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ORIGINAL ARTICLE

Epidemiology and Clinical Characteristics of Community Acquired Pneumonia in childhood at Zagazig University Hospitals

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ABSTRACT:

Background: Childhood pneumonia continues to be a leading cause of morbidity and mortality in developing countries. In Egypt, pneumonia is prevalent and represents a socioeconomic burden on patients and their families due to recurrent absences from school and hospital stays. This study aimed to assess the clinical characteristics and epidemiology of pneumonia among children admitted in pediatric department, Zagazig university hospitals. **Patients and methods:** This cross-section study was carried out at pulmonology unit, Pediatric Department, on 159 children with pneumonia aged between 2 and less than 15 years. Treatment was tailored based on clinical presentation, special emphasis on the duration and severity of pneumonia and treatment given. The respiratory distress severity was assessed using a clinical Canadian emergency department triage. Chest x-ray on admission and before discharge, CT if needed , Laboratory investigations, D-dimer and Blood culture. **Results:** that pneumonia was most prevalent among preschool aged males from urban areas. Moderate pneumonia was most common, with the majority having right lung involvement. All patients presented with fever, tachypnea, dyspnea and cough, while additional symptoms like chest pain and oxygen desaturation below 92% were more associated with pleural effusion. Outcome, 90.6% of patients improved and discharged for follow up in our clinic while 9.4% of them cases needed ICU admission. **Conclusion:** Cultures most commonly yielded no growth, although Staph aureus from pleural fluid and Klebsiella form sputum were notable his attributed to high prevalence of viral causes of pneumonia among studied patients and confirms the importance of Staph aureus and Klebsiella.

Keywords: Epidemiology , Pneumonia, Children

INTRODUCTION

Pneumonia is an acute inflammation of the lung parenchyma. Based on the site of acquisition, it can be categorized as either hospital- or community-acquired pneumonia (CAP); on the basis of the agents or mechanisms involved, it can be classified as ventilator-associated, bacterial, viral, or fungal pneumonia and on the basis of the structure of the lungs involved, it can be classified as lobar, bronchial, or acute interstitial pneumonia **[1].**

Pneumonia and other lower respiratory tract infections account for the fourth most prevalent cause of death globally behind only, ischemic heart disease, strokes, and chronic obstructive pulmonary disease (COPD), according to the 2010 Global Burden of Disease Study **[2]**.

Numerous studies have been carried out worldwide to determine the risk factors associated with pneumonia. Low birth weight, hunger, indoor air pollution, parental smoking, a lack of vaccination, and overcrowding are still non-conclusive contributing factors **[3].**

There are more than 100 known microbiologic causes of CAP. Streptococcus pneumonia, Mycoplasma pneumonia, Chlamydia pneumonia,

Haemophilus influenza, and influenza viruses are the five most prevalent microorganisms **[4]**.

The prevalence of "true" pneumonia in children can be wildly overestimated or understated, depending on the sensitivity and specificity of the selected case definition. The World Health Organisation defines the symptoms and signs of childhood pneumonia as cough or trouble breathing and a high respiratory rate, determined according to the child's age **[5].**

Pneumonia ranks among the leading causes of death for children under five worldwide. Around 700,000 global deaths in children under the age of five from pneumonia in 2015 occurred despite overall improvements in living circumstances, better nutrition, and more effective vaccinations **[6].**

Moreover, outside of the neonatal period, pneumonia remains the most common cause of illness for young children, especially in low- and middle-income countries **[7].**

According to a 2010 World Health Organisation survey, the leading cause of disease burden across all age groups, accounting for 94.5 million disability-adjusted life years, was lower respiratory tract infections, primarily community-acquired pneumonia, which caused 429.2 million episodes of illness worldwide **[8].**

The aim of this study was to assess the clinical characteristics and epidemiology of pneumonia in children aged between 2 and less than 15 years in Zagazig university children's hospitals.

PATIENTS AND METHODS

This cross-section study was conducted in the Pediatrics Department, Faculty of Medicine, at Zagazig University Hospital for 159 children with pneumonia aged between 2 and less than 15 years who admitted to the pulmonology unit, pediatrics department at Zagazig university Children hospitals, during the period from January 2023 to August 2023. All the children's parents or guardians provided written informed consent, and the research ethics committee of Zagazig University's Faculty of Medicine (International Review Board) authorized the study ZU-IRB#10358/25-1-2023. The work was completed in compliance with the Declaration of Helsinki, the world medical association's code of ethics for human subjects' research.

The inclusion criteria were children of both sexes aged from 2 to less than 15 years old admitted to pulmonology unit, pediatric department, Zagazig university children hospital and presented with symptoms and signs of pneumonia according to world health organization criteria. Excluded criteria were children under 2 years and above 15 years, children with immune deficient diseases and children with other chronic chest diseases e.g. cystic fibrosis.

All participants were subjected to complete history taking, Special emphasis on the duration and severity of pneumonia and treatment given and careful clinical examination. The respiratory distress severity was assessed using a clinical Canadian emergency department triage and acuity scale (CTAS) level of respiratory distress severity scoring described by **Murray et al [9].**

Level of distress	Description of patient	O_2 saturation	PEFR predicted	CTAS level
Severe	Fatiguing from excessive work of breathing, cyanosis, single-word speech, unable to speak, upper airway obstruction, lethargic or confused	<90%	—	I
Moderate	Increased work of breathing, speaking phrases or clipped sentences, significant or worsening stridor but airway protected	<92%	<40% predicted	II
Mild / moderate	Dyspnea, tachypnea, shortness of breath on exertion, no obvious increased work of breathing, able to speak in sentences, stridor without any obvious airway obstruction	92% to 94%	40% to 60% predicted	III

PEFR = peak expiratory flow rate.

Radiological investigations included Chest x-ray on admission and before discharge, CT if needed. Laboratory investigations included Complete Blood Count (CBC), C-reactive protein (CRP), and Pro

calcitonin, Erythrocyte sedimentation rate (ESR), D-dimer and Blood culture.

Culture of lower respiratory tract specimen sputum and pleural effusion; the specimens were inoculated on solid media including blood, Mac Conkey agar plates (incubated aerobically) and chocolate agar plate at 5% CO_2 atmosphere. To ensure good quality of respiratory specimens: direct gram stained smear of sputum and semiquantitative culture of BAL using 10 ul calibrated loop presence of ≥25 PMN (polymorphonuclear leukocytes) and ≤10 squamous epithelial cells/LPF in direct gram stained sputum specimens and ≥ 104 Colony Forming Unit (CFU)/ml indicated good quality lower respiratory tract secretions.

Blood culture:

I-5ml venous blood were inoculated into pediatric aerobic (BacT/Alert PF plus) bottles were incubated in the BACT/ALERT 3D ® instrument (bioMérieux) up to 5 days, or until they flagged as positive. All bottle types are charcoal free. Gam stain was performed directly from aliquots of positive blood cultures. Then according to morphology of organisms, blood culture media were subcultured on solid media including blood, Mac Conkey agar plates (incubated aerobically) and chocolate agar plate (at 5% CO_2 atmosphere). Whenever easts are detected by Gram stain, the sample was additionally subcultured on Sabouraud media, which was incubated at 37 °C for 48 hours.

Identification and antibiotic susceptibility:

Colonies were Gram stained. According to microorganisms' microscopic appearance the appropriate Vitek 2 identification cards (GP/GN/Yeast) and Vitek 2 AST cards (GP67/GN204) were used on Vitek 2 compact (bioMérieux) system.

STATISTICAL ANALYSIS:

Version 26 of the SPSS (Statistical Package for the Social Sciences) program was used to analyze the data. Absolute frequencies were utilized to characterize the categorical variables, and the Shapiro-Wilk test was employed to confirm hypotheses before employing them in parametric analyses. Depending on the type of data, the means and standard deviations or the median and quartile range were used to characterize quantitative variables. To determine if categorical variables are equally divided into categories, a single sample chi square test was employed. For normally distributed data, the independent sample t test was employed to compare quantitative data between two groups. Comparing numerical information between two groups, Mann Whitey test (for not normally distributed data) the level statistical significance was set at $P<0.05$. A highly significant difference was present if $p\leq0.001$.

RESULTS

This study included 159 patients admitted with pneumonia. Male represented 60.4% of patients. The age range of the studied group is from 2 to less than15 years with median age 4 years. Weight ranged from 9 to 52 kg with median 14 kg. Higher percentage of patients came from urban areas. There is a statistically significant difference in distribution of baseline characteristics of patients. Concerning diagnosis, 103 patients (64.8%) had pneumonia (42.8% and 22% had right and left lung involvement respectively), 35.2% had bronchopneumonia, 35.8% had pleural effusion complicating pneumonia and two patients (1.3%) had necrotizing pneumonia (table 1). As regard CAP severity, about half of the studied group (50.9%) had moderate pneumonia, followed by 39.6% presented with sever pneumonia. but 9.4% had mild pneumonia (table 1).

All patients with established diagnosis of pneumonia and bronchopneumonia had presented by fever, tachypnea, dyspnea and cough while 20.7%, 55.9% and 39.6% had chest pain, retraction/grunting and O_2 saturation < 92% respectively. The fever ranged from 1 to 5 days while length of hospital stay ranged from 2 to 35 days. Diagnosis of pleural effusion had presented by fever, tachypnea, dyspnea, and cough while 96.4%, 73.2% and 17.8% had chest pain, retraction/grunting and O_2 saturation < 92% respectively. The fever ranged from 4 to 14 days while length of hospital stay ranged from 4 to 30 days as shown in (table 2).

There was statistically significant relation between diagnosis and all of CRP, ESR and WBCs on admission, platelet count on discharge, D dimer on admission and discharge. All were significantly increase in lobar pneumonia than bronchopneumonia. On the other hand, there is non-significant relation between diagnosis and other studied parameters (differential leucocyte count, Hb level and platelet count) (table 3).

One hundred and two patients underwent blood culture which yielded that 74.7% of cultures were sterile, and 7.8% had cultures positive for Coagulase negative Staphylococci. Sixty one patients underwent sputum culture which yielded that 54.1% of cultures were sterile, and 14.8% had cultures positive for Klebseilla. Fifty patients

underwent pleural fluid culture which yielded that 52% of cultures were sterile, and 32% had cultures positive for Staphylococcus aureus as shown in (table 4).

Table 5; showed that on rising acute phase reactants, 28.3% of patients with pneumonia and bronchopneumonia received Vancomycin+meropnem and 12.6% of them received Linezolid +meropenem. While in patients with pleural effusion, 16.1% of them received Vancomycin+ meropnem and 83.9% of them received Linezolid +meropenem. On culture results, 15.7% of patients with pneumonia and bronchopneumonia received Linezolid and 8.2% of them received pipracillin/tazboactam.

Table 6; showed that among 54 patients with pleural effusion, 27.7% received medical treatment, 75.9% underwent chest tube insertion and 16.6% had been subjected to decortication.

Table 7; as regards outcome, 90.6% of patients improved and were discharged for follow-up in our clinic, while 9.4% of them needed ICU admission.

Table (1) Demographic and Baseline characteristics of studied group

	N=159	%	Test value	P
Sex:				
Female	63	39.6%	-2.538	0.011*
Male	96	60.4%		
Residence:				
Urban	97	61%	2.696	0.007*
Rural	62	39%		
	Median	**Range**		**p**
Age (year)	4	2 – 14	0.237¥	<0.001**
Preschool (2 – 6)	105	66%		
Early school (6 - <10)	36	22.6%		
Late school (≥10)	18	11.3%		
Body weight (kg)	14	9 – 52	0.239¥	<0.001**
Clinical characteristics	**N=159**	**%**		
Pneumonia	**103**	**64.8%**		
Right lung pneumonia	**68**	**42.8%**		
Left lung pneumonia	**35**	**22%**		
Bronchopneumonia	**56**	**35.2%**		
pleural effusion	**54**	**35.8%**		
Necrotizing pneumonia	**2**	**1.3%**		
CAP severity	**N=159**	**%**		
Mild	15	9.4%		
Moderate	81	50.9%		
Severe	63	39.6%		

p for one sample Chi square test ¥one sample t test
*p<0.05 is statistically significant **p≤0.001 is statistically highly significant"

Table (2) Clinical presentations among patients with pneumonia & pleural effusion complicated pneumonia.

Clinical presentations	Pneumonia and bronchopneumonia		pleural effusion complicated pneumonia	
	N=159	%	N= 56	%
Fever	159	100%	56	100%
Tachypnea	159	100%	56	100%
Dyspnea & Cough	159	100%	56	100%
Chest pain	33	20.7%	54	96.4%
Retraction and grunting	89	55.9%	41	73.2%
O2 saturation<92%	63	39.6%	10	17.8%
Period of fever at hospital [median (range)]	3 (1 – 5)	10.7%	6(4 – 14)	5.2%
Length of hospital stay, days [median (range)]	6(2 – 35)		13(4 – 30)	

Table (3) Laboratory data of studied patients on admission and discharge:

	Lobar pneumonia	Bronco-pneumonia	Z	P
	Median (IQR)	Median (IQR)		
CRP				
Admission	123(60.29 – 228.82)	36.55(20.33 – 94.45)	-4.522	<0.001**
Discharge	6.03(2.47 – 10.6)	5(2.04 – 9)	-0.721	0.471
ESR				
Admission	90(60 – 115)	6(35 – 79.25)	-4.519	<0.001**
Discharge	10(10 – 14)	10(10 – 12)	-1.167	0.243
D dimer				
Admission	7.1(2.8 – 12.06)	4.4(0.53 – 5.62)	-4.252	<0.001**
Discharge	0.9(0.5 – 2)	0.5(0.4 – 0.6)	-3.852	<0.001**
PCT				
Admission	0.243(0.123 – 0.705)	0.234(0.079 – 0.564)	-0.723	0.47
Discharge	0.192(0.089 – 0.54)	0.175(0.056 – 0.522)	-0.552	0.581
Platelet				
Admission	397(221 – 756)	375(271 – 484)	-0.777	0.437
Discharge	421(300 – 550)	346.5(281.75 – 421.5)	-2.993	0.003*
WBCs				
Admission	16.25(11.75 – 21.1)	10.9(8 – 15.1)	-2.63	0.009*
Discharge	7.6(6.6 – 9.7)	7.6(6.93 – 9.3)	-0.299	0.765
Neutrophil				
Admission	7(4.2 – 12.6)	6.1(3.6 – 8.6)	-0.927	0.354
Discharge	3.1(2.1 – 4.7)	3.05(2.1 – 4.18)	-0.565	0.572
Lymphocyte				
Admission	4.4(2.35 – 6.1)	3.06(2.28 – 5.73)	-0.708	0.479
Discharge	2.8(2.3 – 3.9)	3.1(2.1 – 4.2)	-0.725	0.468
	Mean ± SD	**Mean ± SD**	t	p
Hemoglobin (g/dl)	10.36 ± 1.28	10.56 ± 1.62	-0.784	0.435
On admission	9.81 ± 1.25	10.06 ± 1.17	-1.106	0.271
On discharge				

t independent sample t test Z Mann Whitney test IQR interquartile range *p<0.05 is statistically significant **p≤0.001 is statistically highly significant

Table (4): Distribution of the studied patients according to Blood culture, Sputum culture and Pleural fluid culture result

	N=159	%
Blood culture results		
Result	102	54.7%
Negative	80	74.7%
Positive	22	21.5%
Klebsiella	4	3.9%
Proteus vulgaris	1	0.9%
Pseudomonas aeruginosa	2	1.9%
Coagulase negative Staphylococci	8	7.8%
Staphylococcus aureus	1	0.9%
Staphylococcus epidermydis	3	2.9%
Sputum culture		
Result	61	38.4%
Negative	33	54.1%
Positive	28	45.9%
Klebsiella Pneumonie	9	14.8%
Staphylococcus aureus	11	18%
Candida	8	13.1%
Pleural fluid culture		
Result	50	31.4%
Negative	26	52%
Positive	24	48%
Pseudomonas aeruginosa	1	2%
Klebsiella	6	12%
Streptococcus pneumonia	1	2%
Staphylococcus aureus	16	32%

Table (5) Frequency of Antibiotic regimen added on treatment.

Antibiotics	**Pneumonia**		**Complication on top of pneumonia**	
	N=159	**%**	**N=56**	**%**
Antibiotics started on rising acute phase reactants or poor improvement clinically & radiological				
Vancomycin+meropnem	45	28.3%	9	16.1%
Linezolid +meropenem	20	12.6%	47	83.9%
Antibiotics started based on Cultures results				
Linezolid	25	15.7%	10	17.8%
pipracillin/tazboactam	13	8.2%	6	10.7%
Amikacin	1	0.6%	3	5.4%
Ciprofloxacin	1	0.6%	2	3.6%
Levofloxacin	2	1.3%	5	8.9%
Clidamycin	0	0%	1	1.8%

Table (6): Different Patterns of pleural effusion management in studied patients .

pleural effusion management regimen management regimen	**N=54**	**%**
Medical treatment	15	27.7%
Chest tube	41	75.9%
Decortication	9	16.6%

Table (7): Observed outcome of the studied group.

	N= 159	**%**
cases improved and discharged for follow up in our clinic	144	90.6%
cases needed ICU admission	15	9.4%
cases died	0	0%

DISCUSSION

In our study, the age range of the population studied was 2 to less than 15 years, with a median age of 4 years. Within this group, the preschool age range (2 – 6 years) constituted 66% of the total population.

This agreed with **Aguilera-Alonso et al. [10]** where most pneumonia occurrences in their study were the age group 2 up to 5 years. They recorded epidemiological features of children with community-acquired Mycoplasma pneumonia (MP) pneumonia in a Valencia, Spain, and tertiary hospital.

Most of the research in literature has noted peaks in the age range of 5 to 9 years**[11, 12].**

The study design, differences in socioeconomic level, and the accessibility of health care facilities in the study location could all be contributing factors to this discrepancy.

In our study, a larger percentage of patients came from urban areas. This agrees with results by **Banstola et al. [14]** who reported that, the children under five were from households most concentrated in urban Baglung municipal.

In our study, concerning diagnosis, 103 patients (64.8%) had pneumonia (42.8% and 22% had right and left lung involvement, respectively), 35.2% had bronchopneumonia, 35.8% had pleural effusion complicating pneumonia, and two patients (1.3%) had necrotizing pneumonia.

Aguilera-Alonso et al. [10] reported that, 22 children (13.6%) experienced pleural effusion, and segmental infiltration (62.3%) was the most common radiographic pattern.

In our study, all patients with established diagnosis of pneumonia and bronchopneumonia had presented with fever, tachypnea, dyspnea and cough while 20.7%, 55.9% and 39.6% had chest pain, retraction/grunting and O_2 saturation<92% respectively. The fever ranged from 1 to 5 days while length of hospital stay ranged from 2 to 35 days. All patients with established diagnosis of pleural effusion had presented by fever, tachypnea, dyspnea, and cough while 96.4%, 73.2% and 17.8% had chest pain, retraction/grunting and O2 saturation <92% respectively. Period of fever ranged from 4 to 14 days while length of hospital stay ranged from 4 to 30 days.

Aguilera-Alonso et al. [10] reported that the children who were older and whose fevers started later in life had the highest fever counts. At the time of diagnosis, 14.2% of all CAMP patients were afebrile.

The study of **Hussein et al. [15]** clarified the most common sign, which was decreased air entry in 97.9% of cases, tachypnea in 85.4% of cases, oxygen support in 72.9% of cases, grunting in 60.4% of cases, fine crepitation in 56.2% of cases, wheezes in 54.1% of cases, cyanosis in 37.5% of cases, and requirement for ventilator support in 20.8% of cases of bacterial pneumonia.

In our study, there was statistically significant relation between diagnosis and all of CRP, ESR and WBCs on admission, platelet count on discharge, D dimer on admission and discharge (All were significantly higher in patients with lobar pneumonia). On the other hand, there is non-significant relation between diagnosis and other studied parameters.

Elshiekh et al. [13] revealed that, the mean Hb level were 11.06 gm/dl; while mean hematocrit was 32.44%. Also mean WBCs count was 13.83× 103 /mm3 and mean lymphocyte was 3.75%; while mean neutrophil count was 6.61%. Additionally, the mean platelets count was 345.81 × 103 /mm3 , they

showed increased CRP and PCT, with mean CRP was 43.26 mg/L and the median of PCT was 1.13 (IQR 0.98-1.29) ng/ml. Additionally, there was 9.3% of CAP children showed abnormal urine analysis.

Nademi et al. [16] concluded that, the degree of temperature and WBC count were poor predictors of the serious illness and they can't replace clinical assessment in child with fever.

In our study, the majority of microbiological culture in the current study was sterile. 74.7%, 50%, 52% for blood culture, sputum culture and pleural fluid culture respectively, while bacterial causes of CAP are only 25.15% of the total. This may be attributed to high prevalence of viral causes of pneumonia among this age group.

In a three-year research conducted in the United States, the causal agent for 81% of hospitalized children with CAP was found to be a virus in 66% of cases and bacteria in 8% **[17].**

In our study, one hundred and two patients underwent blood culture, Coagulase negative Staphylococci (21.5%) is the most frequent pathogen found in blood cultures, irrespective of age, Klebsiella 3.9 % .

The study of **Hussein et al. [15]** said that the most frequent pathogen found in blood cultures, Staph. aureus, is 18.7% followed by Klebsiella 2.08%.

The results of **Hussein et al. [15]** demonstrated blood culture yield was limited 27.08%. Contamination was found in 10.4%. While some researchers still discover that positive blood cultures can direct antibiotic therapy to a restricted range, the majority of investigators advise that blood cultures are likely to be useful for management and can be disregarded, especially in mild and moderate CAP, for cost-benefit considerations.

In our study, fifty patients underwent **pleural fluid culture**, and 32% had cultures positive for Staphylococcus aureus .

According to a 2009–2010 Peruvian investigation, *M. pneumonia* was the most common causative agent of community-acquired pneumonia (CAP), followed by *C. pneumoniae.* RSV, IFV, and PIV were the most frequently discovered respiratory viruses**[18].**

The Korean Childhood Community-Acquired Pneumonia Study Group (KoC-CAPS) showed the codetection of virus/M. pneumoniae in 15% and bacteria/*M. pneumoniae* in 3.7% **[19]**. *S. aureus* was the most frequently isolated bacterium by culture (12.8%), followed by *S. pneumoniae* (9%). According to this study, of the 93 instances of *S. pneumoniae*, 14.1% were resistant to penicillin, 8.7% to cefotaxime, 93.5% to erythromycin, 79.3% to tetracycline, and 1.1% to levofloxacin **[21]**.

Different pneumonia-causing bacteria have been identified based on the location, age group, duration, kind of sample, and test used.

A total of 380 blood cultures were acquired for the **Youssef et al. [22],** investigation which included 23 patients who had repeated blood cultures. Five (1.3%) of the fifteen (3.9%) cultures tested positive for bacterial growth; the remaining ten (2.6%) were regarded as contaminants. They came to the conclusion that there is little chance of bacteremia in kids who are hospitalized for CAP. Routine blood cultures ought to be saved for kids who have moderate-to-severe pneumonia.

In our study, sixty one patients underwent **sputum culture** which yielded that 54.1% of cultures were sterile, and 14.8% had cultures positive for Klebseilla.

The study of **Hussein et al. [15]** revealed that most of the identified microbes were isolated from culture of respiratory specimens and blood. No matter the age group, they discovered that S. aureus, at 35.4%, was the most often observed pathogen in sputum. Other prevalent ones included candida (12.5%), Klebsiella (8.33%), and pseudomonus (4.16%).

Aguilera-Alonso et al. [10] the study revealed that among the patients whose nasopharyngeal swab samples were tested for viral detection, those with viral coinfection tended to be younger (median age 2.6 vs. 5.1 years; P=.033) and had a higher probability of being hospitalized (100% vs. 60.9%; P=.048).

In our study, on rising acute phase reactants, 28.3% of patients with pneumonia and bronchopneumonia received Vancomycin+meropnem and 12.6% of them received Linezolid +meropenem. While in patients with pleural effusion, 16.1% of them received Vancomycin+ meropnem and 83.9% of them received Linezolid +meropenem. On culture results, 15.7% of patients with pneumonia and bronchopneumonia received Linezolid and 8.2% of them received pipracillin/tazboactam. On culture results, 17.8% of patients with pleural effusion received Linezolid and 10.7% of them received pipracillin/tazboactam.

In our study, among 54 patients with pleural effusion, 27.7% received medical treatment, 75.9% underwent chest tube insertion and 16.6% had been subjected to decortication

In a Pakistani research, 82% of children with non-severe pneumonia were found to have normal chest radiographs using the WHO case criteria. With the exception of those who have bacterial pneumonia, the majority of these kids might not need antibiotics and will probably recover with supportive care in three to seven days. Giving them antibiotics like co-trimoxazole, amoxycillin, or any other might not change the result**[22]**.

In a research comparing amoxycillin and co-trimoxazole, the amoxycillin group had more patients who had recently taken antibiotics (34% vs. 25.6% in the co-trimoxazole group) **[25].**

High-dose amoxicillin (80–100 mg/kg/d) was the prescribed antibiotic in 3 of the 4 studies **Bielicki et al. [24],** and Five percent were given amoxicillin-clavulanic acid in the fourth research. A research from England contrasted separate low (35–50 mg/kg/d) and high amoxicillin dosages for both short and extended amoxicillin regimens. It was discovered that low dosages were not less effective than high doses, nor were short courses less effective than long courses at any dose **[24].**

In our study, as regard outcome, 90.6% of patients improved and discharged for follow up in our clinic while 9.4% of them cases needed ICU admission.

Elshiekh et al. [13] reported that, 22.2% were admitted to ICU among CAP children.

CONCLUSION

Cultures most commonly yielded no growth, although Staph aureus from pleural fluid and Klebsiella form sputum were notable. This attributed to high prevalence of viral causes of pneumonia among studied patients and confirms the importance of Staph aureus and Klebsiella. These findings will facilitate age appropriate antibiotic selection.

This study we recommended that enhancing awareness of pneumonia symptoms. Develop clinical prediction tools to risk stratify pediatric pneumonia patients on presentation to guide treatment and disposition. Expand microbiologic diagnostic testing availability and stewardship programs in pediatric hospitals to optimize antimicrobial use. Implementing targeted antibiotic therapy based on culture results.

Continuous monitoring and follow-up in outpatient clinics can further contribute to the effective management of pediatric pneumonia. Additional researches on long-term outcomes in pediatric pneumonia patients after discharge were needed.

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