

## Original Research Article

### The Pattern of Respiratory Diseases among Children Admitted in the Children Emergency Ward, University of Port Harcourt Teaching Hospital, Rivers State.

#### ABSTRACT

**Aims:**Respiratory diseases are common causes of childhood morbidity and mortality worldwide. Variations in the pattern of respiratory diseases exist globally, due to environmental conditions, poverty, hygiene and so on. This study sought to determine the pattern of respiratory diseases among children admitted to the emergency ward.

**Study design:**Retrospective case series study.

**Place and Duration of Study:**Children Emergency Ward of the University of Port HarcourtTeaching Hospital, between January 2019 and January 2021.

**Methodology:**This was a retrospective case series study. Data were collected from case notes of 3,851 children, aged two months to 18 years, admitted to the University of Port Harcourt Teaching Hospital, over three years.

**Results:**Respiratory diseases accounted for 500 (13%) of the total admissions, and were commoner in males than females (M: F = 1.3:1).The mean age of children with respiratory illnesses was  $2.27 \pm 4.6$  years. Males were 1.2 times more likely to have respiratory morbidity compared to females. Infectious causes {443 (88.6%)} were significantly higher than non-infectious causes {57 (11.4%)},  $p < 0.001$ . Bronchopneumonia, bronchial asthma and bronchiolitis were the commonest morbidities seen, accounting for 394 (78.8%), 34 (6.8%) and 22 (4.4%) of cases respectively.

**Conclusion:**The prevalence of respiratory diseases is high. This results in a strain in the healthcare system and impacts negatively on the quality of life of children. Practical measures are needed to address this as its causes are largely preventable.

*Keywords: (Pattern, respiratory, diseases, children)*

#### 1. INTRODUCTION

A wide range of diseases affect the respiratory system. These may include non-life-threatening conditions like common cold, tonsillitis, bronchiolitis to severe disorders such as tuberculosis, pneumonia, asthma and foreign body aspiration.[1] These disorders can affect any part of the airway, whether upper or lower and may be of infectious or non-infectious origin.[2]

Infections of the respiratory system are a major cause of hospital admissions,[3] illnesses, and death globally.[4] A systematic analysis of the global burden of diseases reported that lower respiratory tract infections alone are responsible for 2.74 million fatalities and 103 million disability-adjusted life years among children and adults.[5] Furthermore, the World Health Organization (WHO) had documented that about 10.6 million children less than five years die each year as a result of acute respiratory infections (ARI), with pneumonia accounting for about 19% of all deaths.[6] and contributing significantly to hospital admissions.[7,8] In a study done in Tanzania, pneumonia and pulmonary tuberculosis accounted for 82.1% mortality among the study population.[9] In Nigeria, pneumonia was responsible for about 20% of mortalities in children less than five years<sup>3</sup> and has been reported to be a leading cause of hospital admissions.[3,10-13] In a study carried out among

**Comment [EN1]:** The ratio in your abstract is different from the one in your results (1.3:1 vs 1.5:1)

**Comment [EN2]:** What is the real mean age, because this one ( $2.27 \pm 4.6$  years) is different from  $4.6 \pm 4.2$  years in your results

**Comment [EN3]:** Your study doesn't prove it, in your results there was no significant difference between gender

children in Port Harcourt, the prevalence of pneumonia was 13.2% and was observed to be a leading cause of morbidity and mortality in the region.<sup>13</sup> Asthma, on the other hand, is a leading cause of non-infectious respiratory disorder among children and adults and has been projected to be responsible for  $\leq 0.7$  per 100 000 death rates in children.[14]

The direct and indirect costs of diagnosis and treatment for respiratory disorders place a major financial burden on the healthcare system and individual families.[15] This is particularly true for low-middle-income countries, where infectious causes of respiratory diseases predominate and the cost of care is largely out of pocket. In Nigeria, studies have been done in different locations, to determine the pattern of respiratory diseases..[11,16] However, due to different climatic and environmental factors, results differ from region to regions.[16] In addition, illegal oil exploration activities in Port Harcourt, which have been responsible for the outbreak of black soot contribute to environmental pollution and may have an impact on the state's respiratory disease pattern.[15] Therefore, regular health facility-based assessments of child health is necessary to provide information needed for evidence-based decisions and policy making that will reduce morbidity and mortality in childhood.[17] The aim of this study was to determine the pattern of respiratory diseases among children admitted in the emergency ward of the University of Port Harcourt Teaching Hospital, Rivers State.

## 2. MATERIAL AND METHODS

### 2.1 Study design/setting

This was a retrospective cross sectional descriptive study carried out over three months (June – August 2022), among children who presented to the children emergency ward (CHEW) of the University of Port-Harcourt Teaching Hospital (UPTH). The University of Port Harcourt Teaching Hospital is a tertiary hospital located at the Southern part of Nigeria. The hospital is a referral centre for both public and private hospitals within and outside the state. Patients are also seen on self-referral.

The Paediatric department has several wards including the CHEW. The CHEW is where all children aged 1 months to 17 years, who present with emergencies are first stabilized and managed.

**2.2 Study population:** All children aged 1 month to 17 year who were admitted into the CHEW between January 2019 – January 2021 with a diagnosis of a respiratory pathology.

### 2.3 Methods

The records of patients admitted into the emergency ward between January 2019 - January 2021 were obtained from the emergency record. Their folder numbers and the diagnosis made were obtained. Hospital records of patients with a diagnosis of respiratory disorder were retrieved from the hospital record office. The diagnosis of respiratory diseases was made following a detailed medical history, clinical examination and relevant laboratory and radiologic investigations. Information obtained from the case notes retrieved were: Age of patient, sex, month in which patient was admitted and diagnosis. Data was entered into excel; was exported to SPSS after data cleaning was done.

### 2.4 Data Analysis

A descriptive analysis was done using IBM statistical product and service solution (SPSS) version 25. Results were presented as frequency tables, percentages and charts. Student t-test was used to determine age differences while Chi square test was done to compare subgroups. A p value of  $\leq 0.05$  was considered significant.

## 3. RESULTS AND DISCUSSION

A total of 3,857 patients were seen in the CHEW. Two thousand and seventy-two (53.8%) were males while 1779 (46.2%) were females. Five hundred (13%) had respiratory diseases.

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Males were 1.2 times more likely than their female counterpart to have respiratory diseases (OR 1.2, 95% CI 0.97-1.49). There was no significant sex difference in the distribution of respiratory diseases,  $p = 0.08$  (Table I).

**Table I: Prevalence of Respiratory Diseases and Sex Distribution in the Study Population**

Variables	Respiratory	Diseases	
Sex	Yes	No	Total
Male	287 (13.9%)	1,785 (86.1%)	2,072 (100.0%)
Female	213 (12.0%)	1,566 (88.0%)	1,779 (100.0%)
<b>Total</b>	<b>500 (13%)</b>	<b>3,351 (87.0%)</b>	<b>3,851 (100.0%)</b>

$\chi^2 = 2.98$ ,  $DF = 1$ ,  $P = .08$ .  $OR = 1.2$ ,  $95\% CI = .97-1.49$

Table II shows the distribution of respiratory diseases among study participants based on their ages, sex, aetiology and season of presentation.

Of the 500 participants who had respiratory diseases, 262 (52.4%) of them were males, giving a male to female ratio of 1.5:1. Their ages ranged from 4 months to 10 years with a mean age of  $4.6 \pm 4.2$  years, the mean age for the males was  $4.7.5 \pm 2.3$  years while that of females was  $4.9 \pm 1.9$  years. This was not significant;  $t = 1.30$ ,  $p = .20$

Concerning the proportion of respiratory disease by age group, 262 (52.4%) of the participants were less than a year old, this was followed by 174 (34.8%) children aged 1-5 years. Four hundred and forty-three (88.6%) of the cases were of infectious origin. Three hundred and twenty-two (64.4%) of the cases occurred during the dry season.

**Table II: Distribution of Respiratory Diseases by Age, Sex, Aetiology and Seasonal Variation**

Variable	Frequency (n)	Percentage (%)
<b>Distribution of Respiratory Diseases by:</b>		
<b>Sex</b>		
Male	287	57.4
Female	213	42.6
<b>Total</b>	<b>500</b>	<b>100.0</b>
<b>Age</b>		
<1 year	262	52.4
1-<5 years	174	34.8

**Comment [EN5]:** 287 males or 262 males ? I notice great difference between your text and your tables

5-10 years	35	7.0
10 years	29	5.8
<b>Total</b>	<b>500</b>	<b>100.0</b>
<b>Aetiology</b>		
Infectious	443	88.6
Non-infectious	57	11.4
<b>Total</b>	<b>100</b>	<b>100.0</b>
<b>Seasonal Variation</b>		
Rainy season	178	35.6
Dry season	322	64.4
<b>Total</b>	<b>500</b>	<b>100.0</b>

*Mean age 4.6±4.2 years; Males 4.7.5±2.3 years; Females 4.9± 1.9 years; t=1.30, p=.20*

Table III shows the types of respiratory diseases the children presented with. Bronchopneumonia was the highest and was seen in 394 (78.8%) participants, while the least diagnosed was pertussis as seen in 3(0.6%) participants.

**Table III: Types of Respiratory Diseases Admitted in the Children Emergency Ward**

<b>Respiratory Diseases</b>	<b>Frequency (n)</b>	<b>Percentage (%)</b>
Bronchopneumonia	394	78.8
Bronchial Asthma	34	6.8
Bronchiolitis	22	4.4
Adenotonsillitis	12	2.4
Foreign body aspiration	11	2.2
Aspiration Pneumonitis	9	1.8
Croup	4	0.8
Pulmonary Tuberculosis	4	0.8
Lobar Pneumonia	4	0.8
Laryngomalacia	3	0.6
Pertussis	3	0.6

<b>Total</b>	<b>500</b>	<b>100.0</b>
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Concerning the age distribution of the various types of respiratory diseases, 368(93.4%) participants under 5 years of age had pneumonia. Of the 34 participants that had bronchial asthma, 24(70.6%) of them were five years and above (Table IV).

**Table IV: Age Distribution of Respiratory Diseases Admitted in the Children Emergency Ward**

Variables	Age groups				Total (%)
	< 1 year	1 - <5 year	5 - 10 years	>10 years	
Respiratory Diseases					
Bronchopneumonia	234 (59.4)	134 (34.0)	15 (3.8)	11 (2.8)	394 (100.0)
Bronchial Asthma	0 (0.0)	10 (29.4)	12 (35.3)	12 (35.3)	34 (100.0)
Bronchiolitis	14 (63.6)	8 (36.4)	0 (0.0)	0 (0.0)	22 (100.0)
Adenotonsillitis	1 (8.3)	7 (58.3)	2 (16.7)	2 (16.7)	12 (100.0)
Foreign body aspiration	2 (18.2)	8 (72.7)	1 (9.1)	0 (0.0)	11 (100.0)
Aspiration Pneumonitis	5 (55.6)	3 (33.3)	1 (11.1)	0 (0.0)	9 (100.0)
Croup	1 (25.0)	2 (50.0)	1 (25.0)	0 (0.0)	4 (100.0)
Pulmonary Tuberculosis	1 (25.0)	0 (0.0)	1 (25.0)	2 (50.0)	4 (100.0)
Lobar Pneumonia	0 (0.0)	0 (0.0)	2 (50.0)	2 (50.0)	4 (100.0)
Laryngomalacia	3 (100.0)	0 (0.0)	0 (0.0)	0 (0.0)	3 (100.0)
Pertussis	1 (33.3)	2 (66.7)	0 (0.0)	0 (0.0)	3 (100.0)
<b>Total (%)</b>	<b>262 (52.4)</b>	<b>174 (34.8)</b>	<b>35 (7.0)</b>	<b>29 (5.8)</b>	<b>500 (100.0)</b>

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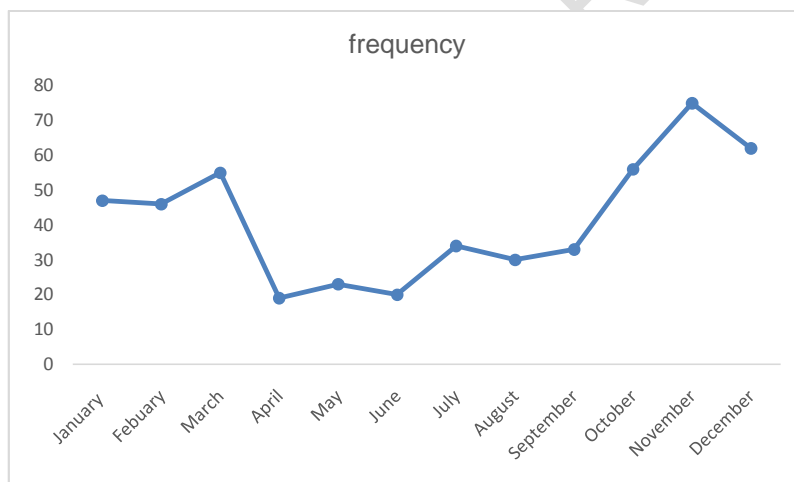
Of the 500 participants with respiratory diseases 322(64.4%) presented during the dry season, while 178 (35.6%) presented during the rainy season. The seasonal variation in the prevalence of respiratory diseases was statistically significant  $P < 0.001$ . (Table V)

**Table V: Relationship between the Seasons of the Year and the Proportion of Respiratory Diseases by Aetiology**

Variables	Season of the Year		
	Raining	Dry	Total
<b>Respiratory Disease Category</b>			
<b>Infectious</b>	146 (33.0)	297 (67.0)	<b>443 (100.0%)</b>
<b>Non-Infectious</b>	32 (56.1)	25 (43.9)	<b>57 (100.0%)</b>
<b>Total</b>	<b>178 (35.6)</b>	<b>322 (64.4)</b>	<b>500 (100.0%)</b>

$\chi^2 = 11.82, DF = 1, p = .0005$

Figure 1 shows the trend of respiratory diseases according to the various month of the year. The peak period of presentation was between October /November while the lowest was between April and June.



**Fig. 1: Trend of respiratory diseases according to the various months**

This study shows that respiratory diseases contribute significantly to admissions in the Children Emergency Ward (CHEW), accounting for 13.9% of all admissions during this period. This finding is lower than the 25.7% recorded by George and Tabansi in 2010, [17] despite the fact that both studies were conducted in the same location. Although, the proportion of children who received their immunization was not part of this study, the lower prevalence observed of respiratory diseases in this study may be attributed to Nigeria's incorporation of the Haemophilus influenza (type b) and Pneumococcal Conjugate Vaccines into the National Programme for Immunisation (NPI) schedule, thereby making these vaccines readily available to eligible children at no financial cost. Other studies carried out in

**Comment [EN7]:** table V shows that there were more patients with non infectious respiratory diseases during (OR: 4.56 ) raining season than dry season , but it doesn't prove seasonal variation in the prevalence.

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Southern Nigeria [2,11] also recorded higher prevalence for respiratory diseases compared to the index study. This may be because these studies reviewed patient's records over a longer period when compared to the present study. Since the aetiology of respiratory diseases among children in Nigeria are mostly due to infections, [2,13] scaling up immunization coverage to target preventable causes can significantly reduce its prevalence.

Majority of the subjects with respiratory diseases were under five years, similar to findings by Ibraheem *et al* [16] and Yiltoket *et al* [12]. The reason for this observation may be due to smaller airway diameters in this age group that can increase the risk of blockage by secretions, less compliant lungs and immature immune systems. [19,20] This further buttresses the need to advocate for favourable health policies in children, particularly in this vulnerable age group, as a key to reducing childhood morbidity and mortality.

Although the proportion of respiratory pathology was slightly higher in males than females, this difference was not significant. The reason for this is not immediately apparent. However, a plausible explanation may be because of the preference bestowed on the male child by our tradition/culture, thus, parents do not delay to bring them to the hospital once they are ill.

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Respiratory diseases due to infectious causes were significantly higher than non-infectious causes, similar to what was reported in other studies. [2,3,11] This may be due to poor hygienic conditions, fuelled by poverty and overcrowding that is still prevalent in our environment. Of the infectious causes, pneumonia was the commonest observed in this study and was higher than the 46.09% reported by Oloyede *et al* [11]. The reason for this difference may be due to the prevalent black soot pollution present in the state where the index study was done, even though both studies were carried out in locations with similar mangrove swamps and tropical rainforests with prolonged rainy seasons.

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It is important to note the low number of tuberculosis case in this study compared to older studies. [2,3] This may be due to devolvement of some aspects of tuberculosis care to primary health centres within the communities, thereby improving access to anti-TB drugs. Additionally, the use of HAART by HIV-infected mothers may have also resulted in a decrease in children infected with HIV, thereby reducing the risk of HIV-TB co-infection.

Bronchial asthma was the commonest non-infectious respiratory disorder, similar to what was obtained in other studies, [2,11] With the high level of soot in Port Harcourt [15] it was expected that the prevalence of asthma would have been higher in this study, we however had a low prevalence of 6.8% which is within the 1-18% reported by the Global Initiative for Asthma. [21] The low prevalence may be attributed to the age of the study participants as more than half of them were less than five years of age and it has been reported that asthma is more common among the older age group compared to children less than 5 years. [14] It could also be possible that the patients and caregivers have a better knowledge of managing Asthma at home making them to present less in the emergency room.

Contrary to other studies, [4,5] this study showed significantly higher cases of respiratory diseases during dry seasons compared to the rainy seasons. Similarly, another study in Rivers State [14] reported an increase in acute respiratory infections among under-fives during dry season, although their finding was not statistically significant. This observation may be due to the absence of rainfall to wash away environmental/atmospheric black soot that is usually more marked during the dry season. Increased dust and sporulation of plants, resulting in the air being polluted by pathogens and pollens have also been proposed as plausible explanations. [11,12,22]

**Comment [EN11]:** Your study doesn't prove it

#### 4. CONCLUSION

The prevalence of respiratory diseases is high. This results in a strain on the family's finances, healthcare system, thereby impacting negatively on the quality of life of children, particularly under-fives. Practical measures such as health education, advocacy, functional health insurance and implementation of existing health policies are needed to address this burden, as its causes are largely preventable.

#### REFERENCES

1. Lozano R, Naghavi M, Foreman K, Lim S, Shibuya K, Aboyans V, et al. Global and regional mortality from 235 causes of death for 20 age groups in 1990 and 2010: A systematic analysis for the Global Burden of Disease Study 2010. *Lancet*.2012;380:2095-128. doi: 10.1016/S0140-6736(12)61728-0
2. Ogonu T, Ayuk CA, Edelu BO, Ndu IK. Pattern of respiratory diseases in children presenting to the paediatric emergency unit of the University of Nigeria Teaching Hospital, Enugu: A case series report. *BMC Pulmonary Medicine*. 2014;14:101. DOI: 10.1186/1471-2466-14-101
3. Akanbi MO, Ukoli CO, Erhabor GE, Akanbi FO, Gordon SB: The burden of respiratory disease in Nigeria. *Afri J Resp Med* 2009, 4:10–17.
4. Liu L, Oza S, Hogan D, Perin J, Rudan I, Lawn JE, et al. Global, regional, and national causes of child mortality in 2000–13, with projections to inform post-2015 priorities: an updated systematic analysis. *The Lancet* 2015;385(9966):430–40.
5. Abubakar II, Tillmann T, Benerjee A, Global, regional and national age-sex specific all-cause and cause-specific mortality for 240 causes of death, 1990–2013: a systematic analysis for the Global Burden of Disease Study 2013. *Lancet* 385: 117-171. [http://doi.org/10.1016/S0140-6736\(14\)61682-2](http://doi.org/10.1016/S0140-6736(14)61682-2)
6. Bryce J, Boschi-Pinto C, Shibuya K, Black RE. WHO Child Health: Epidemiology Reference Group. WHO estimates of the causes of death in children. *Lancet* 2005, 365:1147–52.
7. Yorita KL, Holman RC, Sejvar JJ, Steiner CA, Schonberger LB. Infectious disease hospitalizations among infants in the United States. *Pediatrics* 2008;121:244-52.
8. Carville KS, Lehmann D, Hall G, Moore H, Richmond P, de Klerk N, et al. Infection is the major component of the disease burden in aboriginal and non-aboriginal Australian children: A population-based study. *Pediatr Infect Dis J* 2007;26:210-6.
9. Kishamawe C, Rumishi SF, Mremi IR, Bwana VM, Chiduo MG et al. Trends, patterns and causes of respiratory disease mortality among inpatients in Tanzania, 2006–2015 *Trop Med Intl Health* 2019;24:91-100.
10. Abhulimhen-Iyoha BI, Okolo AA: Morbidity and mortality of childhood illnesses at the emergency paediatric unit of the University of Benin Teaching Hospital, Benin city. *Niger J Paed* 2012, 39:71–74. DOI:<http://dx.doi.org/10.4314/njp.v39i2>.
11. Oloyede IP, Ekriipo UE. Epidemiological and morbidity pattern of respiratory diseases in children admitted in the paediatric ward of a tertiary hospital in Southern Nigeria. *Ibom Med J*. 2020;13:73-80.
12. Yiltok ES, Akhiwu HO, Yilgwan CS, Ejeliogu EU, John C. Pattern and Trends of Respiratory Disease Admissions at the Emergency Paediatrics Unit of Jos University Teaching Hospital – A Four Year Review. *BJMMR* 2017; 22: 1-6. DOI: 10.9734/BJMMR/2017/34099
13. Gabriel-Job N, Azubogu U.S. Prevalence and Pattern of Pneumonia among Children Admitted into University of Port Harcourt Teaching Hospital: A Two-Year Review. *International Journal of Tropical Disease & Health* 2019; 40(2): 1-6

14. Asher I, Pearce N. Global burden of asthma among children. *Int J Tuberc Lung Dis* 2014;18(11):1269–78.
15. Fienemika AE, Ojule IN, Best O. Prevalence of Acute Respiratory Infections among Children Under-Five Years old in a Hospital in Port Harcourt, Nigeria: A Two-Year Follow-Up study. *R Respir Med* 2018;2:109.
16. Ibraheem RM, Aderemi JA, Abdulkadir MB, Johnson WBR. Burden and spectrum of paediatric respiratory diseases at a referral hospital in North-Central Nigeria- A five-year review. *Afr J Emerg Med.* 2020;10:3-7. <https://doi.org/10.1016/j.afjem.2019.09.001>
17. Ndukwu CI, Onah SK. Pattern and outcome of post neonatal pediatric emergencies in Nnamdi Azikiwe University Teaching Hospital, Nnewi, South East Nigeria. *Niger J Clin Pract.* 2015;18:348-53. **DOI:** 10.4103/1119-3077.153246
18. George IO, Tabansi PN. An audit of cases admitted in the children emergency ward in a Nigerian tertiary hospital. *Pak J Med Sci* 2010;26(3):740-743.
19. Johnson A-WBR, Ibraheem RM, Gobir AA, Aderele WI, Azubuike JC, Nkanginieme KEO, editors. *Pneumonia and other acute lower respiratory infections (ALRI)*. Lagos, Nigeria: Educational Printing and Publishing Ltd; 2016. p. 1325–72. *Paediatrics and Child Health in a Tropical Region* 3rd ed.
20. Johnson A-WBR, Gobir AA, Abdulkadir MB, Ibraheem RM. Acute upper respiratory infections (URI). In: Azubuike JC, Nkanginieme KEO, editors. *Paediatrics and child health in a tropical region*. 3rd ed. Lagos, Nigeria: Educational Printing and Publishing Ltd; 2016. p. 1265–324.
21. Global Initiative for Asthma (GINA). *Global strategy for Asthma management and prevention* (2020).
22. Ezeonu CT, Uneke CJ, Ojukwu JO, Anyanwu OU, Okike CO, Ezeanosike OB, et al. The pattern of pediatric respiratory illnesses admitted in Ebonyi State University Teaching Hospital South-East Nigeria. *Ann Med Health Sci Res.* 2015;5:65-70.