ACR

Ohonsi, Alli, et al; Prevalence of pneumonia and associated complications in children in a tertiary hospital in Nigeria: a five year review (2020-2024). Arch. Clin. Res. (Oct); 9(2):1-6

Prevalence of pneumonia and associated complications in children in a tertiary hospital in Nigeria: a five-year review (2020-2024)

Ohonsi AA,[1,2] Alli JS,[1] Oyewusi MA[1,2]

1. Department of Paediatrics, Irrua Specialist Teaching Hospital, Irrua, Edo State, Nigeria
2. Department of Paediatrics , Ambrose Alli University, Ekpoma, Edo State, Nigeria.

Abstract

Pneumonia is a leading cause of mortality among children globally, accounting for 18% of deaths in those under five years. This retrospective study assessed the prevalence and complications of pneumonia among 771 pediatric patients admitted to a tertiary hospital in South-South Nigeria over a five-year period. Pneumonia was diagnosed in 273 children (35.4%), with infants aged ≤1 year being the most affected (52.1%). Males comprised 59.8% of the patients. Among those with pneumonia, 71 (26.0%) developed complications, with congestive cardiac failure being the most frequent (39.4%), followed by pleural effusion (23.9%) and sepsis (18.3%). Other complications included persistent vomiting, febrile convulsions, septic shock, respiratory failure, pneumothorax, dehydration, and atelectasis. Comorbidities such as acute watery diarrhea, anemic heart failure, failure to thrive, multiple organ dysfunction syndrome, obstructive sleep apnea syndrome, pediatric AIDS, viral myocarditis, upper airway obstruction, and conjunctivitis were also observed. The annual frequency of pneumonia cases peaked in 2022 (25.2%). Although the prevalence of pneumonia was higher in males (66.2%) and infants (67.4%), the association between age, sex, and pneumonia development was not statistically significant. The findings underscore the importance of early diagnosis and management of pneumonia and its complications to reduce morbidity and mortality in children.

***keywords**: Pneumonia, Mortality, Children, Complications, Prevalence, Co-morbidities*

Introduction

Pneumonia is an acute respiratory infection that primarily affects the lungs and is recognized as the leading cause of mortality among young children globally.[1] It remains the most prevalent reason for hospital admissions in respiratory units across numerous healthcare facilities.[2,3,4,5,6] Furthermore, it is the predominant cause of mortality within these units.[6,7] Pneumonia is the most common severe respiratory infection, accounting for 18% of all deaths in children under five years of age, which translates to over 1.3 million fatalities annually.[1] It surpasses HIV and malaria in terms of mortality.[8] In 2004, pneumonia was responsible for 19% of child mortality worldwide, compared to 17% from diarrhea, 8% from malaria, 4% from measles, 3% from injuries, 3% from AIDS, and 8% from other neonatal infections.[9]

Corresponding author Dr. Ohonsi Abimbola
Department of Paediatrics ,
Irrua Specialist Teaching Hospital, Irrua, Nigeria.

The lungs, being vital yet vulnerable organs, are uniquely exposed to the external environment.[10] In healthy individuals, the lungs' alveoli fill with air during respiration. However, in cases of pneumonia, these alveoli become filled with fluid, resulting in painful breathing and restricted oxygen intake. Pneumonia is the leading infectious cause of death among children globally, having claimed the lives of 740,180 children under the age of five in 2019.[9] This accounted for 14% of all deaths in this age group and 22% of deaths among children aged one to five years. The highest mortality rates are observed in southern Asia and sub-Saharan Africa.[1,10] Despite its severity, pneumonia can be prevented through simple interventions and treated with cost-effective, affordable medication and care.

Respiratory infections are considered the leading cause of the global disease burden, as indicated by disability-adjusted life-years (DALYs) lost, which quantify the loss of active and productive life due to a condition.[10]

Pneumonia-related complications are numerous and have been linked to increased mortality, with the risk rising as complications occur.[11,12] Among these, congestive heart failure is the most significant, alongside other complications such as hypoxaemia, pneumothorax, pleural effusion, and septicaemia.[11,12,13,14] While many pneumonia cases may resolve on their own, a portion of children, especially those under five, may experience complications due to the pathogen's virulence and/or the host's susceptibility.[15,16] Complications have been increasingly observed across all age groups, often exacerbating pneumonia outcomes.[17]

Research is a crucial tool in reducing respiratory diseases. Public health and clinical research enhance and promote population health by improving healthcare systems' capacity to manage diseases and establish better guidelines and standards for patient care. There is limited data on pneumonia complications and associated co-morbidities, particularly among children in South-South Nigeria. The burden of respiratory diseases is immense, with pneumonia being the leading cause of death in children under five. This necessitates ongoing clinical research on the prevalence and complications of bronchopneumonia to aid in surveillance, with the information gathered being used in epidemiological databases and to strengthen health policies and targeted interventions. This study, therefore, aims to assess the prevalence and complications of pneumonia to help alleviate the burden associated with this disease.

Materials and Method

This study was a retrospective analysis of paediatric patients admitted to the Pediatric ward at the Irrua Specialist Teaching Hospital (ISTH) in Irrua over a five-year span, from January 2020 to December 2024. It involved examining the medical records of all patients admitted to the respiratory unit during this time frame. ISTH, a tertiary institution with 434 beds, is located in Irrua, the administrative hub of Esan Central Local Government Area in Edo State, South-South Nigeria. It serves as a key referral center for patients not only within the state but also from neighboring states like Ondo, Kogi, Delta, and beyond. ISTH is well-regarded for its proficiency in diagnosing, managing, and controlling viral hemorrhagic fevers and emerging pathogens. Although Irrua is a suburban area with a predominantly farming population, it benefits from several tertiary educational institutions, attracting a significant number of educated and professional clients. The pulmonology unit was established in 2015 and has been overseen by a consultant pulmonologist, who, along with resident doctors, evaluates and treats patients. The Paediatric ward addresses both communicable and non-communicable respiratory conditions. The data reviewed included age, gender, diagnosis, length of stay, and related complications. The sample size comprised all patients admitted into respiratory units during the review period. Pneumonia diagnoses in the study were determined by (1) clinical features and (2) radiological assessments, including chest X-rays and computed tomography (CT) scans. Pneumonia diagnosis was based on clinical features such as age-specific rapid breathing, cough, and signs of respiratory distress, diminished or absent breath sounds, bronchial breath sounds, or coarse crackles noted in the case files. The collected data was entered into SPSS, with the student t-test used for analyzing categorical variables and the chi-square test for continuous variables. Demographic characteristics and the frequency of bronchopneumonia were represented using simple frequencies and percentages. A P-value of <0.05 was deemed statistically significant.

Ethical Considerations

All procedures adhered to the 1964 Helsinki Declaration and its subsequent amendments. Maximum privacy was ensured for all data. Ethical approval for this study was obtained from the Institutional Health Research Ethics Committee of ISTH

Results

A total of **771 paediatric respiratory admissions were** evaluated **and pneumonia was diagnosed in 273 children,** representing a **prevalence of 35.4%.** This indicates that **approximately one in three** paediatric admissions was due to pneumonia, Conversely, **498 children (64.6%)** were admitted for other respiratory conditions, indicating that **nearly two-thirds** of the cases did not have pneumonia.

Table 1: Prevalence of Pneumonia among paediatric admissions in ISTH.

Diagnosis of Pneumonia	Frequency (n=771)	Percent (%)
Yes	273	35.4
No	498	64.6

Age distribution reveals that **over half (52.1%)** of the patients were **infants aged ≤1 year,** indicating a high

burden of respiratory disease in this age group. **About one-third (32.7%)** were aged **>1 to 5 years**, while those aged **6–13 years** comprised **approximately one in eight (13.1%).** Adolescents aged **14–18 years** constituted a small fraction **(2.1%)** of the study population. The **mean age** was **2.7 ± 3.4 years,** reflecting a predominantly young paediatric cohort.

Regarding sex distribution, **nearly (59.8%)** of the patients were **males**, while **(40.2%)** were **females**, suggesting a **male predominance** in respiratory disease presentation within the study population.

Table 2: **Demographic characteristics of the study patients with respiratory diseases.**

Year of Diagnosis	Frequency (n=771)	Percent (%)
Age (years)		
≤ 1	402	52.1
>1-5	252	32.7
6-13	101	13.1
14-18	16	2.1
Mean ±SD	2.7±3.4	
Gender		
Male	461	59.8
Female	310	40.2

Among the **273 paediatric patients diagnosed with pneumonia, 71 (26.0%)** developed complications. The most frequently observed complication was Congestive Cardiac Failure, affecting 28 patients (39.4%), which accounts for nearly two-fifths of the cases. Pleural Effusion followed this in 17 patients (23.9%), and Sepsis in 13 patients (18.3%).

Other notable complications included Persistent Vomiting seen in 10 patients (14.1%), Febrile Convulsions in 5 patients (7.0%), and both Septic Shock and Respiratory Failure, each occurring in 4 patients (5.6%). Less common complications, Pneumothorax 2 (2.8%), Dehydration, and Atelectasis, were reported in 1 patient each (1.4%).

In terms of comorbidities, several conditions were identified, though each was present in only one patient (1.4%), except Acute watery diarrhoea 2(2.8%). These included Anaemic Heart Failure, Failure to Thrive, Multiple Organ Dysfunction Syndrome (MODS), Anaemia, Obstructive Sleep Apnoea Syndrome (OSAS), Paediatric AIDS, Viral Myocarditis, Upper Airway Obstruction, and Conjunctivitis.

Table 3: Spectrum of complications and co-morbidities associated with Pneumonia (Multiple responses)

Complications	Frequency (n=71)	Percent (%)
Congestive Cardiac Failure	28	39.4
Pleural Effusion	17	23.9
Sepsis	13	18.3
Persistent Vomiting	10	14.1
Febrile Convulsion	5	7.0
Septic Shock	4	5.6
Respiratory Failure	4	5.6
Pneumothorax	2	2.8
Dehydration	1	1.4
Atelectesis	1	1.4
Comorbidity		
Acute Watery Diarrhoea	2	2.8
Anaemic Heart Failure	1	1.4
Failure To Thrive	1	1.4
MODS	1	1.4
Anaemia	1	1.4
OSAS	1	1.4
Paediatric AIDS	1	1.4
Viral myocarditis	1	1.4
Upper Airway Obstruction	1	1.4
Conjunctivitis	1	1.4

MODS=**multiple organ dysfunction syndrome,** OSAS=**obstructive sleep apnoea syndrome**

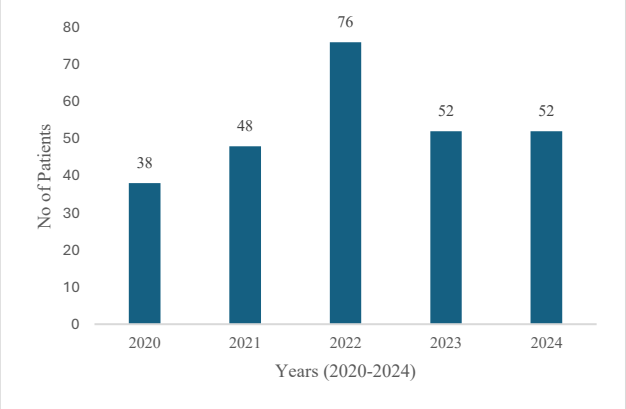

Figure 1: Annual Frequency of Pneumonia diseases from 2020-2024

The distribution of cases over the five years shows a steady increase from 2020 to 2022, with **approximately one-quarter (25.2%)** of all cases diagnosed in **2022**, representing the peak year. This was followed by **2023**

(20.5%) and **2024 (20.2%),** each contributing about one-fifth of the total cases.

Pneumonia was most prevalent among infants aged **≤1 year,** with **67.4%** of children in this age group affected. The prevalence remained relatively consistent across other age groups: **61.9%** in children aged **>1–5 years, 66.3%** in those aged **6–13 years,** and **68.8%** among adolescents aged **14–18 years.** However, the association between age and pneumonia development was **not statistically significant (p = 0.532).**

Among male children, **66.2%** developed pneumonia compared to **64.5%** of females. The difference in pneumonia prevalence between sexes was **not statistically significant (p = 0.638),** indicating that **sex was not a significant predictor** of pneumonia in this cohort.

Table 4: Association between Socio-demographic Factors and the development of Pneumonia

Variable	Development of pneumonia		χ2	P-value
	Present	Absent		
Age (Years)				
≤ 1	271 (67.4)	131 (32.6)		
>1-5	156 (61.9)	96 (38.1)	2.19	0.532
6-13	67 (66.3)	34 (33.6)		
14-18	11 (68.8)	5 (31.2)		
Sex				
Male	305 (66.2)	156 (33.8)	0.22	0.638
Female	200 (64.5)	110 (35.5)		

Discussion

The study investigated the prevalence of pneumonia and its complications among pediatric patients in a tertiary hospital setting. Of the 771 pediatric respiratory admissions assessed, pneumonia was diagnosed in 273 children, indicating a prevalence of 35.4%. This suggests that approximately one in three paediatric admissions was due to pneumonia. Bronchopneumonia has consistently been the leading communicable respiratory tract disorder, as evidenced in other studies.[8,14,15,18] The findings in this study are lower than those reported by Yiltok et al.[14], who noted a prevalence of 54.4% of all respiratory admissions in Jos,[14] while rates of 78.8% and 71.2% were reported in Port Harcourt and Bangladesh, respectively.[15,18] The lower incidence of pneumonia may be attributed to the high immunization rate in the study area, which aids in protecting against communicable diseases, including pneumonia.[19]

The age distribution revealed that over half (52.1%) of the patients were infants aged ≤1 year, underscoring a significant burden of respiratory illness in this demographic. This vulnerability is attributed to their immature and less coordinated immune systems, as corroborated by numerous studies.[14,16,17] The mean age was 2.7 ± 3.4 years, indicating a predominantly young paediatric cohort. However, the association between age and pneumonia development was not statistically significant (p = 0.532). Regarding gender distribution, nearly 60% (59.8%) of the patients were male, while 40.2% were female, suggesting a male predominance in respiratory disease cases within the study group, although no significant difference in pneumonia prevalence between genders was observed. An increased susceptibility to respiratory tract infections (RTIs) in males has been consistently noted in reviewed studies[12,13,14] and is thought to be due to factors such as the influence of male hormones on the immune system.[20] The complication rate in patients diagnosed with pneumonia in this study is 26%, significantly lower than the rates found in some other studies.[13,14,17,21] Ojuawo et al. reported a rate as high as 61.8%,[22] although they examined adult cohorts, and lower rates are observed in some other studies.[18,23] The most common complication was congestive cardiac failure, affecting nearly one-third (39.4%) of these cases, reflecting other studies that identified congestive cardiac failure as the most frequent complication.[12,14,17,18,23,] Childhood pneumonia can manifest as bronchopneumonia or lobar pneumonia, with bronchopneumonia being more prevalent in children under five years of age. In pneumonia, inflammation of the alveoli and interalveolar septum leads to fluid exudation into the alveoli and edema of the inter-alveolar septum. This results in a ventilation-perfusion mismatch, causing hypoxia.[11] Hypoxia induces pulmonary vascular vasoconstriction, increasing pulmonary arterial vascular pressure. The right side of the heart eventually fails when it cannot effectively pump against the pulmonary pressure, and the resulting congestive cardiac failure exacerbates the illness.[12,23]

Complications have been increasingly observed across all age groups, and many of these complications often exacerbate pneumonia outcomes.[21,23] Eberechukwu et al. reported that heart failure occurred in sixty-nine patients, of whom 69.6% survived due to early diagnosis and treatment.[23] Mustapha et al.[13] documented high rates of complications in pneumonia-related mortalities, a finding corroborated by Fagbule et al.,[24] who advocated

for close scrutiny of these complications in hospitalized children diagnosed with pneumonia. A notable complication in this study is the pleural effusion rate of 23.9%, which is higher than those reported in Ilorin,[14] Osogbo,[17] and Port Harcourt.[23] The relatively higher complication rate may be attributed to the longer duration of this study, which spanned five years, whereas the other studies examined periods ranging from nine months to two years.[14,17,23] Less commonly reported complications in this study include pneumothorax and respiratory failure. Dehydration was observed in only one case. The findings of this study align with other studies that have identified pleural effusion, air leak syndrome, septicemia, anemia, sepsis, febrile convulsion, and pneumothorax.[12,13,14,17,21,23] Mbata et al. noted that more severe complications typically occur with delayed presentation and initial incorrect diagnosis.[21] The presence of co-morbidities further exacerbates pneumonia outcomes,[13,18,24] thus timely intervention, identification, and treatment are crucial to reducing mortality and improving outcomes. There was a significant presence of co-morbidities and complications with lobar pneumonia compared to bronchopneumonia, as described by Oloyede et al. in Akwa Ibom.[18] This study has highlighted the presence of co-morbidities such as acute watery diarrhea, paediatric AIDS, failure to thrive, and viral myocarditis, all of which significantly impact mortality associated with pneumonia,[18,21,23] and therefore warrant scrutiny and attention. The very low proportion of children with HIV infection in this study should not be interpreted as an indication that it is not an important co-morbid condition with pneumonia; rather, it remains a significant risk and a common co-morbid condition.[13] Oloyede et al. recorded significantly higher rates of co-morbidities than reported in this study.[18] The lowest point in admission trends was in 2020, attributed to the COVID-19 pandemic, which restricted movement nationwide and reduced access to healthcare facilities,[25] while the peak in respiratory admissions occurred in 2022. This may reflect the post-COVID period, as restrictions and fear associated with COVID diminished, leading to an influx of patients into healthcare facilities. This study did not examine the impact of complications and co-morbidities on the mortality rate, which is a major limitation that may serve as the basis for future studies at our center.

Conclusion

Pneumonia represents a significant infectious disease and is a leading cause of admission in the respiratory unit. The highest incidence was noted in males and infants, congestive cardiac failure emerged as the commonest complication in the cohorts examined. A thorough examination of hospitalized patients for potential complications and associated co-morbidities can substantially contribute to reducing the mortality and morbidity associated with this condition.

References

1. Walker CL, Rudan I, Liu L, et al. Global burden of childhood pneumonia and diarrhoea. Lancet 2013; 381: 1405–1416
2. Yiltok ES, Akhiwu HO, Yilgwan CS, Ejeliogu EU, John C et al. Pattern and trends of Respiratory Disease admissions at the Emergency Paediatric unit of Jos university Teaching Hospital. A four year review. Journal of Advances in Medicine and Medical Research. 2017 (22): 1-6.
3. Oguonu T, Adaeze Ayuk C, 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 Dec;14:1-8.
4. Garba BI, Baura MB, Mohammed BA, Ahmad MM, Yusuf T. et al. Pattern and outcome of childhood respiratory diseases admissions at a specialist hospital in Gusau, North Western Nigeria : A four year review. WJ Biomed Res 2018: 2(5): 1-6.
5. Gabriel-Job N, Chidiebere AC. The pattern of Respiratory diseases among children admitted in the Children emergency ward, University of Port Harcourt Teaching Hospital, Rivers State, Nigeria January 2024. Journal of advances in medical and pharmaceutical sciences 26(1):1-8
6. Ibraheem RM, Aderemi JA, Abdulkadir MB, Johnson WB. Burden and spectrum of paediatric respiratory diseases at a referral hospital in North-Central Nigeria-A five year review. African Journal of Emergency Medicine. 2020 Mar 1;10(1):3-7.
7. Charles NC, Chuku A, Anazodo NM. Childhood mortality in federal medical centre umuahia, South eastern Nigeria. Oman Medical Journal. 2014 Sep;29(5):32
8. World Lung Foundation. The Acute Respiratory Infections Atlas. New York, World Lung Foundation, 2010. Available at https://www.kff.org.accessed 2nd August 2025.
9. WHO child and Adolescent Health and Development. "Global Action plan for pneumonia kicks-off." Issue No.5 [Cited 11th August 2025] Available from www.who.int/ child-adolescent health.
10. Respiratory diseases in the world. Realities of today-opportunities for tomorrow. Forum of international respiratory societies 2013. Available on permissions @ersj.org.uk. 25th July 2025.
11. Li J, Zhao Y, Liu Z, Zhang T, Liu C, Liu X. Clinical report of serious complications associated with measles pneumonia in children hospitalized at Shengjing hospital, China. The Journal of Infection in Developing Countries. 2015 Oct 29;9(10):1139-46.
12. Sadoh WE, Osarogiagbon WO. Pneumonia complicated by congestive heart failure in Nigerian children. East African Medical Journal. 2012;89(10):322-6.
13. 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. Nigerian Journal of Paediatrics. 2013;40(1):30-3.
14. Abdulkarim AA, Ibraheem RM, Adegboye AO, Johnson WB, Adeboye MA. Childhood pneumonia at the University of Ilorin Teaching Hospital, Ilorin Nigeria. Nigerian Journal of Paediatrics. 2013 Jul 2;40(3):284-9.
15. Anne G. Griffiths. Chronic or recurrent Respiratory symptoms.Nelson textbook of paediatrics. 22nd edition 2024. Pages 2526-2530.
16. World Health Organisation. Oxygen therapy for children. Geneva: WHO; 2016. Avail ablefrom: http://apps.who.int/ iris/bitstream/10665/204584/ 1/9789241549554_eng.pdf. [Accessed 4th May 2020].
17. Odeyemi AO, Oyedeji AO, Adebami OJ, Agelebe E. Complications of pneumonia and its associated factors in a

pediatric population in Osogbo, Nigeria. Nigerian Journal of Paediatrics. 2020 Aug 28;47(4):318-23.
18. Oloyede IP, Ekrikpo UE. Epidemiological and morbidity pattern of respiratory diseases in children admitted in the paediatric ward of a tertiary hospital in Southern Nigeria. Ibom Medical Journal. 2020 Aug 1;13(2):73-80.
19. Ohonsi A.A, Sadoh A.E, Alikah S.O. Socio demographic predictors of full immunization coverage in suburban Nigeria: A retrospective review of community-based data. Archives of clinical research.2025 Apr 9:10-21.
20. Oguonu T, Adaeze Ayuk C, 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 Dec;14:1-8.
21. Mbata GC, Chukwuka CJ, Onyedum CC, Onwubere BJ, Aguwa EN. The role of complications of community acquired pneumonia on the outcome of the illness: A prospective observational study in a tertiary institution in Eastern Nigeria. Annals of medical and health sciences research. 2013 Sep 18;3(3):365-9.
22. Ojuawo OB, Desalu OO, Fawibe AE, Ojuawo AB, Aladesanmi AO, Opeyemi CM, Adio MO, Jimoh AO, Amadu DO, Fadeyi A, Salami KA. Clinical and microbiological profile of adult inpatients with community acquired pneumonia in Ilorin, North Central, Nigeria. African Health Sciences. 2020 Dec 16;20(4):1655-68.
23. Ide LE, Uchenwa-Onyenegecha TA. Burden of acute respiratory tract infections as seen in University of Port Harcourt Teaching Hospital Nigeria. J US-China Med Sci. 2015 Dec;12:158-62.
24. Fagbule D, Adedoyin MA. Clinical predictors of outcome in childhood pneumonia. Niger J Paed 1990; 17: 37-41.
25. Huh K, Kim YE, Ji W, Kim DW, Lee EJ, Kim JH, Kang JM, Jung J. Decrease in hospital admissions for respiratory diseases during the COVID-19 pandemic: a nationwide claims study. Thorax. 2021 Sep 1;76(9):939-41.