

# The Pattern of Pediatric Respiratory Illnesses Admitted in Ebonyi State University Teaching Hospital South-East Nigeria

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## Abstract

**Background:** Reports from the developed nations reveal respiratory tract infections as the leading cause of childhood hospital admissions. Children may be admitted for a variety of respiratory illnesses. Data on the spectrum of pediatric respiratory illnesses admitted in the hospital is scarce. **Aim:** To determine the pattern of pediatric respiratory illness admissions, seasonal frequency, underlying risk factors and outcome. **Subjects and Methods:** A retrospective assessment of respiratory cases admitted in the pediatric ward from 2005 to 2010 was conducted using case notes. Parameters considered included month of presentation, age, sex, immunization and nutritional status, tools of diagnosis and patient outcome. Results were analyzed using the Statistical Package for the Social Sciences with the level of significance  $P \leq 0.05$ . **Results:** Of the 239 cases admitted, there were more males than females (1.4:1). The commonest case was Bronchopneumonia, 71.6% (171/239 out of which 161 were uncomplicated, 5 had effusions and 6 were associated with measles). Other cases were Pulmonary Tuberculosis, 10.9% (26/239), Lobar pneumonia 8.8% (21/239), Bronchiolitis, 5% (12/239), Aspiration pneumonitis 2.1% (5/239) and Bronchial asthma, 0.8% (2/239). Mortality was 7.5% (18/239) mostly from Bronchopneumonia amongst the 1–5 years old. Mortality was significantly associated with malnutrition ( $P < 0.001$ ) and poor immunization status ( $P < 0.01$ ). **Conclusion:** Bronchopneumonia was found to be the commonest illness with significant mortality and peak occurrence in the rainy season. More emphasis must be laid on anticipatory guidance and prevention by encouraging the immunization, good nutrition and increased attention on children even after 1 year of age.

**Keywords:** Admissions, Ebonyi, Nigeria, Pattern, Respiratory illness

## Introduction

Reports from the developed nations reveal respiratory tract infections as the leading cause of childhood hospital admissions.<sup>[1,2]</sup> Back home in the developing world, respiratory tract infections along with malaria and diarrheal diseases constitute the major causes of childhood morbidity and

mortality particularly in the under-five age group.<sup>[3]</sup> Globally, a systematic analysis of the global burden of disease, reviewing two hundred and thirty-five causes of death between 1990 and 2010, found Pneumonia, a respiratory illness, as the leading cause of morbidity and mortality in children aged below 5 years.<sup>[4]</sup> Apart from the pneumonia, children may suffer a variety of respiratory illnesses ranging from common cold, nasopharyngitis, laryngitis, sinusitis, bronchiolitis, tonsillopharyngitis, asthma, tuberculosis to foreign body aspiration. Some of these cases may require hospital admission based on its severity.

The spectrum of illnesses in a given locality may differ from another. This work is aimed at reviewing the various respiratory cases for which a child was admitted in our hospital, the Ebonyi State University Teaching Hospital,

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South east Nigeria, over a 5 year period, in a bid to determine the most prevalent respiratory case admitted, the age group most affected, seasonal predisposition, identifiable risk factors and the outcome.

Data on the spectrum of paediatric respiratory illnesses admitted in the hospital is scarce and therefore, this retrospective study of respiratory case admissions, is considered relevant as it would provide a base-line information for a better understanding of the epidemiology of pediatric respiratory admissions, assist health care planning, resource allocation, prevention and intervention strategies as well as making of relevant health policies.

## Subjects and Methods

### Study area

This study was conducted in the Pediatric ward of the Ebonyi State University Teaching Hospital (EBSUTH). EBSUTH is a tertiary hospital situated in Abakaliki, the capital town of Ebonyi State, South eastern part of Nigeria, a part occupied by the Igbos. The occupation of the inhabitants of this area ranges from subsistence farming, trading to civil service. EBSUTH is an institution that offers primary, secondary and tertiary health care services to a great proportion of the people within Abakaliki town and the surrounding suburbs and villages. It has a children emergency room where emergencies are stabilized and eventually transferred to the pediatric ward or discharged. With respect to this study, it is pertinent to note that the hospital although Tertiary had limited availability of laboratory diagnostic resources as is common with most health institutions in the developing countries. However, it could offer basic laboratory services such as X-rays, microbiological analysis of some bacterial infections, but not viral, except antibody studies of the human immunodeficiency virus. Due to some technical and financial challenges, the Institution, at the time of the study lacked respirators and facilities for advanced life support. However, this study has been tailored to the available resource capacity within the study area.

### Study population

The study was a retrospective review of all the respiratory cases in children aged 0–18 years old, admitted into the Pediatric ward of EBSUTH from January 2005 to January 2010.

### Ethical consideration

Approval for this study was obtained from the Ethics and Research committee of the EBSUTH, Abakaliki.

### Study inclusion criteria

Children aged 0–18-year-old, who had been on admission for a respiratory illness, diagnosed from clinical history of symptoms such as cough, wheeze, stridor, breathlessness,  $\pm$ fever, etc., and physical examination for typical signs such

as chest in-drawing, added or abnormal chest sounds with or without radiological/microbiological evidence, as seen in the case note.

### Case review strategy

The case notes of all the patients who fulfilled the study inclusion criteria were obtained, and the following data were extracted; age of the patient, sex, month of presentation, nutritional status, immunization status, birth order, family size, diagnosis made and the tools used for making the diagnosis. Tools, here, referred to the history (of cough  $\pm$  fast breathing, etc.), physical examination of throat and chest, radiological tests and laboratory tests. The data were reviewed with respect to the type and most prevalent respiratory tract illness, the age group most affected, the seasonal frequency, the tools of diagnosis, mortality and associated risk factors such as immunization status, nutritional status, number of children in the family and birth order. The presence of co-morbidities was justified by relevant investigations and screenings done as recorded in the folder. Outcome of the admission were either discharged (survived), died on admission, discharged against medical advice, absconded (i.e. escaping from the hospital while on treatment) or referred out to another institution.

### Statistical analysis

The obtained data were analyzed using the Statistical Package for the Social Sciences (SPSS) software, version 13.0 Chicago IL, USA, SPSS Inc. association between variables were determined using Chi-square and Fischer's exact test and the level of significance of findings was set at  $P < 0.05$ .

## Results

Of the 239 cases admitted, 58.6% (140/239) were males while 41.4% (99/239) were females making a ratio of about 1.4:1. The commonest case admitted was bronchopneumonia, 71.6% (171/239 out of which 161 were uncomplicated, 5 had effusions and 6 were associated with measles). Other cases were Pulmonary Tuberculosis, 10.9% (26/239), Lobar pneumonia 8.8% (21/239), bronchiolitis, 5% (12/239), aspiration pneumonitis 2.1% (5/239) and bronchial asthma, 0.8% (2/239) [Table 1]. Background retroviral disease (RVD) was found in 4.6% (11/239) of cases, out of which six had tuberculosis. Congenital heart diseases (categorically Ventricular Septal Defects confirmed by echocardiography) were found in 1.3% (3/239) of cases.

The most frequent period of presentation was between July and September (35.1%), followed by January to March (23%).

The outcome of these illnesses in relation to certain variables has been illustrated by Table 2. With respect to birth order, mortality was higher in children between the first and third

**Table 1: Distribution of paediatric respiratory case admissions in relation to age in Ebonyi State University Teaching Hospital Abakaliki, Nigeria (n=239)**

Diagnosis	0-6 months	>6-12 months	>1-5 years	>5-12 years	>12-18 years	Total (%)
Bronchopneumonia						
Uncomplicated	65	39	48	8	1	161 (67.4)
With effusion	-	1	4	-	-	5 (2.1)
With measles	-	2	3	1	-	6 (2.5)
Lobar pneumonia						
Right lobar	3	1	5	4	1	14 (5.9)
Left lobar	-	-	4	3	-	7 (2.9)
Pulmonary tuberculosis	2	3	8	13	-	26 (10.9)
Bronchiolitis	11	1	-	-	-	12 (5)
Aspiration pneumonitis	3	1	1	-	-	5 (2.1)
Bronchial asthma	-	-	2	-	-	2 (0.8)
Retrophary abscess	-	1	-	-	-	1 (0.4)
Total	84	49	75	29	2	239 (100)

**Table 2: A summary of general outcome with respect to certain variables in pediatric respiratory illness admissions in ebonyi state University Teaching Hospital Abakaliki, Nigeria**

	Discharged (n)	Died (n)	DAMA (n)	Absconded (n)	Referred out	P
Gender						
Male	126	12	1	0	1	0.03
Female	85	6	5	3	0	
Diagnosis						
Bronchopneumonia	152	12	0	0	0	0.47
Pulmonary tuberculosis	19	5	0	2	0	
Lobar pneumonia	20	1	0	0	0	
Bronchiolitis	12	0	0	0	0	
Inadequate immunization	41	12	3	0	0	<0.01
Inadequate nutrition	50	14	4	2	0	<0.001
Tools of diagnosis						
Hx+PE+CXR	145	11	1	1	1	0.03
Hx+PE only	66	7	5	2	0	

Hx: History, CXR: Chest X-ray, DAMA: Discharged against medical advice, PE: Physical examination

birth order (72.2%,  $P = 0.57$ ), and highest between the ages of 1–5 years old (55.6%) although it was not statistically significant. Mortality was significantly higher amongst the males (66.7%) with  $P = 0.04$ .

Malnutrition and poor immunization status significantly correlated with mortality [Table 2].

History, Physical examination and chest X-ray were used in making diagnosing in 66.5% (159/239) of the cases whereas only history and physical examination were used in 35.5% (80/239) of the cases. A comparison of the outcome between those that had a chest radiograph and those that did not, using the Chi-square test and Fischer's exact test, showed a significant difference [ $P = 0.03$ ] [Table 2].

Majority of the cases were discharged and 7.5% (18/239) died with 61.1% of the deaths amongst those with bronchopneumonia, followed by pulmonary tuberculosis (27.8%), ( $P = 0.01$ ) Five out of the eighteen deaths (27.8%) had background RVD.

## Discussion

Infectious diseases have been shown to be the major cause of childhood admissions in Nigeria.<sup>[5,6]</sup> The most prevalent respiratory case admission was bronchopneumonia and the commonest age group affected was 0–6 months [Table 1].

Koch *et al.*,<sup>[7]</sup> found age as a strong risk factor for both upper and lower respiratory tract infections, with the highest risk between 6 and 11 months of age somewhat contrary to our findings. The age of 6 months to 18 months has been termed the period of greater vulnerability to infections possibly due to the degradation of maternal antibodies and gradual cessation of breast milk.<sup>[8]</sup> In Greenland, exclusive breastfeeding compared with no breastfeeding or having weaned was found in a prospective study to protect against lower respiratory tract infection in a multivariate analysis.<sup>[7]</sup> Savitha *et al.*<sup>[9]</sup> found that early weaning before the age of 4 months was significantly associated with lower respiratory tract infection. However, we were unable to specifically analyze the pattern of breast feeding, with interest in exclusive breastfeeding, in relation to the

incidence of respiratory tract admissions, mainly because such data were not properly documented in most of the case files. This is a major limitation associated with retrospective studies.

The preponderance of males on admission could reflect either of these, that the male children are more vulnerable to infections or that the society pays more attention to male babies than the female babies in terms of willingness to go further miles for their survival. Several studies, however have reported higher admissions of males more than females.<sup>[10-12]</sup> A study by Hoo *et al.* attributed this sex difference to smaller airway size in young boys than in young girls<sup>[13]</sup> Whereas Alams *et al.* attributes it to possibly cultural factors like preference in seeking medical care for boys.<sup>[14]</sup> A look at Table 2 on the outcome reveals that males were less likely than females to be taken home against medical advice, and no male was taken away in abscondment. This may as well buttress the fact that health care seem to be more invested on the male gender.

The peak period of presentation was found to be between July and September, followed by the period between January and March. These periods correspond to the peak of the rainy season and the peak of the dry season respectively, in Nigeria. The rainy season brings cold and humid weather, while the early dry season of January, February brings hot, dry and dusty weather. Earlier studies done here in Nigeria<sup>[5,15]</sup> recorded a similar peak period particularly between July and November. The study done in Nairobi, Kenya by Ye *et al.*,<sup>[16]</sup> reported a peak period between April and June which corresponds to the rainy season in Nairobi. Rainfall and humidity have been identified as possible risk factors to pneumonia in children.<sup>[17]</sup> This then implies that people need to be more prepared and pro-active towards preventing, particularly, the acute respiratory tract infections during these seasons. Most upper respiratory tract infections, like common cold, may not warrant admission but if not properly managed, could progress to lower respiratory tract infections, which may likely need admission into the hospital for management. Thus, early identification, early presentation and diagnosis of respiratory tract infections with prompt, treatment, especially during the rainy season may help to reduce morbidity and mortality from such infections.

Bronchopneumonia was the commonest respiratory case admitted followed by Pulmonary tuberculosis that was seen amongst the children aged 1–5 years. This age group is not out of place, since the so called favored age group in Tuberculosis, is between 5 and 14 years.<sup>[18]</sup> However, it must be stated that six out the cases of Tuberculosis had background RVD, which, most likely, made them vulnerable.<sup>[19]</sup>

For those that had Lobar pneumonias, right sided Lobar pneumonia (66.7%) was found to be more common than the left sided lobar pneumonia (33.3%), which may be alluded to the anatomical disposition of the right bronchus, which favors easier entry of matter.

It was interesting to find a high request (66.5%) of radiological investigation (chest X-ray) in most of the cases. Nevertheless, such request is not out of place in a tertiary institution such as the study area. In as much as a chest radiograph may not be a pre-requisite for managing respiratory tract infections, its use is not being discouraged, rather a sharp clinical acumen and judgment is being emphasized and advocated especially in resource poor countries, like ours, where such investigations may either not be accessible or affordable. There is no doubt that certain respiratory tract infections may strictly need radiographs for diagnostic support and proper management. Swingler<sup>[20]</sup> in a systematic review, found no significant correlation between radiological findings and clinical/aetiological diagnosis of pneumonia in children, since some cases of pneumonia may present with normal chest X-ray, while some simple cases of upper respiratory tract infections would present with abnormal chest X-ray. He noted that these were as a result of poor quality films and lack of expertise in reporting. Shaikh *et al.*<sup>[21]</sup> in their study made similar observations, that nearly half of the children with pneumonia and those who grew organisms from the oropharyngeal swabs had normal chest radiograph.

Indeed, sometimes the request for chest radiographs may result to wasting of the meager financial resources of the financially poor patients as is common with developing countries. Emphasis on chest radiographs may also constitute delay in treatment and increase the risk for mortality, although in this study 61.1% (11/18) of the mortality cases had radiological investigations while 38.9% had not with no statistical significance.

A greater percentage of patients (88.3%, 211/239) were discharged home while 7.5% (18/239) died while on admission. In this study, the highest mortality was recorded amongst children aged between one and 5 years old, mainly due to Bronchopneumonia. It has been documented that Pneumonia is the leading cause of death in children under the age of 5 years, more than AIDS, Malaria and Measles put together according to the UNICEF report in 2008.<sup>[22]</sup> It is notable that most of the mortality was recorded amongst children of the first to third birth order. A study by Lawoyin<sup>[23]</sup> on the risk factors for infant mortality in a rural community in Nigeria found specifically that children of the first birth order were associated with higher risk of mortality. This may be explained by the relative inexperience of the mothers at the time of their first child.

The contributory effects of malnutrition and poor immunization status to mortality in this review were obviously significant as shown in Table 2. A significant correlation was found between mortality and nutritional status ( $P < 0.01$ ) as well as with immunization status ( $P = 0.004$  i.e.  $P < 0.01$ ). Majority of the cases that died had either inadequate immunization or inadequate nutrition or both similar to findings by Savitha *et al.*<sup>[9]</sup> Malnutrition is reported as the primary cause of immunodeficiency worldwide. There is a strong relationship

between malnutrition and infection and infant mortality as poor nutrition leaves the child weakened and vulnerable to infection due to loss of epithelial integrity.<sup>[24,25]</sup> Immunization boosts a child's innate immunity against certain infections. Immunization in this study refers to the routinely given vaccines against Tuberculosis, Diphtheria, pertussis and measles are important in reducing respiratory tract infections. These are routinely given vaccines in the study area, according to the National Programme on Immunization (NPI), at no cost to the beneficiaries.<sup>[26]</sup> Haemophilus Influenza type B (Hib) vaccine and the pneumococcal vaccine which are very essential were not yet routinely given in the study area at the period of study. Poor immunization status goes to reflect the health seeking behavior of the care givers of the children since a mother or care giver who would not comply with these freely offered routine immunization may not likely seek or access proper health care management for common childhood infections.

There needs to be an increased awareness campaign on the importance of immunization to improve compliance. This study did not categorically look at limitations to their immunization with respect to access, and there was no significant correlation between places of residence (i.e. rural vs. urban) and outcome ( $P = 0.93$ ). Poverty and ignorance beget malnutrition and so more active efforts must be applied to eradicate extreme hunger and poverty as in the Millenium Development Goal 1 for a healthier nation.<sup>[27]</sup>

### Limitation to the study

Inappropriate and incomplete documentation of some information in the case notes posed a challenge to our study. With the study being retrospective, the importance of the pattern and duration of breast feeding in relation to this study could not be highlighted because of incomplete information on this from the folders. We could not identify the causative organisms largely because they were not investigated for in most cases either due to lack of facilities or by omission. A microbial etiological diagnosis is recommended in future prospective studies. The small number of subjects over the study period may also be considered as a limitation.

It may be necessary to note that health facility-based surveillance is affected by healthcare seeking patterns for ARI, which may vary by population group and over time.

### Conclusion

Bronchopneumonia, an acute lower respiratory infection, was found to be the commonest respiratory case admission and a significant cause of morbidity and mortality with a peak occurrence in the rainy season. Mortality was significantly associated with inadequate nutrition and inadequate immunization. Hib and the pneumococcal vaccines though not routinely given in Nigeria should be advocated, while compliance to the existing NPI should be encouraged.

Respiratory tract infections still remain an important cause of childhood morbidity and mortality especially in the under-five age group. For the millennium development goal 3<sup>[27]</sup> to be achieved, it is recommended that emphasis should be on anticipatory guidance and prevention by encouraging proper education of mothers, for their better understanding and utilization of the child survival strategies especially immunization and appropriate nutrition.

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