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ORIGINAL ARTICLE

MAGNITUDE OF COMMUNITY ACQUIRED PNEUMONIA AMONG TREATED ADULTS IN TIKUR ANBESSA SPECIALIZED HOSPITAL: A RETROSPECTIVE STUDY

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ABSTRACT

Introduction: *Pneumonia is a major cause of morbidity and mortality in children and adults in low-and middle-income countries . The aim of this study was to determine the magnitude of community acquired pneumonia among treated adults of 13 years and above at Tikur Anbessa Specialized Hospital.*

Methods: *This is a register based retrospective community acquired pneumonia study. The study period was from August 2017 to 2019 . Data were collected using a structured checklist for record review. Data analysis was conducted using SPSS.*

Results: *The magnitude of community acquired pneumonia was 1.19 % (104/8673; 95% CI: 0.97%,1.43%) of all patients managed as in patient. Fifty five (52.9%) of the community acquired pneumonia patients were male and 49(47.1%) were females. Indication for admission by CURB65 (Confusion, Bun, Respiratory rate, systolic blood pressure, age>65) criteria was only 28% (29/104). Patients were on IV antibiotics on the average for 8 days with average length of stay of 10.8 days before discharge. Anti-TB was started for 16 % (17/104). Sputum culture was done for only 8 % (8/104). Eighty six percent (89/104) survived to discharge and 14 % (15/104) died in the hospital. Readmission within 30 days was 10.5% (11/104)*

Conclusions: *Community acquired pneumonia encompasses only few of manged inpatients. Indication for admission based on severity score and outcomes were confounded by co comorbidities. Pulmonary TB was diagnosed in significant number of patients who present with clinical and radiological community acquired pneumonia patients.*

Keywords: *Community acquired pneumonia, Tikur Anbessa Specialized Hospital, Ethiopia*

INTRODUCTION

Community-acquired pneumonia (CAP) is commonly described as an acute infection of the lung parenchyma acquired in the community. It is most commonly caused by bacteria and is associated with clinical and/or radiological evidence of consolidation of part or parts of one or both lungs (1). CAP is associated with a considerable burden of disease in most regions of the world (2–7). As part of the burden of respiratory infections, CAP is well recognized to be a leading cause of death among the infectious diseases (6, 8).

Pneumonia is a major cause of morbidity and mortality in children and adults in low-and middle-income countries (LAMICs). In the last decade, there have been several advances and new interventions, resulting in a substantial reduction in pneumonia incidence and improved outcomes. Nevertheless, pneumonia remains the most common reason for adult hospitalization in sub-Saharan Africa, with an estimated 4 million episodes and 200 000 deaths each year (9).

There are a considerable number of risk factors for CAP that exists in populations all over the world, and most of these risk factors are associated with an impairment of host immune defense (7).

In addition to aging, the common risk factors in adults are smoking; the presence of various underlying comorbid conditions, including chronic cardiorespiratory, renal and hepatic conditions, and, at least in some regions of the world, concomitant human immunodeficiency virus (HIV) infection (7, 11-18).

But, little is known about the epidemiology, etiology and predictors of poor outcomes for CAP in Ethiopia. Thus, the main objectives of this study was to determine the proportion of admissions with CAP, indications and place of admission, etiology, treatment outcome and predictors of poor outcome at one of the oldest tertiary teaching hospital in Ethiopia.

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METHODS

Study Setting: The study was conducted at Tikur Anbessa Specialized Hospital (TASH). The hospital is tertiary hospital located in Addis Ababa, Ethiopia. The hospital is one of the oldest tertiary referral care centers. It has more than 700 inpatient beds and 18 common ICU beds. Department of Internal Medicine at TASH has 120 inpatient medical beds and six ICU beds. It has 18 intermediate ward beds and used to have emergency medical ward. Registers with CAP from all medical wards, intermediate, emergency and MICU were included in the study

Study design: The study design was a register based retrospective study on patients admitted to medical inpatients with clinician made diagnosis of CAP based on clinical and radiological evidence. Pneumonia diagnosis was made when a patient with acute presentation (symptom less than 2 week) with chest symptoms like cough, fever chest pain and difficulty of breathing with radiologic evidence of pneumonia like consolidation, lung infiltrate and pleural effusion and physician decided to treat as a case of community acquired pneumonia. The study period was from August 2017 to 2019. During the study period, data was collected using data abstraction form on indications (CURB65 score) and place of admission, comorbidities, treatments and their outcomes including death for each study subject admitted with CAP.

Study population: The source populations for this study were all patients admitted to the medical wards and MICU of Tikur Anbessa Specialized Hospital. The study populations were all CAP patients admitted and managed in the hospitals in the last two years. There were difficulties obtaining some charts of patients with the diagnosis of CAP.

Dependent variables: The dependent variable to be studied was proportion of CAP, indications for admission, place of admission, severity of disease, length of stay, treatment outcomes including discharge, readmission and death.

Independent Variables: The independent variables of this study were age, sex, severity scores and comorbidities.

Sample Size

Total of 104 patients with clinician and radiologic diagnosis of CAP from August 2017 to 2019 admitted to TASH inpatient was included in the analysis.

Sampling procedures: All admitted patients to the medical wards with diagnosis of CAP were selected to be included in the sample.

Data collection procedures: The sources of data for this study were the inpatient ward registers of the hospital. In the registers, clients' socio demographic, clinical and laboratory information, treatments being provided to the clients, the starting date and stopping date of treatment and the follow up status for each client were recorded and reviewed. Data were collected using a structured data extraction form for record review developed in English for this study from the registers and standard guidelines.

Data were collected by the primary investigator, the medical resident, in the hospital wards and card rooms. The developed checklist was pilot tested, and some amendments were made before it was used for the actual data collection. Incomplete data mainly with no radiological evidence were excluded.

Data Analysis

After the data have been collected, it was first checked daily for completeness after collection in the field and electronic data were captured by the principal investigator. For data analysis, SPSS version 25.0 was used. Descriptive statistics was generated for demographics of CAP population, descriptions of treatment, severity assessment and predictors of mortality were taken as significant at $P<0.05$ level of significance. Completion rates were described by subcategories of demographic and clinical characteristics. Independent variables that were significantly associated with treatment completion in bi-variate analysis were further examined in multivariate analysis using log-binomial regression.

Ethical consideration

Ethical clearance was secured from the Ethical Clearance Committee of the Department of Internal Medicine, College of Health Sciences, Addis Ababa University, and Support letter from department has been obtained and submitted to the hospitals card room. To ensure the confidentiality, names and any other personal identifiers were not used during the data collection and analysis.

RESULTS

The magnitude of community acquired pneumonia was 1.19 % (104/8673; 95% CI: 0.97%,1.43%) of all patients managed as in patient. Fifty five (52.9%) of the community acquired pneumonia patients were male and 49(47.1%) were females. The mean age of CAP patients was 41.9 years with age ranging from 13 years to 79 years. All CAP patients were admitted through the emergency route.

Majority (55%) were admitted during day time. Common age group affected by CAP was from 30-64 years of age and age more than 64 years constitute 17%. Smoking rate among CAP patients was 4%. The mean duration of symptoms during presentation was 11 days. All patients had at least derangement in one vital sign during presentation. Common presenting symptoms include cough, fever, shortness of breath fatigability and weight loss. Age is associated with severity and outcome of CAP though confounded by comorbidities. Almost all CAP patients included in the analysis had at least one comorbidity.

Twenty four per cent of them had more than one comorbidity. The most common comorbidity seen in CAP patients admitted to TASH include, 27% cancer of any kind, 21% Heart failure, 17% Bronchiectasis, 11.5% Hypertension, 8.5% renal disease, 7% Asthma, 6% Chronic Obstructive Pulmonary Disease(COPD) and 6% Diabetes Miletus (DM) . Major established risk factors for development of CAP include presence of comorbidities of different types, previous TB, previous pneumonia, HIV and smoking (Table 1).

Table 1: Major risk factors for CAP among study participants in Tikur Anbessa Specilaized Hospital, August 2017-19

Risk factors	Frequency/Percentage (%)
Previous TB	18(17%)
Previous pneumonia	20(19%)
HIV/AIDS	9(8.6%)
Smoking	4(3.8%)
Comorbidity	104(100%)

The diagnosis of pneumonia was made using clinical parameter which includes acute symptoms less than 2 weeks and other alternative diagnosis ruled out and supportive radiologic finding. All patients had radiologic evidence of lung involvement and 45% (46/104) had evidence of pleural effusion.

Only 28% (29/104) of CAP patients had CURB65 score greater or equal to two needing admission. The decision of admission was determined by presence of comorbidity and other factors rather than severity. The majority of patients 97% of them were admitted to general ward and only few of them were directly admitted to ICU. All patients were started on antibiotics and the most commonly used antibiotic regimen was ceftriaxone and azithromycin 64/104(61.5%) followed by cefepime and vancomycin18/104(17%). The mean duration of IV antibiotics was 8 days.

Microbiological investigation was done for a significant number of cases, which included 8/104 (8%) sputum culture, 78/104(75%) blood Culture, 8/104(8%) sputum MTB/RIFXPERT and 1/104 (1%) sputum TB culture. All investigations were found in the patient charts and 2 sputum cultures grow streptococcus pneumonia, no growth of blood cultures, 4 patients were sputum MTB/ RIFXPERT positive but negative sputum TB culture.

Advanced interventions were needed for some patients. The intervention included invasive mechanical ventilation1/104(1%), inotropes/ vasopressor use 3/104(3%) and renal replacement therapy1/104(1 %). After admission and initiation of treatment, 17/104(16%) of them were found to have pulmonary tuberculosis and their treatment was changed clinically or bacteriologically, while 4/104(4%) developed pneumocystis pneumonia (PCP) clinically.

The treatment outcomes of patients treated for CAP in TASH showed that the majority (86%) of patients treated were discharged with improvement. From the total of patients discharged with improvement 10.5% were readmitted due to worsening of the symptoms. Further, the treatment outcome of 14% patients was death. The average length of stay before discharge was 11 days and the average length of stay before death was 10 days (Table 2).

Table 2: Treatmetn oucomes of patienst treated for CAP at Tikur Anbessa Specilaized Hospital, August 2017-19

Outcome Measurement	Frequency (%)
Survival to discharge	89(86%)
Death	15(14%)
Readmitted with 30 days	11(10.5%)
Average LOS before discharge	10.82 days
Average LOS before death	9.8 days

DISCUSSION

As part of the burden of respiratory infections, CAP is well recognized to be a leading cause of death among the infectious diseases (6, 8). A total of 104 patients with clinical suspected and radiologically confirmed patients with CAP were included.

The main findings were 1) relatively young patients having pneumonia; 2) limitation of CURB-65; 3) presence of comorbidly in all patients; 4) high mortality rate as compared to other countries (<8%) for CAP in the hospital; and 5) overlapping clinical symptom (TB,PCP,CAP).

This study clearly showed us, the proportion of CAP admissions were significantly lower than other studies done in this country and other African countries (19, 20). This shows us many things. First, in this study only patients with imaging confirmed cases were involved. Second, chart retrieving and documentation in our hospital was unacceptably poor (21). Third, even if CAP is still the cause of inpatient mortality according to FMOH, Ethiopia, cases might be managed at primary health care unit (22). CURB-65 severity score, even though very easy to use in our setting, it identified only 28 % of those admitted patients. It was calculated and some data were missing for blood urea nitrogen and correctly identified in 16% for complete data. This is explained by the young population with mean age of 42 years and at least one comorbid condition in all patients was not part of calculation (23).

This indicates that CURB-65 has limitation in Africa patients and difficult to generalize in this part of the region where the population pyramids showed younger one and few cross more than 65 year. Even though, 45% of the patients have associated pleural effusion, the mean duration of IV antibiotics was only 8 days. Probably this may be a reason for readmission of some of the patients. Further studies are needed to establish the duration of antibiotic therapy for adults with complications of CAP and adults with prolonged time to achieving clinical stability (25).

The hospital mortality rate of 14% found in this study was high compared to the 11% obtained in a study done at the same hospital, Ethiopia, 23 years ago (27). This is explained by the presence severe & multiple comorbidities. Compared to the same study (27), the comorbidity was much higher in this study (100% vs 38%). Again, this is explained by better inpatient care in this study. Thus, comorbidities were risk for disease acquisition and bad outcome (25).

In this study, there was a significant number of overlaps of CAP with Pulmonary TB which was identified and 16% of them started on anti-TB and 4% developed Pneumocystic pneumonia (PCP). In this part of the world, there is over lap of common lung infections (CAP, TB and PCP) up to 10%. This figure is high, probably mode of the patients were patients with chronic disease and at high risk to develop TB. (24)

Microbiologic diagnosis especially sputum culture was very low and bacteremic CAP not found. Even if doing sputum culture for CAP patient is not cost effective (25), in our setting it is quite worthy in two ways. First, the need to have national antimicrobiome (drug sensitivity patterns of common microorganisms) to facilitate appropriate drug selection, Second 7.8 % of patients were found to be smear positive pulmonary TB indicating similar clinical and radiological findings. It is clear that blood cultures should be obtained before antibiotic administration in all patients with CAP who are ill enough to be hospitalized and likelihood of having bacteremia. The IDSA and ATS have also recommended blood cultures for patients who are admitted to an ICU and have a cavitary lesion, leukopenia, active alcohol abuse, asplenia, a positive pneumococcal urinary antigen, or a pleural effusion (27). Furthermore, because the cause of pneumonia is not always found, assessment of clinical response to initial therapy is important, and blood cultures should be obtained in patients not responding to antibiotic therapy (28, 229).

The duration of antibiotics use was also prolonged as compared to the nation & international standards for CAP inpatient management and the antibiotic stewardship should be strengthen to prevent emergency of drug resistance (25).

Limitation

This study focused only on patients treated at one national specialized hospital, the Tikur Anbessa Specialized hospital located at the capital city of the country. The setups of the study hospital and the clinical status of patients treated at the study hospital might be different from patients with the same health problem but who were treated at other hospitals of Ethiopia. Moreover, data were collected from purposively selected patients treated for CAP which may limit generalizability of the result to the general population. Thus, the outcomes of this study may be generalized with caution.

Conclusion

The study revealed that there were many caveats in management of admitted CAP patients. Hence, having this as baseline data performing prospective multicentric longitudinal studies is recommended. The study also needs to look the clinical care from patient's perspective to make it complete.

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Competing interest

The authors declare that this manuscript was approved by all authors in its form and that no competing interest exists.

REFERENCES

1. Feldma C, Brink AJ, Richards GA, Maartens G, Bateman ED. South African guideline for the manage ment of community acquired pneumonia in adults. South African Thoracic Society, Federation of Infec tious Diseases Societies of Southern Africa. 2017; 9(6): 1469-1502.
2. File TM Jr, Marrie TJ. Burden of community-acquired Pneumonia in North American adults. Postgradu ate Medicine. 2010; 122 (2): 130–141.
3. Isturiz RR, Luna CM, Ramirez J. Clinical and economic burden of pneumonia among adults in Latin America. International Journal of Infectious Diseases.2010; 14 (10): e852–e856.
4. Song, JH, Thamlikitkul V, Hsueh PR. Clinical and economic burden of community-acquired pneumonia amongst adults in the Asia-Pacific region. International Journal of Antimicrobial Agents. 211; 38 (2):108–117.
5. Welte T. Risk factors and severity scores in hospitalized patients with community-acquired pneumonia: prediction of severity and mortality. European Journal of Clinical Microbiology and Infectious Dis eases.2012; 31 (1): 33–47.
6. Welte T, Torres A, Nathwani D. Clinical and economic burden of community-acquired pneumonia among adults in Europe. Thorax. 2012; 67(1): 71–79.
7. Brown JS. Community-acquired pneumonia. Clinical Medicine. 2012; 12(6): 538–543.
8. Zar HJ, Madhi SA, Aston SJ, Gordon SB. Pneumonia in low and middle income countries: progress and challenges. Thorax. 2013 Nov;68(11):1052-6.
9. Principles of Medicine in Africa. Ed. by David Mabey, Geoffrey Gill, Eldryd Parry, Martin W Weber and Christopher JM Whitty. 4th ed. Cambridge: Cambridge University Press, 2013
10. Blasi FM, Mantero S, Achille P, Tarsia P. Understanding the burden of pneumococcal disease in adults. Clinical Microbiology and Infections. 2012; 18 (5): 7–14.
11. Feldman C, Anderson R. Cigarette smoking and mechanisms of susceptibility to infections of the respire tory tract and other organ systems. Journal of Infection.2003; 67(3):169– 184.
12. Herrero FS, Olivas JB. Microbiology and risk factors for community-acquired pneumonia. Seminars in Respiratory and Critical Care Medicine. 2012; 33(3): 220–231.
13. Madeddu G, Fiori ML, Mura MS. Bacterial community-acquired pneumonia in HIV-infected patients. Current Opinion in Pulmonary Medicine.2010; 16(3): 201–207.
14. Feldman C, Klugman KP, Yu VL et al. Bacteremic pneumococcal pneumonia: impact of HIV on clinical presentation and outcome. Journal of Infection.2007; 55 (2):125–135.
15. Feldman C, Anderson R. HIV-associated bacterial pneumonia. Clinics in Chest Medicine. 2013; 34 (2):205–216.
16. Martin-Loeches J, Sol´e-Viol´an F, Rodr´ıguez de Castro et al. Variants at the promoter of the interleukin -6 gene are associated with severity and outcome of pneumococcal communityacquired pneumonia. In tensive Care Medicine. 2012; 38 (2): 256–262.
17. Dahmer MK, O'Cain P, Patwari, P et al.,. The influence of genetic variation in surfactant protein B on severe lung injury in African American children. Critical Care Medicine.2011; 39 (5): 1138–1144.
18. Garc´ıa-Laorden MI, Rodr´ıguez de Castro F, Sol´e-Viol´anetal J. Influence of genetic variability at the surfactant proteins A and D in community-acquired pneumonia: a prospective, observational, genetic study. Critical Care.2011; 15(1): R57.
19. Haftu Berhe Gebru. Magnitude of community acquired pneumonia among hospital treated adults in Ti gray, Ethiopia: A Hospital Based Retrospective Study: Journal of Health, Medicine and Nursing, An In ternational Peer-reviewed Journal. 2016: 33.
20. Mandell LA, Wunderink RG, Anzueto A, et al. Infectious diseases society of America/American Thoracic Society consensus guidelines on the management of community acquired pneumonia in adults. Clin Infect Dis.2007; 44:S27–S72.

21. Bigelow B, Desalegn DN, Salomon JA, et al. modelling hospital operations: insight from using data from paper registries in the obstetrics ward at a hospital in Addis Ababa, Ethiopia. BMJ Glob Health. 2019; 4: e001281. doi:10.1136/ bmjgh-2018-001281
22. Federal Democratic Republic of Ethiopia, Ministry of Health. Communicable diseases part one. Addis Ababa: 2011
23. Pereira JM, Paiva JA, Rello J. Assessing severity of patients with community-acquired pneumonia. Semi nars in respiratory and critical care medicine. 2012; 33(3): 272–283.
24. Gersh JK, Feldman Z, Greenberger E, et al. Tuberculosis among individuals with community-acquired pneumonia presenting to emergency in Gaborone, Botswana. J Public Health Afr. 2018;9(1):803. Pub lished 2018 May 21. doi:10.4081/jphia.2018.803
25. Metlay JP, Waterer GW, Long AC, Anzueto A, Brozek J, Crothers K, Cooley LA, Dean NC, Fine MJ, Flanders SA, Griffin MR, Metersky ML, Musher DM, Restrepo MI, Whitney CG. Diagnosis and Treat ment of Adults with Community-acquired Pneumonia. An Official Clinical Practice Guideline of the American Thoracic Society and Infectious Diseases Society of America. Am J Respir Crit Care M e d . 2019 Oct 1;200(7):e45-e67.
26. Aderaye G. The etiology of community acquired pneumonia in Adults in Addis Ababa. West Africa Jour nal of Medicine. 1994 jul-sep; 13(3):142-5.
27. Mandell, Douglas. Bennett's principles and practice of infectious diseases, 9th ed. London: Elsevier; 2020.
28. Craven DE. Blood cultures for community-acquired pneumonia: piecing together a mosaic for doing less. Am J Respir Crit Care Med. 2004; 169:327–328.
29. Temesgen, D., Bereded, F., Derbie, A. et al. Bacteriology of community acquired pneumonia in adult pa tients at Felege Hiwot Referral Hospital, Northwest Ethiopia: a cross-sectional study. Antimicrob Resist Infect Control 8, 101 (2019).