered sensorium		
Yes	16	9.1
No	160	90.9
Jaundice		
Yes	8	4.5
No	168	95.5

Table 4
Risk factors for CAP in the studied patients (N = 176).

Variable	Frequency N = 176	Percentage (%)
Risk factors		
COPD	72	40.9
Smoking	38	21.6
Diabetes	34	19.3
Alcohol	32	18.2
Congestive heart failure	28	15.9
Asymptomatic malaria	12	6.8
Chronic liver disease	8	4.5
HIV	6	3.4

In all, 16 (9.1%) died on admission. The mean age of the alive and the dead were 54.4±17.1 and 65.2 ±10.1,respectively. The majority of deaths, 12 (6.8%) was observed in the older age (≥65 years) and in males (5.7%) than females. There was a statistically significant difference between CAP mortality and age (p= 0.005). However, there was no significant difference between CAP mortality and sex (p= 0.921) (Table 5).

In all, the multivariate logistic regression model revealed that, the older age patients of 65 years and above [AOR, 4.135: 95% CI (12.315-1.389); p =0.005], hypoxia (SP02 <95%) [AOR, 11.118: 95% CI (47.405-2.607); p<0.001], tobacco smoking [AOR, 3.632: 95% CI (9.039-1.459); p=0.008], COPD [AOR, 10.111: 95%CI (43.139-2.370); p <0.001], and HIV [AOR, 9.444: 95% CI (20.725-4.304), p<0.001], were the independent predictors of CAP mortality (Table 6).

Discussion

In this study, the mean age of the patients was 53.3±16.8 years. This is in line with other studies in developing countries where the mean age of CAP patients was in the 5th decade [5,12]. The risk factors for CAP are most prevalent in the above age range. However, the mean age in this study was less than the mean age reported by other studies [7,13]. The difference may be due to hospital-based settings, selection bias, and poor risk factors control. Thus, community-based studies are required to clarify and compare the incidence as well as the prevalence of CAP by age in our area. The higher percentage of CAP in male over female patients in this study is consistent with other studies [5,13]. These studies have attributed the male preponderance to the high incidence of alcohol abuse and tobacco smoking which have been identified as significant risk factors for CAP in males when compared to females. However, other studies found female genders to be a risk factor for CAP due to proximity to children [14,15].

The most common respiratory symptom was a cough, which was noted in 85.5% and was productive in only 81.8% and may be a result of a potential decreased ability to bring out sputum as age increases.

Reports by another study found cough in 74% of patients, which was productive in only 58% of patients [7]. Fever was also a presenting feature in 81.8% of patients in this study. This is consistent with findings in other studies where the incidence of fever ranged between 50% to 100% [12,14].

In this study, the most common presenting signs were tachypnoea, crepitation, and tachycardia. This finding is consistent with another study that found tachypnoea (84%), crepitation (94%), and tachycardia (70%) as the most presenting signs [7]. The study by Bansal et al. [16], and Zalcain et al. [17] also found crepitation in 98% and 79% of patients admitted for CAP, respectively. Poor febrile response in this study may be due to a decreased release of IL-1 in older age patients. This was also consistent with other studies who found a poor febrile response due to a decrease in IL-1 [18,19]. The proportion of patients with hypotension and hypoxia in this study is similar to findings from other studies. It may be due to septic shock, commonly seen in patients with severe CAP [12,20]. In this study, bronchial breath sounds were found in 15.9% which is consistent with 18.4% found among the atypical pneumonia patients in other studies [9,12]. However, another study found 47% of patients with bronchial breath sounds, more than observation in this study [21].

Pallor in this study is similar to the findings by Pipalia HM et al [18] and could be due to secondary infection associated with co-morbid ailments [18]. Similarly, the proportion of patients with altered sensorium is similar to 16% found by Abdullahi et al. and may be due to the similarities in the study design [7]. However, another study found pallor present in 32.5% of patients, which was more than our observation [12]. The presence of altered sensorium in all the above studies, including ours, suggests that chest radiographs should be considered for all patients with altered sensorium upon arrival at the hospital. In this study, the proportion of patients with jaundice is consistent with findings by other studies [7,12]. Jaundice is commonly described in CAP infection as part of multiple organ dysfunction and may be due to underlying chronic liver disease (CLD) found in some of our patients.

The number of patients with COPD in this study out-numbered that of smokers (a major risk factor for COPD). This is not surprising as studies in Nigeria have identified in-door pollution, such as the use of firewood (which is a major source of cooking in rural areas of this nature) as a significant factor for COPD [6,22]. The higher percentage of COPD (40.9%) in this study is consistent with other studies, and may be due to defective mucociliary clearance, mucous plugging and airway collapse [6,23]. As observed in this study, tobacco smoking is consistent with a study in Nigeria [7]. However, the 21.6% prevalence of smoking in this study was lower than that of other studies [5,12]. This may be due to poor documentation of smoking history in the case notes of patients because of the retrospective nature of the study and the fact that when patients perceive that their illnesses may be related to smoking, they tend to deny the history of smoking to avoid blame from their relatives [12]. Alcohol interferes with various respiratory tract infections leading to an increased risk of aspiration, impaired mechanical

Table 5
Prevalence and pattern of CAP mortality (N = 176).

Variable	Mortality				
	Dead n (%)	Alive n (%)	Total N (%)	χ^2	p-value
Age group (in years)				7.844	0.005
< 65	4 (2.3)	98 (55.7)	102 (58.0)		
≥ 65 Total	12 (6.8) 16 (9.1)	62 (35.2) 160 (90.9	74 (42.0) 176 (100.0)		
Mean age ± SD	65.2 ± 10.1	54.4 ± 17.1	55.3±16.8	5.022	<0.001
Sex				0.010	0.921
Male	10 (5.7)	102 (58.0)	112 (63.6)		
Female	6 (3.4)	58 (32.9)	64 (36.4)		

Table 6
Crude and adjusted odd ratios for the significant factors associated with CAP mortality.

Variable	OR(95% CI)	P	AOR(95% CI)	P
Age ≥ 65 years	4.135 (1.389 – 12.315)	0.005	3.456 (1.056 – 7.443)	0.039
Dyspnea	8.077 (1.040 – 62.752)	0.019	2.185 (0.273 – 6.061)	0.452
Chest pain	5.741 (1.953 – 16.871)	0.001	2.710 (0.820 – 12.236)	0.124
Temperature >37.2^{0}C	3.3158 (1.026 – 10.720)	0.036	3.000 (0.823 – 8.944)	0.066
SBP <100 mmHg	42.778 (11.660 – 156.943)	<0.001	2.926 (1.054 – 8.124)	0.061
DBP <60 mmHg	42.778 (11.660 – 156.943)	<0.001	3.238 (0.203 – 11.188)	0.356
SPO_2 < 95%	13.741 (3.013 – 62.664)	<0.001	11.118 (2.607 – 47.405)	<0.001
Heart Rate >100 b/min	4.915 (1.081 – 22.353)	0.024	4.407 (0.825 – 12.793)	0.147
Parlor	9.444 (3.128 – 28.408)	<0.001	5.961 (0.592 – 17.827)	0.412
Altered sensation	117.000 (25.971 – 527.080)	<0.001	9.070 (0.984 – 16.255)	0.062
Jaundice	13 (2.886 – 58.564)	<0.001	3.451 (0.269 – 7.905)	0.647
Smoking	4.333 (1.505 – 12.475)	0.001	3.632 (1.459 – 9.039)	0.008
COPD	12.310 (2.703 – 56.077)	<0.001	10.111 (2.370 – 43.139)	<0.001
Congestive Heart Failure	27.000 (7.783 – 93.667)	<0.001	5.510 (0.587 – 24.634)	0.698
Cerebrovascular Disease	9.000 (2.717 – 29.809)	<0.001	3.200 (0.455 – 8.349)	0.569
HIV	25.000 (4.148 – 150.693)	<0.001	9.444 (4.304 – 20.725)	<0.001
Chronic Liver Disease	13.000 (2.886 – 58.5644)	<0.001	2.898 (0.910 – 8.905)	0.053

OR = Odds Ratio, AOR = Adjusted Odds Ratio.

clearance, and deficient humoral and cellular immunity [24]. The presence of congestive heart failure (15.9%) in this study is similar to findings in other studies [7,23]. This may be due to the similarity in the study design. Also, the proportion of patients with CLD suggests a hepatic impairment from a severe infection, and is consistent with findings in other studies [7,18]. HIV infection as a co-morbid ailment in this study supports other studies that linked HIV infection with increased risk of CAP [5,23]. This calls for routine screening of HIV among patients with CAP.

The case fatality rate of 9.1% represents the mortality in this study irrespective of the age group. However, when viewing along the line of the older age patients, the case fatality rate is consistent with the case fatality rate reported in other studies [5,6].This may probably be because these other studies, including ours, were hospital-based, with related study design. The case fatality rate in our study was lower than the 14.6% observed in Malawi [25], and 26.15% in Nigeria [26] in other studies performed. This is maybe because the case fatality rate in our study was only during the admission period and could be higher than the previous studies that looked at the 30-day case fatality, which was difficult to extrapolate from the case notes because of poor documentation. However, the case fatality rate in our study was higher than what was obtained in a UK cohort study in patients younger than 50 years [27]. This suggests a substantially higher age-adjusted case fatility rate in our study. The inclusion of HIV infection and CLD as co-morbidities that were identified with deaths may explain some of this apparent large discrepancy in the case fatality rate.

In this study, using a multivariate logistic regression model, older age patients, hypoxia, tobacco smoking, COPD and HIV infection were the independent predictors of CAP mortality. Previous studies have found older patients at a much higher risk of death following CAP infections [12,23]. This is reflected in our research, where the mortality in those aged 65 years and above was significantly higher than those less than 65 years. This may be due to age-related changes in innate and adaptive immune responses [28]. Other studies found a delay in diagnosis and treatment as reasons for the observed mortality in older age patients [7,29]. This implies that these patient groups are important vaccination targets in Nigeria for reducing mortality associated with CAP.

The observed association of hypoxia with mortality in this study is consistent with other studies [20,30]. This may be due to mitochondrial damage resulting in cellular apoptosis during sepsis [20].

The observed association of CAP mortality with smokers may be due to alteration in respiratory flora mechanical clearance and cellular defences [12,31].Mucociliary clearance is more defective in smokers than in non-smokers due to a reduction in ciliary beat frequency and a change in the viscoelastic property of respiratory secretions [12,31]. In this study, COPD is an independent predictor of CAP mortality and is similar to other studies [23,28]. The increased mortality of CAP due to COPD may be explained due to defective mucociliary clearance, airway collapse and respiratory muscle fatigue [23,28].

HIV infection in this study is associated with CAP mortality. These findings are consistent with several studies that found significantly higher mortality among those who were HIV positive compared to HIV negative patients [23,32]. This may be due to the fact that HIV-infected patients in Africa are vulnerable to severe recurrent infection with *pneumococcus* [23]. The degree of immunosuppression is a significant factor that contributes to higher mortality [23,32]. This was not investigated and form part of the limitation in this study.

The study was retrospective, and with a relatively small sample size of this nature, we recommend further studies to effectively document CAP presentations and mortality in Nigeria. The study was based on data solely derived from single hospital-based CAP admission. Thus, it might not provide an accurate picture of the CAP case fatality rate and its predictors in the general population.

This study may help with priorities for public health policymakers, so that they may plan for preventions and control programmes to reduce CAP mortality in rural settings. Cost-effective measures such as pneumo-

coccal preventive vaccine may be explored adequately to significantly reduce CAP admission and mortality. Future research is encouraged to understand the specific predictors of CAP mortality further.

Dissemination of results

The results of this study were shared by staff members of EC through an informal presentation. The results were also published in the service's newsletter.

Authors' contribution

Authors contributed as follow to the conception or design of the work, the acquisition, analysis, or interpretation of data for the work; and drafting the work or revising it critically for important intellectual content: AOI contributed 70%; and OMS, SKA and OEO contributed 10% each. All authors approved the version to be published and agreed to be accountable for all aspects of the work.

Declaration of Competing Interest

The authors declare that they have no conflicts of interest.

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References

[1] Gupta D, Agarwal R, Aggarwal AN, Singh N, Mishra N, Khilnani GC, et al. Guidelines for diagnosis and management of community- and hospital-acquired pneumonia in adults: Joint ICS/NCCP(1) recommendations. Lung India 2012;29(2):527 -62.
[2] The Global Burden of the Disease: 2004 Update: Available from: http://www.who.int/healthinfo/global-burden-disease/GBD-report-2004update .(Accessed May 25,2021).
[3] Ramirez JA, Wiemken TL, Peyrani P. Adults hospitalized with pneumonia in the United States: incidence, epidemiology, and mortality. Clin Infect 2017;65(11):1806 -12.
[4] Umoh VA, Otu A, Okpa H, Effa E. The pattern of respiratory disease morbidity and mortality in a tertiary hospital in Southern-eastern Nigeria. Pulm Med 2013:581973 2013.
[5] Onyedum CC, Chukwuka JC. Admission profile and management of community acquired pneumonia in Nigeria. A- 5 year experience in a tertiary hospital. Respir Med 2011;105:298–302.
[6] Mbata GC, Onyedun CC, Onwubere BJC, Aguwa EN. Comparison of two predictive rules for assessing severity of community acquired pneumonia. Afr J Resp Med 2014;10:10–14.
[7] Abdullahi BB, Zoheb M, Ashraf SM, Ali S, Nausheen N. A study of community Acquired pneumonias in elderly individuals in Bijapur, India. Int Scholarly Res Netw. Pulmonol 2012;9:1–10.
[8] Lupisan S, Suzuki A, Macalalad N, Egos R, Sombrero L, Okamoto M, et al. Etiology and epidemiology of community-acquired pneumonia in adults requiring hospital admission: A prospective study in rural central Philippines. Intern J Infec Dis 2019;80:46–53.
[9] Granton JT, Grossman RF. Community acquired pneumonia in the elderly patients: clinical features, epidemiology, and treatment. Clinic Chest Med 1993;14(3):537–53.
[10] Slide share, author. Profile of Ekiti State.(18/3/2021). Available at www.slideshare.net/EkitiState.
[11] Gabriel OE, Ajetumobi OA, Shabi OM, Adebara I O, Busari OA, Dada AS. Influence of family dynamics in medication adherence among hypertensive patients in a tertiary hospital in South-West Nigeria. JMSCR 2017;5(7):25146–55.
[12] Nagesh Kumar TC, Rafiudeen R, Rashmi K. A study of clinical and etiological profile of community acquired pneumonia with special reference to atypical pneumonia. Ann Nig Med 2017;11:11–16.
[13] Barbagelata E, Cilloniz C, Dominedo C, Torres A. Gender differences in community-acquired pneumonia. Minerva Med 2020;111:153 -65.
[14] Breiman RF, Keller DW, Phelan MA, Sniadack DH, Stephens DS, Rimland D, et al. Evaluation of the effectiveness of the 23-valent pneumococcal capsular polysaccharide vaccine for HIV-infected patients. Arch Intern Med 2000;160:2633 -8.
[15] Bule KA, Klugman KP, Von Gottberg A, Perovic O, Karstaedt A, Crewe-Brown HH, et al. Gender as a risk factor for both antibiotic resistance and infection with pediatric serogroups/serotypes, in HIV- infected and -uninfected adults with pneumococcal-bacteremia. J Infect Dis 2004;189:1996–2000.
[16] Bansal S, Kashyap S, Pal LS, Goel A. Clinical and bacteriological profile of community- acquired pneumonia in Shimba. Himachal Pradesh. Indian J Chest Dis Allied Sc 2004;46:17–22.
[17] Zalacain R, Torres A, Celis R, et al. Community-acquired pneumonia in the elderly: Spanish multicentre study. Europ Respir J 2003;21(2):294–302.
[18] Pipalia HM. Clinical Profile and outcome in patients with community acquired pneumonia Thesis. Georgia State University; 2017.
[19] Kauffman CA, Jones PG, Kluger MJ. Fever and malnutrition, endogenous pyrogen, interleukin-1 in malnourished patients. Am J Clin Nutri 1986;44(4):449 -52.
[20] Waitt PI, Mukaka M, Goodson P. Sepsis carries a high mortality among hospitalized adults in Malawi in the era of HAAT scale-up: a longitudinal cohort study. J Infec 2015;70:11–19.
[21] Ishida T, Miyashita N, Nakahama C. Clinical differentiation of atypical pneumonia using Japanese guidelines. Respirology 2007;12:104 -10.
[22] Torres A, Dorca J, Zalacain R. Community-acquired pneumonia in chronic obstructive pulmonary disease: a Spanish multicenter study. Am J Res Critical Care Med 1996;154(5):1456 -61.
[23] Iliyasu G, Habib AG, Mohammed AB, Borodo MM. Epidemiology and clinical outcomes of community acquired pneumococcal infection in North-West Nigeria. Sub-Saharan Afri J Med 2015;2(2):78–84.
[24] Samokhvalov AV, Irving HM, Rehm J. Alcohol consumption as a risk factor for pneumonia: a systematic review and meta-analysis. Epidemiol Infect 2010;138:1789 -95.
[25] Aston SJ, HO Antonia, Jary H, Huwa J, Mitchell T, Ibitoye S, et al. Etiology and Risk factors for mortality in an adults community-acquired pneumonia cohort in Malawi. Am J Res Critical Care Med 2019;200(3):360 -71.
[26] Tanimowo MO. Mortality predictors in community acquired pneumonia. Nig J Clin-Pract 2009;12(3):298–300.
[27] Chalmers JD, Singanayagam A, Hill AT. Predicting the need for mechanical ventilation and inotropic support for young adults admitted to the hospital with community acquired pneumonia. Clin Infect Dis 2008;47:1571–4.
[28] Dai RX, Kong QH, Mao B. The mortality risk factors of community acquired pneumonia with COPD: a retrospective cohort study. BMC Pulm Med 2018;18:12.
[29] Williams NP, Coombs NA, Johnson MJ, Josephs LK, Rigge LA, Staples KJ, et al. Seasonality, risk factors and burden of community acquired pneumonia in chronic obstructive pulmonary disease patients: a population database study using linked health care records. Intern J Chronic ObstrPulm Dis 2017(12):313 2017-22.
[30] Evans H-GT, Mahmood N, Fullerton DG, Rylance J, GoraniA Gordon SB, et al. Oxygen saturation of medical in- patients in a Malawian hospital: cross sectional study of oxygen supply and demand. Pneum 2012;1:3–6.
[31] Mutepe ND, Cockeran R, Steel HC. Effects of cigarette smoke condensate on pneumococcal biofilm formation. Eur Respir J 2013;41:392 -305.
[32] Cilloniz C, Torres A, Polverino E, Gabarrus A, Amaro R, Moreno E, et al. Community acquired lung respiratory infections in HIV-infected patients: microbial aetiology and outcome. EuropResp J 2014;43:1698–708.