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Research Article

Assessment of Treatment Outcomes and Associated Factors of Pneumonia among Hospitalized Pediatric Patients at Pediatric Ward in Jimma University Medical Center

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Abstract

Background: Pneumonia and other lower respiratory tract infections are the leading causes of death worldwide. Because pneumonia is common and is associated with significant morbidity and mortality, properly diagnosing pneumonia, correctly recognizing any complications or underlying conditions, and appropriately treating patients are important. Although in developed countries the diagnosis is usually made in the basis of radiographic findings, the World health organization (WHO) has defined pneumonia solely on the basis of clinical findings obtained by visual inspection and on timing of the respiratory rate.

Pneumonia may originate in the lung or may be a focal complication of a contagious or systemic inflammatory process. Abnormalities of airway patency as well as alveolar ventilation and perfusion occur frequently due to various mechanisms. These derangements often significantly alter gas exchange and cellular metabolism in many tissues and organs that determine survival and contribute to quality of life. Recognition, prevention and treatment of this problems are major factors in the care of children with pneumonia.

Objective: The general objective of the study is to assess the treatment outcomes and associated factors of pneumonia among hospitalized pediatric patients at JUMC.

Methods: A hospital based retrospective cross sectional study was conducted to assess treatment outcomes and associated factors of pneumonia among hospitalized pediatric patients at JUMC.

Result: A total of 112 charts were reviewed, male comprised 65 of the study population. Majority, 62 of them were in the age range of 1 month - <1 years old. Majority, 61, of the patient's weight were in the range of 6-10.9 kg.

Conclusion and Recommendation: the results of this study showed that high prevalence of Good treatment outcome in the study area. Patients who stayed >= 8 days were the significant predictors of poor treatment outcome in children with pneumonia.

Keywords: Pneumonia; Pediatrics; JUMC; Treatment Outcome

Introduction

Background

Pneumonia is an infection of the pulmonary parenchyma [1]. Pneumonia in children represents a common problem and is a leading cause of morbidity and mortality worldwide. Many pathogens cause pneumonia in children, including bacteria, viruses, parasites, and fungi [2]. The potential involvement of multiple drug resistant (MDR) pathogens has led to a revised classification system of pneumonia in which infection is categorized as either community-acquired pneumonia (CAP) or health care–associated pneumonia (HCAP), with subcategories of HCAP including hospital-acquired pneumonia (HAP) and ventilator-associated pneumonia (VAP) [3].

The term ―community-acquired pneumonia‖ (CAP) refers to a pneumonia in a previously healthy person who acquired the infection outside a hospital. CAP is one of the most common serious in-

fections in children, with an incidence of 34 to 40 cases per 1,000 children in Europe and North, Although death from CAP is rare in industrialized countries, lower respiratory tract infection is one of the leading causes of childhood mortality in developing countries [4]. In Ethiopia it is responsible for about 28% of all deaths in children aged less than 5 years, with an absolute number of more than 100,000 under five children dying from Pneumonias each year [5].

Determining the cause of pneumonia in a child is often difficult, but the patient's age can help narrow the list of likely etiologies. Group B streptococcus and gram-negative enteric bacteria are the most common pathogens in neonates (i.e., birth to 20 days) and are obtained via vertical transmission from the mother during birth. Anaerobic organisms may be acquired from chorioamnionitis. Pneumonia in infants aged three weeks to three months is most often bacterial; Streptococcus pneumonia is the most common pathogen. In infants older than four months and in preschool-aged children, viruses are the most frequent cause of CAP; respiratory syncytial virus (RSV) is the most common. Viral pneumonia occurs more often in the fall and winter than in the spring and summer. Bacterial infections can occur at any time of the year in preschool- and school aged children and in adolescents. S. pneumonia is the most common bacterial cause of CAP after the neonatal period. Less common bacterial etiologies include Haemophilus influenzae type B, Moraxella catarrhalis, and Staphylococcus aureus. Mycoplasma pneumonia and Chlamydiapneumonia frequently are associated with CAP in preschool-aged children and are common causes of CAP in older children and adolescents [6].

The strongest predictors of pneumonia in children are fever, cyanosis, and more than one of the following signs of respiratory distress: tachypnea, cough, nasal flaring, retractions, rales and decreased breath sounds [7]. When diagnosing community-acquired pneumonia, physicians should rely mainly on the patient's history and physical examination, supplemented by judicious use of chest radiographs and laboratory tests as needed. The child's age is important in making the diagnosis [8]. Childhood immunization has helped decrease the incidence of invasive *Haemophilus influenzae* type B infection, and the newly introduced heptavalent pneumococcal vaccine may do the same for *Streptococcus pneumoniae* infections [9].

The majority, over 90%, of basically healthy, western children with CAP clinically improves with disappearance of fever and reduction of breathing work within 48 hours after the onset of antibiotics [10]. The treatment of pneumonia is always empirical, as it is extremely rare that the causative organism is identified before antibiotics are selected. Empiric therapy should be based on knowing the most likely pathogen in each community, as the relative frequency varies from one region to another, but also the risk for resistant organisms [11]. Because it is difficult to distinguish between bacterial, viral, and mixed infections, most children with community acquired pneumonia are treated with antibiotics. Treatment decisions regarding selection of antibiotic should be based on the age of the child and epidemiologic factors and sometimes the results of chest radiography [12]. Antibiotic therapy for community-acquired pneumonia should always be selected with patient characteristics, place of acquisition, and severity of disease in mind. With concerns about antimicrobial overuse, health care costs, and bacterial resistance increasing, and the therapy should always follow confirmation of the diagnosis of pneumonia and should always be accompanied by a diligent effort to identify a causative agent. When a specific pathogen is identified, pathogen-specific therapy can be used [13].

Therefore, most international and national guidelines recommend Children's with fast breathing pneumonia with no chest in drawing or general danger sign should be treated with oral amoxicillin: at least 40 mg/kg/dose twice daily (80 mg/kg/day) for five days. In areas with low HIV prevalence, give amoxicillin for three days. Children with fast-breathing pneumonia who fail on first-line treatment with amoxicillin should have the option of referral to a facility where there is appropriate second-line treatment. Children aged 2–59 months with severe pneumonia should be treated with parenteral ampicillin (or penicillin) and gentamicin as a first-line treatment. Ampicillin: 50 mg/kg, or benzyl penicillin: 50.000 units per kg IM/IV every 6 hours for at least five days and Gentamicin: 7.5 mg/kg IM/IV once a day for at least five days. Ceftriaxone should be used as a second-line treatment in children with severe pneumonia having failed on the first-line treatment [14].

Statement of the problem

Pneumonia continues to be the biggest killer of under five children worldwide. Although the implementation of safe, effective and affordable interventions has reduced pneumonia mortality from 4 million in 1981 to just over one million in 2013 pneumonia still accounts for nearly one-fifth of childhood deaths worldwide [15].

In 2008 pneumonia occurred in approximately 156 million children (151 million in the developing world and 5 million in the de-

veloped world) [16]. It resulted in 1.6 million deaths or 28-34% of all deaths in those under five years of age of which 95% occur in the developing world [16,17]. Countries with the greatest burden of disease include: India (43 million), China (21 million) and Pakistan (10 million) [18]. (In the United States, community-acquired pneumonia affects 5.6 million people per year and ranks 6th among leading causes of death. In 2009, there were approximately 1.86 million emergency department encounters for pneumonia in the United States [19].

CAP continues to be an important public health problem worldwide with a mortality rate between 8% and 15%, and complications in 15% to 50% of hospitalized patients. CAP is leading cause of death among children in low income countries many of these deaths occur in the newborn period. CAP remains a common and serious illness, in spite of the availability of potent new antimicrobials and effective vaccines [20]. This global disease is typically curable in developed countries but often tragic in the developing countries. It has neither a united nation agency to highlight its importance nor funds nor any form of global networks to advocate for drugs, vaccines or care. Having a global burden of 5,000 childhood deaths every day, pneumonia is a continuous, tangible threat that should trigger similar responses- action and research on pneumonia are urgently required [21].

Few headlines report the impact of pneumonia has on children's lives yet the toll it exerts on them in developing countries is shocking or rather surprising. There are relatively low global resources dedicated to tackling this problem and the burden placed by pneumonia on families and health care systems in low resource countries, in turn, exacerbates inequalities. Overwhelmingly, children who are poor, hungry and living in remote areas are most likely to be visited by this forgotten killer [22].

The fourth Millennium Development Goal calls for reducing child mortality by two-thirds between 1990 and 2015, but about 29,000 children under-five die worldwide every day, mainly from preventable or treatable conditions causes such as acute respiratory infection primarily pneumonia, neonatal problems, malaria, diarrhea and malnutrition as underlying causes, In 2007, 9.2 million children died before age five globally. Africa and Asia together accounted for 92 percent of these deaths. Sub-Saharan Africa had an average under-five mortality rate of 172 deaths per 1,000 live births. Ethiopia ranks 27th in under-five mortality with 119 deaths per 1,000 live births. Almost one in every ten babies born in Ethiopia does not survive to celebrate the first birthday [23]. An inadequate response to initial empirical treatment of CAP represents a challenge for clinicians and requires early identification and intervention. The incidence of treatment failure (TF) in CAP is 10 to 15%, and the mortality is increased nearly fivefold. Resistant and unusual microorganisms and noninfectious causes are responsible for treatment failure. Risk factors are related to the initial severity of the disease, the presence of co morbidity, the microorganism involved, and the antimicrobial treatment implemented [20].

In developing countries, low socio-economic status, malnutrition, low birth weight, non-exclusive breastfeeding, indoor air pollution, crowding, parental smoking, zinc deficiency, mother's experience as a caregiver, mother's age, lack of education in the mother, humid conditions, high altitude, vitamin A deficiency, birth order and outdoor air pollution were found as possible risk factors associated with pneumonia among children [24]. Pneumonia is very extensive and a life-threatening event among children in developing countries like Ethiopia [25]. These neonatal diseases are major causes of death for 85% of African and 90% of Ethiopian children [26]. In Ethiopia, there are studies showing causes of mortality among children. However, little is known about the prevalence and determinants of each cause of mortality identifying its prevalence in under-five children and the associated factors is crucial to achieve MDG4 in developing countries [23,26]. Therefore, this study is aimed to fill the existing practical gaps by assessing treatment outcome of pneumonia among pediatric patient hospitalized in Jimma University Medical center (JUMC).

Significance of the study

The result of this study is believed to be useful to fill the existing information gap related to treatment outcomes of pneumonia among pediatrics, particularly in the study area and it will give a clue for the preparation of antibiotic use guidelines and as such helps policy makers on areas of infectious diseases. Moreover, the identification of the factors of poor treatment outcome helps policy makers to develop appropriate intervention strategies to tackle such problems, and also the finding of this study can be used as an input for further researches.

Literature Review

Pneumonia accounts for nearly four million deaths in children worldwide each year [27]. Globally, it is estimated that 11 - 20 mil-

lion of the 146 million/annual childhood episodes of community-acquired pneumonia (CAP) require hospitalization [28]. Over 90% of the estimated 1.8 million annual deaths due to acute respiratory infections in children less than 5 years of age occur in developing countries [29].

Multicenter, retrospective study conducted in US showed that there were 257 episodes of pneumococcal pneumonia that occurred in 254 patients. Of the 257 isolates, 22 (9%) were intermediate and 14 (6%) were resistant to penicillin; 7 (3%) were intermediate to ceftriaxone and 5 (2%) were resistant to ceftriaxone. There were no differences noted in the clinical presentation of the patients with susceptible versus non susceptible isolates. Twenty-nine percent of the patients had a pleural effusion. The 189 (74%) hospitalized patients were more likely to have an underlying illness, multiple lung lobe involvement, and the presence of a pleural effusion than non-hospitalized patients. Eighty percent of the patients treated as outpatients and 48% of the inpatients received a parenteral second or third generation cephalosporin followed by a course of an oral antimicrobial agent. Two hundred forty-eight of the patients (97.6%) had a good response to therapy. Six patients died; however, only 1 of the deaths was related to the pneumococcal infection [30].

Study done in New Delhi, India, Department of Pediatrics, Of 200 children enrolled in the study, 113 (56.5%) needed a change in antibiotics,102 (51%) stayed for more than 5 days in the hospital, 41 (20.5%) needed mechanical ventilation and 21 (10.5%) died. The predictors were lack of exclusive breastfeeding (EBF), overcrowding and an abnormal chest x-ray were associated with the need for change of antibiotics. Lack of exclusive breastfeeding, overcrowding and an abnormal chest x-ray were identified as determinants for prolonged hospital stay. Head nodding, altered sensorium, abnormal leukocyte counts and pallor were associated with mortality. Head nodding and cyanosis were the determining factors for mechanical Ventilation had been reported [31].

Study done in Pediatric Ward of Masih Daneshvari Hospital, Tehran-Iran one the total number of patients hospitalized in the pediatric ward between the years 2000-2005 was 1821 cases; out of those 182 children were diagnosed as having pneumonia (10%). 48.4% were males and 51.6% were females. The mean age was 4.7 yrs. Of these children, 7.2% (13 cases) were younger than 6 months, 30% (55 cases) were between 6 months to 2 years, 29.2% (53 cases) were between 2-5 years and the remaining 33.5% were older than 5 years of age.

During the hospitalization 93.6% of the patients had been treated with ceftriaxone and erythromycin, 4.1% were treated with cotrimoxazole and erythromycin and 2.2% were treated with ampicillin and gentamycin. Mean duration of hospital stay was 6.8 ± 4.56 days and no mortality had been reported [32].

Research done at university hospital in Rabat, Morocco, Of the 689 children included in this analysis, 55 (8.0%) required intensive care and 28 died (4.0%). Five hundred and two (72.8%) children were classified as having a good prognosis and 187 (27.2%) as having a poor prognosis. A history of prematurity of fever, living in a house with smokers, impaired consciousness, cyanosis, pallor, having rhonchi on auscultation, and human metapneumovirus infection were all independent risk factors for an adverse outcome, whereas a history of asthma was the only independent risk factor for a positive outcome, amongst children with a poorer outcome, hospitalizations were significantly more prolonged in this group (9.96 days vs. 4.31 days, $p = 0.001$) [33].

Research done in referral hospital of northern Tanzania the prevalence of pneumonia was 67%. The most common signs and symptoms presented when admitted was Fast breathing 100%, History of cough 95%, Difficulties in breathing 77.1%, Chest-wall in drawing 42.9% Nasal flaring 21.4%, Feeding problems 15.7%, History of convulsion 4.3% and Cyanosis %. Seventy-five (53.6%) were boys and 65 (46.4%) girls. The mean age in months was 35, median 21. Forty-four (31.4%) of the admissions were relapsing infections. In one case the infection was hospital-acquired. Treatment with antibiotics was given in 137 (97.9%) cases. The most co morbidities were asthma, malnutrition, malaria and anemia. The commonest regime was the combination of ampicillin and gentamycin, followed by single treatment of ampicillin and ceftriaxone respectively. A second line treatment with antibiotics was given in 39 (27.8%) cases; single treatment with parenteral ceftriaxone was most common, followed by parenteral cloxacillin. Six (4.3%) patients were treated with oral antibiotics Amoxicillin. The commonest primary diagnosis in the study was severe pneumonia, followed by non-severe pneumonia. Five of these cases were defined as non-severe pneumonia, one as severe pneumonia. Eleven (8%) patients were shifted from parenteral to oral antibiotics during ad-

mission and in 74 (53%) cases home treatment with oral antibiotics was prescribed after discharge; single treatment with amoxicillin was most common [34].

Study conducted on 222 hospitalized pediatric patients in Pediatrics ward of Nekemte Referral Hospital shows that Ceftriaxone was prescribed as a primary antibiotic and then changed to cotrimoxazole and cephalexin in 6 and 10 children, respectively. Ceftriaxone was stopped and replaced by other agents as a result of lack of improvement in 9 patients, due to allergy in 5 patients, switched to oral agents in 42 patients and other reasons such as new diagnosis in 12 patients. Out of 57 children who were prescribed only crystalline penicillin as a first line antibiotic: 42 had severe pneumonia, 5 had pneumonia, and 4 had pneumonia with a co-morbid disease. Among 57 patients, 42 had treatment initiated by crystalline penicillin and was then switched to another antibiotic. From 202 patients who had received parenteral antibiotics, 96 (47.5%) were administered it for more than 72 hours [35].

Few studies are available to inform duration of intravenous antibiotics for children and when it is safe and appropriate to switch to oral antibiotics. Shorter antibiotic courses can potentially affect antimicrobial resistances. Systematically reviewed antibiotic duration and timing of intravenous to oral switch for 36 pediatric infectious diseases and developed recommendations for antibiotic duration and intravenous to oral switch. The minimum intravenous and total antibiotic duration required to achieve outcomes similar to or better than those with traditional longer durations were identified. The minimum intravenous antibiotic duration was zero days, for severe or complicated CAP initial intravenous treatment was recommended based on expert opinion. The criterion for switch to oral antibiotic was clinical improvement. The minimum total antibiotic duration was 3 days for mild CAP and fewer than or equal to 7 days for moderate or severe uncomplicated CAP. Oral antibiotics were deemed acceptable for most children requiring hospital admission [36].

A community based cross sectional study done in Gondor North West Ethiopia Among 286 children included in the study, 59 (20.6%) had cough at the time of interview or within the last two weeks. Among these children, 41 (14.33%) had only history of fast breathing, 3 had both general danger sign and fast breathing and only one child had convulsion with no fast breathing which is one of the general danger signs. Therefore, the prevalence of pneumonia among under-five children at the time of survey or within the last two weeks was 16.1%. Of all the under-five children included in the survey, 148 (51.7%) were male and 138 (48.3%) were females More than one fourth of children (26.9%) were between the age groups of 24-35 months [23,38].

Objective

General objective

To assess Treatment Outcome of pneumonia among pediatric patients hospitalized in Jimma University Medical center.

Specific objectives

- To assess the prevalence of Good Treatment Outcome of pneumonia among pediatric patients hospitalized in JUMC
- To assess the prevalence of Poor Treatment Outcome of pneumonia among pediatric patients hospitalized in JUMC
- To identify factor affecting treatment outcome among pediatric patients hospitalized in JUMC.

Methodology

Study area and study period

A retrospective cross sectional study was conducted in pediatrics ward of JUMC from March14 to March 22, 2019. JUMC is a teaching and referral hospital located in Jimma town, Oromia region, south west Ethiopia, which is 346 km away from Addis Ababa. Currently it became the referral hospital in the southwestern part of the country.

Study design

A Hospital based retrospective cross sectional study design was conducted by reviewing patient record card in JUMC Pediatrics ward to assess treatment outcome of pneumonia.

Population

Source population

All pediatric patients medical record card which contains admission and discharge information from patient cards with clinical diagnosis of pneumonia at Jimma University Medical Center from November 2017 to December 2018.

Study Population

All pediatric patients' medical record data with clinical diagnosis of pneumonia at Jimma University Medical Center from November 2017 to December 2018.

Sample size and sampling technique

The sample size was determined by using single population proportion formula taking the assumption of 5% margin of error, 95% confidence interval and 16.1% prevalence of pneumonia among pediatrics.

$$N = \frac{(Za/2)^2 pq}{d^2}$$

Where

N = The required sample size

z= 1.96, standard score corresponding to 95% CI

P = 16.1% Estimate of the prevalence of pneumonia

q= 1-p

d= The margin of error tolerable, i.e. 5%.

Since the total number of patient's cards in pediatrics ward of JUMC who admitted with the diagnosis of pneumonia and complete the treatment from November 2017 to December 2018 (one year retrospective cross sectional study) was 203 which is <10,000.

$$= \frac{(1.96)^2 * 0.16 * 0.84}{(0.05)^2}$$

=207

$$nf = \frac{n}{1+\frac{n}{N}}$$

$$= \frac{207}{1+\frac{207}{203}}$$

= 102

Where,

nf= Final sample size

N = Total study population which is 207

N = Source population which is 203.

By Adding 10% of non-respondent rate, the final (actual) sample size was 112 and the systematic random sampling technique was used for data collection.

Inclusion and exclusion criteria

Inclusion criteria

All patients with age <= 14 years old admitted and treated with pneumonia in pediatrics ward of JUMC during the study period.

Exclusion criteria

- Uncertainty in diagnosis of pneumonia
- Patient with incomplete medical records
- Referred to other facility.

Study variables

Dependent variables

Treatment outcomes

- Good treatment outcome
- Poor treatment outcome.

Independent variables

- Socio-demographic characteristics
- Past history of exposure to pneumonia/LRTIs
- Duration of treatment (Hospital stay)
- Antibiotics administered
- Co morbid illness/infection
- Severity of pneumonia.

Data collection

Instruments: The Data extraction format was developed to extract any relevant information from patient chart about patient Socio–demographic characteristics, Patient's Medical Conditions Management Approach of pneumonia, Diagnostic method (s) used for identification of the disease, Pertinent lab findings, Co-morbidities, Medications administered, Complication of the disease, Patient's discharge information (Treatment outcome) and Duration of hospital stay. Data extraction format containing necessary information to assess treatment outcome of pneumonia. Data was collected from patient chart of Jimma University Medical Center using pre-structured data collection format, first sources of data was identified from logbook.

Data collectors: The data was collected by graduating pharmacy student. The collected data will be checked every day by the principal investigator for its completeness, eligibility, and appropriateness.

Data quality control: The collected data was checked for its completeness, accuracy, and clarity at the moment of data collection and every day by principal investigator.

Data processing and analysis: Data was entered to SPSS version 21 software package for data analysis. Frequency table, graphs and charts was used to present the finding.

Ethical consideration: An official latter stating the purpose of the study was written by school of pharmacy and presented to the responsible authorities of Jimma university medical center to get permission and sent to Pediatrics Department head office of

JUMC to conduct the study. Confidentiality of the information was assured or kept at all stages because the name of the individual is not included in this study.

Dissemination of result: The finding of this study will be disseminated to the Institute of health science (JU), school of pharmacy and CBE office.

Operational definition

- Treatment Outcome - result obtained after the use of a drug it may be cure, death, and complication.
- Pediatric-younger than 14 years of age.
- Good Treatment Outcome - a good prognosis as need for admission to the ICU, and a discharge from hospital on the grounds of clinical improvement.
- Poor Treatment Outcome - poor prognosis was defined as the occurrence of a death and complication outcome, or an ICU admission
- Respiratory rate - the number of respirations in one full minute (also called breathing rate)
- Pneumonia - child having cough with fast breathing
- Co morbidity-diseases associated with another disease, pneumonia in this case.

Results

Socio demographic characteristics

A total of 112 charts were reviewed, male comprised 65 of the study population. Majority, 62 of them were in the age range of 1 month - <1 years old. Majority, 61, of the patients' weight were in the range of 6 - 10.9 kg (Table 1).

Variables		
Sex	**Frequency**	**Percentage (%)**
Male	65	58
Female	47	42
Total	112	100
Age category (years)	**Frequency**	**Percentage (%)**
< 1month	4	3.6
1 month - < 1 year	62	55.4
1 year - < 3 year	21	18.8
3 year - < 6 year	9	8
>= 6 year	16	14.3
Total	112	100
Weight category (kg)	**Frequency**	**Percentage (%)**
1 - 5.9 kg	18	16.1
6 - 10.9 kg	61	54.5
11 - 15.9 kg	20	17.9
>= 16 kg	13	11.6
Total	112	100

Table 1: Socio demographic characteristics of the children admitted to Jimma University Medical Center of pediatric ward from November 2017_December 2018 (N = 112).

Disease related characteristics

Most, 73 (65.2%) of patients were diagnosed with CAP, followed by HAP and Aspiration pneumonia (24 (21.4%) and (15) 13.4% respectively) (Figure 1).

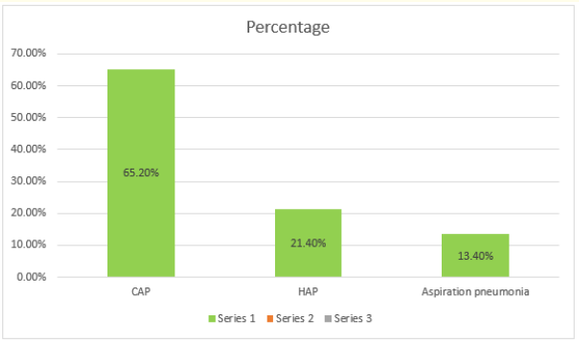

Figure 1: Types of pneumonia among children admitted to Jimma University Medical Center of pediatrics ward from November 2017- December 2018 (N = 112).

Majority (79.5%) of patients had a severe pneumonia and the rest had a non- severe and very severe (18.8% and 1.8% respectively) (Figure 2).

Variables		
History of past exposure to LRTI	**Frequency**	**Percentage (%)**
Yes	57	50.9
No	55	49.1
Total	112	100
Types of LRTI	**Frequency**	**Percentage (%)**
Pneumonia	40	70.18
Bronchitis/bronchiolitis	17	29.82
Total	57	100

Table 2: Past history of exposure to pneumonia at Jimma University Medical Center of pediatrics ward from November 2017-December 2018 (N = 112).

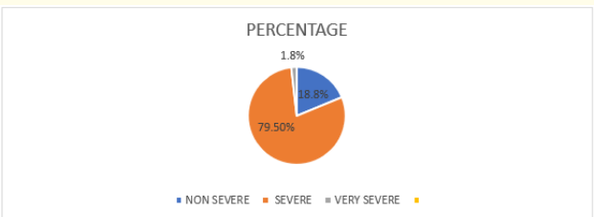

Figure 2: Severity of pneumonia of the children admitted to Jimma University Medical Center of pediatrics ward from November 2017-December 2018 (N = 112).

The two most recorded clinical features were cough with fast breathing and fever 43 (38.4%) and 50 (44.6%) respectively. On

the other hand, lower chest in dwelling and nasal flaring was present in 37 cases, wheezing 14 (12.5%) and vomiting was reported in 8 (7.1%) of cases (Table 3).

Variables		
Constitutional symptom(s)	**Frequency**	**Percentage (%)**
Fever	50	44.6
Vomiting	8	7.1
Fever and vomiting	17	15.2
Fever and diarrhea	14	12.5
Fever, diarrhea and vomiting	15	13.4
Loss of appetite	8	7.1
Total	112	100
Respiratory symptom(s)	**Frequency**	**Percentage (%)**
Cough	16	14.3
Fast breathing	7	6.3
Grunting, cough and fast breathing	13	11.6
Cough and dyspnea	11	9.8
Cough and fast breathing	43	38.4
Cough, fast breathing and dyspnea	8	7.1
Wheezing	14	12.5
Total	112	100
Physical sign(S)	**Frequency**	**Percentage (%)**
central cyanosis	11	9.8
lower chest wall indwelling	43	38.4
nasal flaring	21	18.8
lower chest wall indwelling and nasal flaring	37	33
Total	112	100

Table 3: Sign(s) and Symptom(s) of the children admitted to Jimma University Medical Center of pediatrics ward from November 2017-December 2018 (N = 112).

From all pediatrics admitted with pneumonia 49 (43.8%) were diagnosed based on complete blood count (CBC). While 33 (29.5%) were confirmed together with chest radiography (Figure 3).

Variables		
Co-morbidities	**Frequency**	**Percentage (%)**
Yes	80	71.4
No	32	28.6
Total	112	100.0
Type of co-morbidities	**Frequency**	**Percentage (%)**
Anemia	7	8.75
Malnutrition	10	12.5
bronchial asthma	24	30
AGE	9	11.25
AGE + bronchial asthma	6	7.5
Others*(specify)	24	30
Total	80	100

Table 4: Co-morbidity in the children treated for pneumonia at Jimma University Medical Center of pediatrics ward from November 2017- December 2018 (N = 112).

*HIV, Meningitis, CHF, Disseminated TB, HAAD, HTN, foreign body aspiration, oral thrush, bacterial conjunctivitis, rickets.

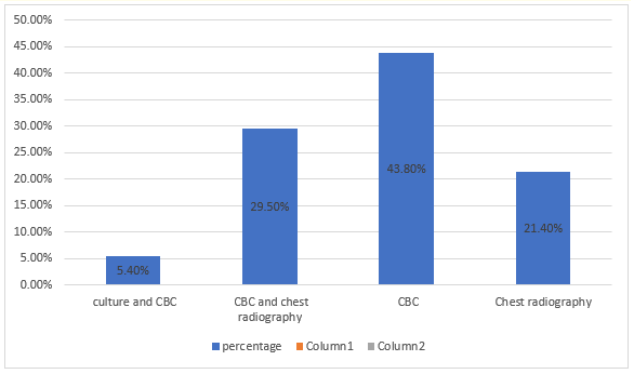

Figure 3: Diagnostic method used for identification of the disease of the children admitted to Jimma University Medical Center of pediatrics ward from November 2017- December 2018 (N = 112).

Medication related characteristics

(Table 5)

From the total of children treated with pneumonia, 78 (69.6%) of the patient were discharged with oral medication. Cephalexin and amoxicillin account 48 (61.5%) and 18 (23.1%) respectively.

Variables	Frequency	Percentage (%)
Antibiotics administered		
crystalline penicillin	7	6.3
Ampicillin + gentamycin	14	12.5
Ceftriaxone	63	56.3
Ceftriaxone + azithromycin	9	8
Ceftriaxone + metronidazole	7	6.3
Others (specify)	12	10.7
Total	112	100
Co-medication	**Frequency**	**Percentage (%)**
Yes	77	68.75
No	35	31.25
Total	112	100
Types of co-medication	**Frequency**	**Percentage (%)**
PCM	23	29.9
salbutamol puff	11	14.3
Hydrocortisone +salbutamol	7	9
ORS and zinc	8	10.4
Pcm + salbutamol	6	7.8
ORS and zinc with salbutamol	6	7.8
Others*	16	20.8
Total	77	100

Table 5: Patterns of medication usage among children treated for pneumonia at Jimma University Medical Center of Pediatrics ward from November 2017- December 2018 (N = 112)

*HAART, anti TB, ceftriaxone + gentamycin, CAF, miconazole, vancomycin, erofas, feso4, calvitalin syrup, prednisolone, diazepam, phenobarbitone, phenytoin, formula milk, plump nut, vitamin D.

Variables		
Patient discharge medication	**Frequency**	**Percentage (%)**
Yes	78	69.6
No	34	30.4
Total	112	100
Type of patient discharge medication	**Frequency**	**Percentage (%)**
Amoxicillin syrup	18	23.1
Cephalexin syrup	48	61.5
Azithromycin syrup	7	9
Others*(specify)	5	6.4
Total	78	100

Table 6: Patient discharge medication for children treated for pneumonia at Jimma University Medical Center of pediatrics ward from November 2017- December 2018 (N = 112).

Others* metronidazole syrup, cotrimoxazole syrup, metronidazole capsules.

Patient discharge information	Frequency	Percentage (%)
Improved	102	91.1
discharged with no improvement	10	8.9
Total	112	100

Table 7: Patient discharge information (treatment outcome) of children treated for pneumonia at Jimma University Medical Center of pediatrics ward from November 2017- December 2018 (N = 112).

Duration of hospital stay	Frequency	Percentage (%)
<= 3 days	55	49.1
4 - 5 days	31	27.7
6 - 7 days	15	13.4
>= 8 days	11	9.8
Total	112	100

Table 8: Duration of hospital stay children aged <=14 years old treated for pneumonia at Jimma University Medical Center of pediatrics ward from November 2017 - December 2018 (N = 112).

Treatment outcome

From the total of 112 pneumonia cases, the majority, 102 (91.1%) were found to have good treatment outcome, whereas 10 (8.9%) had poor treatment outcome.

Factors associated with treatment outcome

Binary logistic regression analysis was performed to identify factors associated with treatment outcome. On the univariate analysis, the association between independent and dependent variables was identified by cross tab. From the cross tab, factors that have P-value <0.05 has significant association on dependent variable. Four factors were found to be candidate for multiple logistic regression (those factors having P-value <0.25). These include; Antibiotics administration (P = 0.071), Duration of hospital stay (P = 0.04), presence of past history of exposure to pneumonia/LRTI (P = 0.054) and Severity of pneumonia (P = 0.10) (Table 9).

Discussion

This study showed that the proportion of good treatment outcome in pediatrics diagnosed with pneumonia were 91.1%. Both good treatment outcome and poor treatment outcome were within the minimum standard set of the WHO guideline for the management of severe pneumonia. This finding is higher than the studies done in Rabat, Morocco where 72.8% of study participants had good prognosis [33]. But, the result is almost similar with the studies conducted in US in which97.6% of study participants had

good treatment outcome [30]. Likewise the poor treatment outcome was much higher in this study as compared to findings from Tehran-Iran in which no mortality has been reported. In present study 8.9% were poor treatment outcome. This may be due to the presence of high proportion of co-morbidities, like anemia, malnutrition, bronchial asthma and AGE.

Variables		Treatment outcome		COR (95%CI)	AOR (95%CI)	p-value
		Good	Poor			
Antibiotic (s) administered	Crystalline penicillin	6	1	1.833 (0.096-34.849)	0.519 (0.019-13.964)	0.687
	Ampicillin+gentamycin	12	2	1.833 (0.145-23.154)	0.006 (0.037-9.792)	0.639
	Ceftriaxone	61	2	0.361 (0.030-4.388)	1.751 (0.117-26.152)	0.421
	Ceftriaxone+azithromycin	6	3	5.500 (0.464-65.162)	0.219 (0.012-4.009)	0.177
	Ceftriaxone+metronidazole	6	1	1.833 (0.096-34.849)	0.679 (0.027-17.255)	0.687
	Others (specify)	11	1	1	1	
Duration of hospital stay	<= 3 days	53	2	1	1	
	4 - 5 days	30	1	.101 (0.014,0.698)	2.763 (0.249-30.695)	.020
	6 - 7 days	11	4	.089 (0.008,0.974)	5.461 (0.327-91.177)	.048
	>= 8 days	8	3	.970 (0.168,5.593)	0.374 (0.037-3.767)	.973
Past history of exposure to pneumonia/LRTI	Yes	49	8	4.327 (0.876,21.374)	0.368 (0.005-2.461)	0.072
	No	53	2	1	1	
Severity of pneumonia	Non-severe	20	1	1	1	
	Severe	81	8	0.05 (0.002-1.533)	5.187 (0.052-520.406)	0.086
	Very severe	1	1	0.099 (0.006-1.734	3.215 (0.074-139.032)	0.113

Table 9: Univariate and multivariable logistic regression showing factors associated with treatment outcomes of children treated for pneumonia at Jimma University Medical Center of pediatrics ward from November 2017- December 2018 (N = 112).

In current study evaluation, it was found that ceftriaxone alone was prescribed for 63 (56.3%) of the patients. This finding is in consistent with the studies done in Nekemte Referral Hospital in which Ceftriaxone was the most frequently used antibiotic which account in 112 (50.5%) of cases [35]. on the other hand, lower number 9 (4.3%) of patients was treated with ceftriaxone + Azithromycin, which is listed for resistance pathogen in the treatment of pneumonia in Ethiopian national treatment guideline.

This study found a shorter mean duration of illness (1.84 days), as Compared to similar findings, hospitalized children in New Delhi, India (6.8 days) [31]. But studies done in Rabat Morocco reported hospitalizations were significantly more prolonged in poor treatment outcomes (9.96 days), p = 0.001 [33]. Hospitalization was significant predictor of poor treatment outcome. As the hospital stay of the patient becomes 4 - 5 and 6 - 7 days, the odds of being poor treatment outcome was decreased by about 89.9% and 91.1% respectively. This is because of overcrowding. The more patient stayed at hospital the higher risk for developing hospital acquired infection, complications like persistent effusions and emphysemas are the most common serious complications of bacterial pneumonia, Pulmonary abscess, Respiratory distress Sepsis (bacteremia may occur in 10-30% cases of pneumonia; sepsis in < 10% cases especially in SAM) those reasons might be a tendency for a longer duration of hospital stay. This result was consistent with study in New Delhi, India and US [31,34].

Limitation of the Study

Difficult to identify specific cause of pneumonia for proper selection of antibiotics from the information source.

The data were collected retrospectively: As a result does not show a strong causal effect between the variables of interest.

Shortage of time was a major limitation in the efforts to make this study possible.

Poor patient data documentation and record keeping might have also contributed to underestimation of some factors.

Conclusion

The study showed that most of the study participants had good treatment outcome. There was a statistically significant association between duration of >=8days stay in Hospital and treatment outcome of pneumonia. Majority of the study subjects had good treatment outcome with ceftriaxone followed by ampicillin plus gentamycin. Good treatment outcome was higher in the absence of past exposure to pneumonia/LRTIs when compared with the presence of past history of exposure to pneumonia/LRTIs.

Recommendation

- Relationship between physicians and pharmacists should be encouraged in order to patients get a better chance of early receiving and appropriate treatment for pneumonia which in turn leads to reduced complications, ADRs, Hospitalization, and health resource use.
- Especial attention from the Hospital, zone Health office and other organizations who are working on pneumonia prevention should be given for early recognition and immunization to reduce child mortality rate.

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