

**Mustapha MG**  
**Ashir GM**  
**Alhaji MA**  
**Rabasa AI**  
**Ibrahim BA**  
**Mustapha Z**

## **Presentation, complications and management outcome of community acquired pneumonia in hospitalized children in Maiduguri, Nigeria.**

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Mustapha MG (✉)  
 Ashir GM, Alhaji MA, Rabasa AI,  
 Ibrahim BA.  
 Department of Paediatrics,

Mustapha Z  
 Department of Radiology,  
 University of Maiduguri Teaching  
 Hospital, Maiduguri, Nigeria.  
 PMB 1414, Maiduguri.  
 Tel: +2348038087639  
 Email: mgofama@yahoo.com

**Abstract Background:** Pneumonia remains a leading cause of U-5 morbidity and mortality in developing countries like Nigeria. This study was conducted to determine the clinical presentation, complications and factors contributing to mortality in the hospitalized children with community acquired pneumonia (CAP) in Maiduguri, Nigeria.

**Methods:** Children younger than 14 years admitted into the Emergency Paediatric Unit of the University of Maiduguri Teaching Hospital (UMTH), Maiduguri, in 2011 with the diagnosis of community acquired pneumonia were followed up until discharge or death. Chest radiographs were read by radiologists.

**Results:** Eighty nine children aged two months to 14 years were

studied. The commonest clinical features were fever, cough, tachypnoea and dyspnoea. Radiographic evidence of pneumonia was found in 84 (94.4%) of cases. Dehydration and congestive cardiac failure (CCF) were the commonest complications encountered. Eight (9.0%) children died, seven of whom had complications of pneumonia. The rate of occurrence of complications, radiographic pattern of pneumonia and outcome of treatment did not significantly differ statistically in the different age groups;  $p = 0.135$ ,  $0.622$  and  $0.167$  respectively.

**Conclusion:** While dehydration and CCF were found to be commonest complications, mortality was commoner among the male infants hospitalized for pneumonia.

### **Introduction**

Community acquired pneumonia (CAP) is one the commonest lower respiratory tract infection of children with unparalleled morbidity and mortality, especially in developing countries, like Nigeria.<sup>1-5</sup> Explanations proffered for the high burden of pneumonia in the developing economies include overcrowding, malnutrition, lack of exclusive breast feeding, low birth weight and limited access to curative health services among others.<sup>5-8</sup> Intra-thoracic and extra-thoracic complications of pneumonia such as pleural effusion, air leak syndrome, heart failure and septicaemia among others increase the pneumonia morbidity and mortality. This is in spite of the efforts by the World Health Organization (WHO) and other United Nation bodies over the years in promoting and advocating many diagnostic and treatment guidelines, not only for the management of pneumonia, but the entire acute respiratory infections (ARI) in general.

Pneumonia deaths occur both at home and in the hospital setting.<sup>3,9</sup> Complications of pneumonia and factors contributing to pneumonia mortality in the hospitalized

children in addition to the presentation of children with CAP in Maiduguri was prospectively studied with special reference to different age groups.

### **Methodology**

The study was carried out in the University of Maiduguri Teaching Hospital (UMTH), Maiduguri, North-eastern Nigeria. The UMTH renders specialised services to the people of North-eastern Nigeria, Republics of Cameroon, Chad and Niger. All children admitted into the Emergency Paediatric Unit of the UMTH, in 2011 with fever, cough, fast breathing and chest wall in drawing who qualified diagnosis of CAP formed the study group.<sup>10-12</sup> A study Proforma with the demographic details, clinical features, complications of pneumonia and treatment outcome was filled for each eligible child. These children were followed up until discharge or death. Chest radiographs were read and reported by radiologists. Chest radiographic evidence of

pneumonia includes homogeneous opacity and/or patchy infiltrates of the lung parenchyma consistent with consolidation with or without other radiographic features of pneumonia. Children with incompletely filled records and those who did not have chest radiograph were excluded. Children found to have HIV infection, hospital acquired pneumonia or aspiration pneumonia were also excluded.

Data generated was entered into a computer and analyzed using SPSS version 16. Results were given in proportions, percentages and tables. Comparisons between groups were done with appropriate chi-square test and a p-value of < 0.05 was considered significant.

## Results

Eighty nine of the children admitted for pneumonia met the study criteria, 26 did not and thus excluded. The age ranged from two months to 14 years and the mean age (SD) was 18.44 (128.76) months. The male to female ratio was 1.5:1, but the male to female ratio was 5:1 in the age group 1-6 months. Eighty four (94.4%) of the children were U-5. The age and sex distribution of the children is shown in table 1.

**Table 1:** Age group and sex distribution of the study population

Age (months)	Sex		Total (%)
	Male (%)	Female (%)	
1-6	20(22.47)	4(4.49)	24(26.96)
7-12	13(14.60)	14(15.73)	27(30.33)
>12-59	19(21.34)	14(15.73)	33(37.07)
> 59	2(2.24)	3(3.37)	5(5.61)
Total	54(60.7)	35(39.3)	89(100.00)

Clinical features at admission showed that cough and fast breathing were found in 98.8% of the children, table 2. Five, four and eight care givers were not sure of prior history of common cold, history of contact with person (s) with common cold and history of prior exposure to cold weather respectively.

**Table 2:** Frequency of clinical features in study patients

Clinical Feature	No of patients (per cent)
Fever	84(94.4)
Cough	88(99.8)
Fast breathing	88(99.8)
History of recent common cold	36(40.4)
Contact with individual with common cold	13(14.6)
History of exposure to cold weather	24(26.9)
Poor appetite	67(75.3)
Vomiting	49(55.1)
Diarrhoea	48(53.9)
Dyspnoea	89(100)
Hepatomegaly	44(49.4)
Splenomegaly	7(7.8)

Dehydration and congestive cardiac failure were the most prevalent complications (Table 3). No complication was detected in 43 (48.3%) of the children studied. Chest radiographs of 84 (94.4%) of the children were suggestive of pneumonia; the remaining five were reported as normal, (Table 3). While 81(91%) of the patients recovered and were discharged home, the outcome was fatal in eight of them (Table 3). The prevalence of complications, radiographic pattern of pneumonia and outcome of treatment did not significantly differ significantly in the different age groups; p = 0.135, 0.622 and 0.167 respectively. Further analysis of the eight fatal cases revealed that four had convulsions and three had CCF as complication. However, no complication was identified in the remaining child. Although, the mortality rate among the males and females was seven and one respectively, no significant statistical difference was found (p = 0.140).

**Table 3:** Age related complications, radiographic pattern and outcome of treatment of CAP.

	Age group (months)			
	1 to 6 n = 24	7 to 12 n = 27	> 12 to 59 n = 33	≥ 60 n = 5
<i>Complications</i>				
CCF	7(29.2)	5 (18.5)	6 (18.2)	0(0.0)
Seizures	4 (16.7)	3 (11.1)	1(3.0)	0(0)
Dehydration	6 (25.0)	9 (33.3)	12 (36.4)	0(0.0)
Pyothorax	0 (0.0)	2 (7.4)	0 (0.0)	1(20.0)
Hydropneumothorax	0 (0.0)	0 (0.0)	1(3.0)	0(0.0)
None	9 (37.5)	11(40.7)	17(51.5)	4(80.0)
<i>Chest radiographic finding</i>				
Bronchopneumonia	22(91.6)	24(88.9)	29(87.9)	4(80.0)
Lobar pneumonia	1(4.2)	3(11.1)	1(3.0)	0(0.0)
Normal radiograph	1(4.2)	0(0.0)	3(9.1)	1(20.0)
<i>Outcome</i>				
Recovered	19(79.2)	25(92.6)	32(97.0)	5(100)
Died	5(20.8)	2(7.4)	1(3.0)	0(0.0)

Note: Some children had more than one complication, H pneumoth: Hydropneumothorax.  
CCF: congestive cardiac failure

## Discussion

The importance of pneumonia in particular and ARI in general to public health and especially in children cannot be over emphasized. The fact that the majority of the patients were U-5, underlines the significant contribution of pneumonia to U-5 morbidity, similar to observations made previously.<sup>1,2,8,10</sup> The preponderance of infants in general and that of males among the children younger than six months in this study, may be attributed to the incomplete development of the immune system and the increased risks to infection of the males of this age.<sup>13,14</sup> Fever, cough and fast breathing found in majority of children in this study are the hallmark for the clinical diagnosis of pneumonia, especially in children.<sup>2,15</sup> Anorexia, vomiting and diarrhoea, although not specific respiratory symptoms, are usually found in children with pneumonia as earlier reported.<sup>2,15</sup>

These symptoms occur due to the systemic inflammatory effect of pneumonia.

Majority of the subjects had complications directly attributable to pneumonia. This calls for a deliberate look for such complications in children with pneumonia. Dehydration was the commonest complication encountered but it is not usually reported as a common complication of pneumonia. This may be due to the fact that most authors lay emphasis on the direct and local complications of pneumonia. Dehydration in children with pneumonia in the present study may be due to increased insensible fluid loss; through the skin and the airways. This is important as majority of the subjects were infants; who are known to have high total body water, which makes them at risk of increased fluid loss.

Diarrhoea, vomiting and poor intake found in significant proportion of the children studied can all contribute to dehydration. Small body size compared to relative large body surface area of the children (over half of children studied younger than 12 months), also predisposes them increased fluid loss and thus dehydration. Another factor contributing to dehydration in the study patients is the weather effect of Maiduguri. Like other Sahel regions of the world Maiduguri is generally dry, sunny, and hot with low humidity; these factors contribute to fluid loss via several mechanisms.

Congestive cardiac failure (CCF) is a common complication of pneumonia seen in this study. Fagbule *et al*<sup>2</sup>, reported a CCF prevalence of up to 46%, in a study conducted at Ilorin Teaching Hospital. Other authors have also reported CCF to be one of the common complications pneumonia in children.<sup>8,16,17</sup> Pulmonary hypertension manifesting as cor pulmonale, as quoted by Shan *et al*<sup>18</sup> may be the cause of heart failure in children with pneumonia. Other causes are pericarditis and myocarditis.

While the low prevalence of pyothorax and pneumothorax in this study is similar to previous reports,<sup>2,16</sup> few cite seizures as a common complication of pneumonia; probably because it is extra-thoracic. Convulsion; an acute encephalopathy in children with pneumonia in the present study may be due to febrile convulsion. It can also be a feature of sepsis manifesting as multi-organ dysfunction (MOD) in general or can arise from a secondary meningitis following embolic phenomena from pneumonia. Olowu and Njokanma reported febrile convulsion as the most prevalent complication of pneumonia following CCF and metabolic acidosis.<sup>16</sup> Although there was no significant difference of the prevalence of complications and age in this study, it was reported that the prevalence of complications of pneumonia is inversely proportional to age.<sup>19</sup>

While the chest radiograph is the standard diagnostic investigation for pneumonia, the issue of sensitivity of chest radiography in detecting pulmonary infiltrates,

the accuracy of the interpretations of chest radiographs, and when should chest radiography be ordered in patients with pneumonia still remains unresolved.<sup>20</sup> Some authors have reported it to be less sensitive than high resolution CT scans in detecting pulmonary infiltrates.<sup>20</sup> In a study of 2000 children with WHO non severe pneumonia; children with fast breathing, an outrageous 82% were reported to have normal chest radiographs,<sup>21</sup> compared to only 5.6% obtained in this study. This is probably because the categories of patients studied were different. In this study, all the children met the WHO criteria for severe or very severe pneumonia, which perhaps explains the high proportion of children with radiological evidence of pneumonia.

While a normal chest radiograph does not exclude pneumonia as it may not detect early changes of the disease,<sup>22</sup> the presence of other clinical features of pneumonia in addition to fast breathing may provide a better assessment of the child for pneumonia, as fast breathing in a coughing child could be explained by many disease conditions. Of 75 children with pneumonia, Fagbule *et al*<sup>2</sup> found patchy consolidation and punctuate perihilar opacities in 33 and 12 children, while lobar consolidation and normal chest radiographs were found in nine and two children respectively. That study was done in hospitalized children like the present study, thus, the similarity of radiographic findings. The high prevalence of bronchopneumonia in younger children compared to older ones seen in this study was reported earlier.<sup>16</sup> This may perhaps be due to the less ability of the younger children compared to older ones or adults in localizing infection.

The mortality of hospitalized children with pneumonia in the present study of 9% is similar to 10% and 10.5% earlier reported,<sup>2,7</sup> The high proportion of complications among the dead children calls for the need to actively and deliberately look for such complications in all hospitalized children. Similar to the finding in the present study, Fagbule and Adedoyin earlier reported the high rate of mortality in the young and in children with complications of pneumonia.<sup>23</sup> The high rate of mortality among the infants in the present study may be as a result of the combination of complications in addition to the sub optimal state of immunity in the younger children.<sup>14</sup>

Although, the clinical diagnosis of pneumonia is simple, complications and deaths are common especially among the male hospitalized children. Certain predisposing factors and important complications of pneumonia such as septicaemia, septic embolic phenomena, syndrome of inappropriate anti diuretic hormone secretion were not looked for in this study, perhaps due to their occult occurrence. We recommend that complications such as dehydration and CCF be looked for in all children hospitalized for pneumonia.

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