ORIGINAL ARTICLE

Respiratory Illnesses Presenting to The Children's Emergency Room of a Tertiary Hospital in South–East Nigeria: A Retrospective Study

Ogochukwu C **OFIAELI**[1]
Chizalu I **NDUKWU**[1]
Chisom A **NRI-EZEDI**[1]
Ogochukwu R **OFIAELI**[2]

[1]*Department of Paediatrics*
[2]*Department of Medical Microbiology*

Faculty of Medicine
Nnamdi Azikiwe University
Anambra State, NIGERIA

Author for Correspondence
Dr Ogochukwu C **OFIAELI**
Department of Paediatrics
Nnamdi Azikiwe University
Teaching Hospital
PMB 5025 Nnewi
Anambra State, NIGERIA

Phone: +234 803 474 6680
Email:
ofiaeliogochukwuchioma@gmail.com
oc.ofiaeli@unizik.edu.ng

Received: March 17th, 2020
Accepted: June 30th, 2020

DISCLOSURE
There was no conflict of interest nor external source of funds

ABSTRACT

Background: Respiratory illnesses are a major cause of morbidity and mortality in children worldwide. The impact is more profound in low and middle income countries.

Objective: To determine the pattern of the respiratory illnesses in children that presented to the Children Emergency Room (CHER) of Nnamdi Azikiwe University Teaching Hospital Nnewi, a tertiary hospital in South-East Nigeria, over a 5-year period.

Methodology: Clinical records of all children presenting over a 60-month period (July 2011 to June 2016) were retrieved and analyzed. Their age, gender as well as outcome of admission within 72hours in the CHER were reviewed.

Results: A total of 4622 children were admitted over the specified period. Six hundred and sixty-eight (14.45%) had an Acute Respiratory Illness(ARI). Age range of the children was I month to 17years, mean age was 2.33 (± 3.56) years.

Bronchopneumonia occurring in 27 (41.01 %)children was the most common diagnosis; followed by Bronchiolitis in 78 (11.68%), Aspiration pneumonitis in 41 (6.14%) and Acute Asthma in 40 (5.99%). There was equal gender distribution among the modal age of presentation.

Majority of the cases 367 (54.94%) were transferred to the ward for continued care within 72hours of admission, while 54 (8.08%) died. The aetiology of the respiratory pathology (infectious or not) had a significant association with outcome of 72hours of admission in CHER (p = 0.01).

Conclusion: Prevalence of ARIs among toddlers is still high. Efforts have to be re-enforced in order to reduce the negative impact of respiratory illness on child health and survival in the sub region.

***Key Words**: Acute pulmonary morbidity, Chest infections, Paediatrics, Healthcare centre*

INTRODUCTION

Respiratory illnesses are a major cause of morbidity and mortality in children globally.[1,2] In Nigeria, they are among the main causes of childhood illness and deaths.[3] More than 2 decades ago, Fagbule *et al.* reported as much as

three episodes of Acute Respiratory Illness (ARI) per child per year in a community in Southern Nigeria.[4] They found 2 peak periods of respiratory illness, a major peak between July–November during the rains and the 2nd peak between February and April during the dry season.[4] In India, Mathew *et al.* reported that a fourth of the total deaths in under-5's was due to pneumonia. [5]

Respiratory illnesses feature majorly in emergency room presentations.[6,7,8] In the United States of America (USA), respiratory illnesses have been reported as the second most common cause of emergency room presentation in children.[9] In Nigeria, Oguonu *et al.* reported that 24.7% of the emergency room visits in children were due to respiratory diseases.[10] A large percentage of these presentations, as well as admissions into the paediatric ward have been attributed to bronchopneumonia.[11,12] Determining the acute paediatric respiratory presentations and the associated outcomes will augment information needed for child health management and adequate health system structuring.

This research was carried out to gain insight into the respiratory illnesses that presented to the Children Emergency Room (CHER) of Nnamdi Azikiwe University Teaching Hospital (NAUTH)Nnewi, Anambra state, South-East Nigeria. The study also ascertained the age and gender distribution of these presentations, their outcome within 72 hours of admission as well as the peak months for those presentations.

METHODOLOGY

NAUTH Nnewi is located in Nnewi North Local Government Area of Anambra state, South-East Nigeria and is the only Federal Teaching Hospital in the state. It provides a 24 hour CHER service and caters to the emergency health needs of children in Anambra state and environs. Children aged 2 weeks to 18 years were admitted into the CHER including both medical and surgical emergencies. Diagnoses were arrived at on presentation mostly based on history and physical examination supported by relevant laboratory investigations and imaging as applicable.

Health records of all children that presented over the 60-month period were extracted from CHER registry and analyzed. The diagnosis at presentation, demographic information and outcome of admission were noted. Chi square analysis was used to test for associations. Data was analyzed using SPSS 21, and a p-value < 0.05 was considered significant.

RESULTS

A total of 4622 children were admitted over the specified period. Six hundred and sixty-eight (14.45%) had an Acute Respiratory Illness. There were 418 (62.57%) males and 250 (37.43%) females with a male to female ratio of 1.7:1. Age range of the children was one month to 17 years, mean age was 2.33 (± 3.56) years and the most frequent age among the children who had presented with a respiratory illness was one year. Table 1 shows the distribution of the study subjects by age category.

The greater proportion of the presentations were due to infectious diseases (554, 82.8%). The most common diagnosis was bronchopneumonia in 274(41%) children; followed by bronchiolitis in 78 (11.7%), aspiration pneumonitis in 41(6.1%) and acute asthma in 40(6%). There was equal gender distribution among one year olds, which was the modal age of presentation. Table 2 gives details of the respiratory illnesses.

The observed peak periods of presentation of respiratory illnesses were May to July and February to March. Presentations of infectious respiratory diseases remained above 25% all year round (Figure 1). The month of presentation had no significant association with the type of the respiratory illness (p = 0.56, CI = 0.54 to 0.57). Males in the age category of 0-5 years had the greatest proportion of respiratory illness (Table 3). Age had a significant association with the aetiology of the respiratory illness (p = 0.001) but gender did not (p = 0.13, CI = 0.12 to 0.14).

Among these presentations, 367(54.9%) were transferred to the ward after 72 hours of admission while 54(8.1%) died. The rest were discharged home. Deaths due to infectious disease contributed the greater proportion of deaths from respiratory illness (Table 4). Co-morbidities were found in 38.4% of the children that presented with respiratory illness (the greater proportion of which were infectious) – Table 5. The presence of co-morbidities in other systems had a significant association with the etiology of respiratory illness (p = 0.001).

Table 1. Age and gender distribution of the study subjects

Characteristic	Frequency	Percentage
Age category (in years)		
0-5	582	87.13
6-11	55	8.23
12-17	31	4.64
Total	**668**	**100.00**

Table 2. Respiratory illnesses that presented during the study period

Respiratory illness	Freq	%
Infectious		
Bronchiolitis	78	11.7
Bronchopneumonia	274	41.0
Lobar pneumonia	21	3.1
Pleural effusion	12	1.8
PTB	39	5.8
Rhino sinusitis	35	5.2
Pharyngotonsillitis	79	11.8
Pertusis	4	0.6
Diphtheria	1	0.1
Pneumothorax	2	0.3
Croup	2	0.3
Others	7	1.0
Total	**554**	**82.9**
Non-Infectious		
Acute asthma	40	6.0
Aspiration pneumonia/pneumonitis	41	6.1
Acute FB aspiration	28	4.2
Others	5	0.7
Total	**114**	**17.1**
Grand total	**668**	**100.0**

PTB – Pulmonary tuberculosis, FB – foreign body

Figure 1. Respiratory illnesses by month of presentation

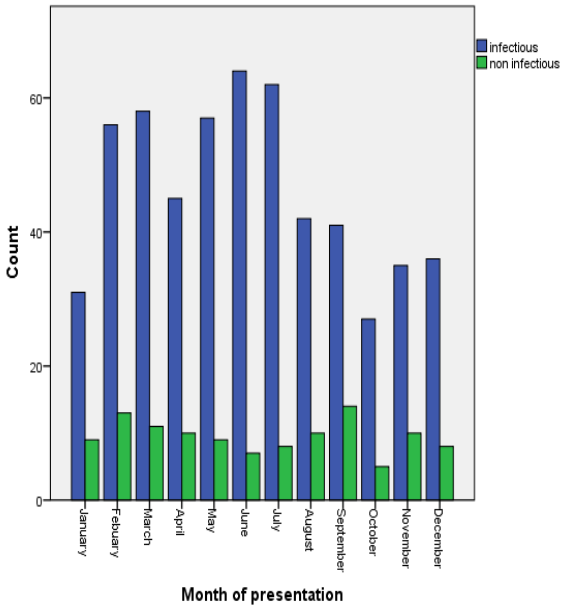

Table 3. Age and gender distribution of the respiratory illnesses

Gender	Age category (in years)	Respiratory illness		Total
		Infectious (%)	Non-infectious (%)	
Male	0-5	314 (85.6)	53 (14.4)	367 (100.0)
	6-11	20 (57.1)	15 (42.9)	35 (100.0)
	12-17	11 (68.8)	5 (31.3)	16 (100.0)
	Total	**344 (82.5)**	**73 (17.5)**	**418 (100.0)**
Female	0-5	188 (87.4)	27 (12.6)	215 (100.0)
	6-11	14 (70.0)	6 (30.0)	20 (100.0)
	12-17	8 (53.3)	7 (46.7)	15 (100.0)
	Total	**210 (84.0)**	**40 (16.0)**	**250 (100.0)**

Table 4. Outcome of the admissions within 72hours in CHER

Admission outcome	Respiratory illness		Total	*p*-value
	Infectious (%)	Non-infectious (%)		
Death	41 (75.9)	13 (24.1)	54 (100.0)	***0.01**
Ward	323 (88.0)	44 (12.0)	367(100.0)	
Home	190 (76.9)	57 (23.1)	247 (100.0)	
Total	**554 (82.9)**	**114 (17.1)**	**668 (100.0)**	

Chi-square – test of association. *Significant, $p<0.05$

Table 5. Distribution of the respiratory illnesses by presence of other co-morbidities

Co-morbidities in other systems	Respiratory illness		Total
	Infectious (%)	Non-infectious (%)	
Yes	243 (94.6)	14 (5.4)	257 (100.0)
No	311 (78.7)	100 (24.3)	411 (100.0)
Total	**554 (82.9)**	**114 (17.1)**	**668 (100.0)**

DISCUSSION

This study showed a high prevalence of respiratory illness. This is in line with studies from other parts of Nigeria that have reported high prevalence of respiratory disease in children especially amongst those aged less than 5 years.[7,8,10,11,12,13] With care being sought for only 44.1% of children with ARI in West Africa, a much higher prevalence may possibly be obtained from a community based survey.[14] The prevalence of 14.5% is however less than those from other parts of Nigeria.[7,8,10-13]This reduction may be accounted for by the improving health care services in the sub region.

Over 87% of the patients in this study were aged between 1 and 5 years. This is higher than the 75% reported by Oguonu *et al.* in Enugu.[10] ARIs are a major cause of admissions for children especially those less than 5 years because of their weaker immune system, shorter respiratory passage ways and exposure to more risk factors.

Pneumonia was found to be the commonest cause of respiratory morbidity in children in this study. This is similar to earlier reports.[6,10,11,12] The lower prevalence observed in this study, compared to the report by Oguonu *et al.* and Ezeonu *et al.* may be due to the effect of introduction of *Haemophilus Influenza* B (HIB) vaccine as part of the pentavalent vaccine to the National Programme on Immunization in Nigeria in 2012 and pneumococcal vaccine(PCV) in 2014.[10,12,15,16] *Haemophilus influenza* type B and *Streptococcus pnuemoniae* are responsible for a significant proportion of pneumonias in children, especially in those aged less than 5 years.[17] In the United States, there was approximately 41000 fewer admissions in one year in children less than 2 years following the introduction of PCV.[18] Further studies however may be necessary for more region specific institutionalized comparative studies in the era before and after the introduction of these two vaccines to better understand the effect.

Aspiration pneumonitis was a major cause of non-infectious morbidity in this study with kerosene aspiration being the most recurring substance. The prevalence of aspiration pneumonitis in this study was much higher than what was reported by Oguonu *et al.* and Ezeonu *et al.*[10,12] Unintentional ingestion of poisonous substances especially kerosene in Nigeria is not uncommon in young children.[19,20] This may be a pointer to carelessness of adults in leaving household chemicals within the reach of children. Kerosene is a hydrocarbon with low viscosity, high volatility and low surface tension, properties which aid its penetration into the tracheobronchial tree, causing displacement of alveolar gas and enhancing spread over the lung tissue.[21] Thus, kerosene has a high aspiration potential. Unfortunately, it is found in most homes where they are mostly inappropriately stored and at risk of inadvertent consumption by vulnerable children especially in the hot season.[19,20]

Respiratory illnesses remained high all year round and similar findings were reported by Oguonu *et al.*[10.] This could be accounted for by the fairly high all year round humidity in the South-East of Nigeria which can create a favourable milieu for respiratory tract infections.[22] Observed peaks in respiratory illness in this study were in February to March and May to July. Though this slightly varied from what was reported by Oguonu *et al.* and Ezeonu *et al.*, these periods still correspond to high humidity and rainy periods in the South-East of Nigeria.

More males suffered both infectious and non-infectious respiratory illness in this study. Males have been reported to have a higher susceptibility to infectious pathogens and to come down more with respiratory illness compared to the females.[23,24] Genetic disposition can account for this.[23,24] Most of the admissions for respiratory illness in this study survived the first 72hours of presentation. This was also observed by Oguonu *et al.* Improved and specialized care as well as the round clock services offered in CHER can account for this. The observed mortality of 8.1% however exceeded the 0.5% reported by Oguonu *et al.*[2]. Majority of the cases that ended in mortality presented with an infectious respiratory pathology.

A good proportion of the respiratory illnesses observed in this study presented with other morbidities (Table 5). Most children rarely present with a single illness and this is most likely due to their immature immune system; more so in sub Saharan Africa where a lot of socio-economic and demographic factors affect

child health and wellbeing.[25] An integrated approach to the management of childhood illnesses will go a long way to ensure that all health problems at the time of presentation to a health facility are well addressed.

CONCLUSION

Respiratory illnesses constitute a major proportion of children emergency room presentations. The mortality associated with these diseases is still high. Community awareness campaigns as well as prompt and proper referral where necessary will also go a long way to consolidate efforts geared at improving respiratory health in children.

Limitations

Data reported on were drawn from CHER registry. Patients' folders/cards were not accessed individually. This might have provided detailed insight to their illness and management protocol.

REFERENCES

1. Simeos EAF, Cherian T, Chow J, Shahid-Salles SA, Laxminarayan R, John TJ. Acute Respiratory Infections in Children. In: Jamison DT, Breman JG, Measham AR, Alleyne G, Claeson M, Evans DB, *et al,* editors. Disease Control Priorities in Developing Countries [Electronic copy]. 2nd ed.; 2006.
2. Madhi SA, Klugman KP. Acute Respiratory Infections. In: Jamison DT, Feachem RG, Makgoba MW, Bos ER, Baingana FK, Hofman KJ, *et al*, editors. Disease and Mortality in Sub-Saharan Africa [Electronic copy]. 2nd edition; 2006.
3. UNICEF Nigeria. The situation of women and children in Nigeria. Available from: https://www.unicef.org/nigeria/situation-women-and-children-nigeria [Date accessed: September 8. 2020].
4. Fagbule D, Parakoyi DB, Spiegel R. acute respiratory infections in Nigerian Children: prospective cohort study of incidence and case management. *J Trop Pediatr* 1994; 40: 279-284.
5. Mathew JL, Patweri AK, Gupta P, Shah D, Gera T, Gogia S, *et al*. Acute respiratory infection and pneumonia in India: a systematic review of literature for advocacy and action: UNICEF-PHFI series on newborn and child health, India. *Indian Pediatr* 2011; 48: 191-218.
6. Anyanwu OU, Ezeanosike OB, Ezeonu CT. Pattern and outcome of admissions at the children emergency room at the Federal Teaching Hospital Abakiliki. *Afr J Med Health Sci* 2014; 13: 6-10.
7. Ezeonwu BU, Chima OU, Oguonu T, Ikefuna AN, Nwafor I. Morbidity and Mortality Pattern of Childhood Illnesses Seen at the Children Emergency Unit of Federal Medical Center Asaba Nigeria. *Ann Med Health Sci Res*. 2014; 4: 239-244.
8. Abhulimhen-Iyoba 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.
9. Wier LM, Yu H, Owens PL, Washington R. Overview of Children in the Emergency Department, 2010. Healthcare Cost and Utilization Project: Agency for Healthcare Research and Quality. 2013. Available from: https://www.hcup-us.ahrq.gov/reports/statbriefs/sb157.pdf [Date accessed: September 9, 2020].
10. Oguonu 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: a case series report. *BMC Pulmonary Med* 2014; 14: 101-108.
11. Yiltok ES, Akhiwu HO, Yilgwan CS, Ejeliogu EU, John C, Ebonyi AO, *et al*. 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.

12. 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.
13. Ibeziako SN, Ibekwe RC. Pattern and Outcome of Admissions in the Children's Emergency Room of the University of Nigeria Teaching Hospital, Enugu. *Niger J Paed*2002; 29: 103-107.
14. Akinyemi JO, Banda P, De Wet N, Akosile AE, Odimegwu, CO. Household relationships and healthcare seeking behaviour for common childhood illnesses in sub-Saharan Africa: a cross-national mixed effects analysis. *BMC Health Services Research* 2019;19: 308
15. International Vaccine Access Centre. Pneumonia facts and figures: Nigeria. [online] Available at: https://dclnigeria.com/wp-content/uploads/2016/11/IVAC-Pneumonia-Fact-Sheet.pdf [Date accessed: August 10, 2019].
16. World Health Organization Regional Office for Africa. Nigeria Introduces New Vaccine – PCV 10. Available from: https://www.afro.who.int/news/nigeria-introduces-new-vaccine-pcv-10 [Date accessed: August 10, 2019].
17. Qazi S, Weber M, Boschi-Pinto C, Thomas C. Global Action Plan for the Prevention and Control of Pneumonia (GAPP). WHO Library. 2007 Available from: https://apps.who.int/iris/handle/10665/43826 [Date accessed: August 23, 2019].
18. Grijalva CG, Nourti JP, Arbogast PG, Martin SW, Edwards KM, Griffin MR Decline in pneumococcal admissions after routine childhood immunization with pneumococcal conjugate vaccine in the USA: a time series analysis. *Lancet* 2007; 369:1179-1186.
19. Edelu BO, Odetunde OI, Eke CB, Uwaezuoke NA, Oguonu T. Accidental Childhood Poisoning in Enugu, South-East, Nigeria. *Ann Med Health Sci Res* 2016; 6: 168–171.
20. Osaghae DO, Sul G. Accidental childhood poisoning in Benin city: still a problem? *Journal of Biomedical Sciences* 2013; 12: 19-26.
21. Ramnarine M, Santoriello LM. Hydrocarbons Toxicity. Medscape reference. Last updated 2015 August. Available from: https://emedicine.medscape.com/article/1010734-overview#a5 [Date accessed: August 9, 2019].
22. Seasons of the year. Seasons in Nigeria. Last updated 2019. Available from: https://seasonsyear.com/Nigeria#targetText=The%20most%20humid%20regions%20are,from%201600%20to%203000%20mm. [Date accessed: August 10, 2019].
23. Falagas ME, Mourtzoukou EG, Vardakas KZ. Sex differences in the incidence and severity of respiratory tract infections. *Respir Med* 2007; 101: 1845-1863.
24. Muenchhoff M, Goulder PJR. Sex Differences in Pediatric Infectious Diseases. *J Infect Dis* 2014; 209: 120-126.
25. Jamison DT, Feachem RG, Makgoba MW, Bos ER, Baingana FK, Hofman KJ, *et al*, editors. Disease and Mortality in Sub-Saharan Africa. 2nd edition**.** Washington (DC): The International Bank for Reconstruction and Development / The World Bank; 2006. Available from: https://www.ncbi.nlm.nih.gov/pubmed/21290641 [Date accessed: August 14, 2019].