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Original Research Article

THE PATTERN OF MORBIDITY AND TRENDS OF RESPIRATORY ADMISSIONS IN A SUBURBAN HOSPITAL IN SOUTH - SOUTH NIGERIA: A FIVE YEAR REVIEW (2020-2024)

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Authors' contributions
This study was a collaborative effort of the author. The author reviewed and approved the final version of the manuscript for publication.

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ABSTRACT
This retrospective study analyzed the patterns and trends of respiratory diseases among pediatric patients admitted to the Irrua Specialist Teaching Hospital in Edo State, Nigeria, from January 2020 to December 2024. The study included 771 patients aged 1 month to 18 years. The highest disease burden was observed in 2022 (25.2%), and infants (1 month-1 year) were the most affected age group (53.4%). Males had a higher prevalence of respiratory diseases (59.9%) compared to females (40.1%). Communicable diseases accounted for 91.0% of cases, while non-communicable diseases comprised only 9.0%. Age and sex were significantly associated with the prevalence of communicable and non-communicable diseases. Bronchopneumonia was the most common condition (32.8%), followed by pharyngotonsillitis (30.6%) and bronchiolitis (13.0%). The trend analysis revealed fluctuations in respiratory conditions over the study period, with bronchopneumonia consistently being the most prevalent. The highest burden of bronchopneumonia, pharyngotonsillitis, and bronchiolitis was observed in infants, while older children (4-12years) had the highest proportion of bronchial asthma. The monthly distribution of cases showed peaks in October, August, and November, suggesting seasonal variations in respiratory illnesses. The findings emphasize the importance of age and gender in the incidence and distribution of respiratory diseases and highlight the need for effective interventions to reduce the burden of communicable respiratory diseases in the pediatric population. This study's limitations include its retrospective data collection with incomplete admission outcomes. As a single-center study, the results' generalizability is limited.

Keywords: Paediatric Respiratory diseases; Morbidity patterns; Nigeria; Hospital admissions

INTRODUCTION

Respiratory diseases represent a significant global health challenge. It is estimated that 235 million individuals suffer from asthma, (World Health Organization, [WHO],n.d.) while over 200 million are affected by chronic obstructive pulmonary disease (COPD), (World Health Organization, [WHO] Chronic Respiratory Diseases ,n.d.) Annually, 8.7 million people develop tuberculosis (TB), (World Health Organization (WHO, 2012) and millions live with pulmonary hypertension. Infants and young children are particularly vulnerable to respiratory diseases, with nine million children under the age of five dying each year (Walker *et al*., 2013), primarily due to lung diseases. Pneumonia is the leading cause of mortality among young children worldwide (Walker *et al*., 2013). Asthma is the most prevalent chronic disease, affecting approximately 9.1% of children globally and 11% of adolescents (Global Asthma Report, 2022), with incidence rates on the rise. The lungs, being the only internal organ that is continuously exposed to the external environment (Forum of International Respiratory Societies, 2013), render everyone susceptible to airborne infectious and toxic agents. Although respiratory diseases cause mortality across all regions and social classes, children are particularly susceptible to environmental exposures (Forum of International Respiratory Societies, 2013). Respiratory tract infections remain a leading cause of morbidity and mortality among children globally, with pronounced effects in Sub-Saharan Africa (Agbesanwa *et al*., 2023; Garba *et al*., 2018). In the Netherlands (Otters *et al*., 2005), respiratory tract infections are the most frequently reported health issue in children, despite a reported decline in incidence.

The prevalence of preventable communicable diseases, such as malaria, diarrheal diseases, and pneumonia, remains high in Sub-Saharan African countries (Oloyede and Ekrikpo, 2020). Assessing the collective burden of respiratory diseases can elucidate their impact on health systems, facilitating the development of appropriate strategies and interventions. In many developing countries, such as Nigeria, hospital data serve as a primary source of information on population health due to inadequate community surveillance and record-keeping systems (Yiltok *et al*., 2017). Respiratory units frequently encounter both communicable and non-communicable diseases (Enyuma *et al*., 2019; Nneka and Chidiebere, 2024; Ibraheem *et al*., 2020), with conditions such as bronchopneumonia, acute viral bronchiolitis, pharyngotonsillitis, bronchial asthma, croup, and acute and chronic suppurative otitis media being common (Garba *et al*., 2018; Nneka and Chidiebere, 2024; Haddad, 2020, p.2545). Other conditions include bronchiectasis, allergic rhinitis, and rhinosinusitis. A previous study conducted at our institution examined the patterns and trends of respiratory diseases in adults (Emorinken *et al*., 2023), reporting a higher prevalence of non-communicable diseases in the outpatient department. However, paediatric studies have often recorded the opposite trend (Enyuma *et al*., 2019; Nneka and Chidiebere, 2024; Oguonu *et al*., 2014). This study focuses on the paediatric population, and to the authors' knowledge, no similar study has been conducted in the unit since its inception in 2015. The rate of care-seeking for children with acute respiratory infections in Nigeria is 40% (United Nations International Children's Emergency Fund [UNICEF], 2023), significantly lower than in Norway (93%) and Uganda (71%) (United Nations International Children Emergency Fund [UNICEF], 2023). It is therefore imperative to continuously evaluate patterns and trends in respiratory units to remain informed of emerging trends and identify research and intervention priorities. There is a paucity of data on this subject, with few published works available. This study aims to conduct a retrospective analysis of the patterns and trends of respiratory diseases among patients admitted to the Paediatric Ward.

MATERIALS AND METHODS

This retrospective review was conducted on Paediatric patients admitted to the Respiratory unit in the Paediatric Ward of the Irrua Specialist Teaching Hospital (ISTH) in Irrua over a five-year period, from January 2020 to December 2024. The ISTH is a tertiary institution with a capacity of 434 beds, located in Irrua, which serves as the administrative center of the Esan Central Local Government Area in Edo State, South-South Nigeria. It is a major referral center not only for patients within the state but also for those from neighboring states such as Ondo, Kogi,

Delta, and beyond. ISTH is renowned for its expertise in diagnosing, managing, and controlling viral hemorrhagic fevers and emergent pathogens.

Although Irrua is a rural community with predominantly agrarian residents, the pulmonology unit was established in 2015. Since its inception, the Respiratory unit has been managed by a consultant pulmonologist who, along with specialty resident doctors, assesses and manages patients. The pulmonology unit provides care for both communicable and non-communicable respiratory conditions. All procedures were conducted in compliance with the 1964 Helsinki Declaration and its later amendments. Maximum privacy was ensured for all data. Medical records of patients admitted to the respiratory unit of the Irrua Specialist Teaching Hospital from January 2020 to December 2024 were assessed. The institution utilizes electronic media records to enroll patients upon their admission, each admission was exclusive. Information obtained included age (1 month to 18 years), gender, diagnosis, and period of admission. Inclusion criteria were all patients (771) admitted during the review period with respiratory pathology. The collected data were entered into SPSS, with the Student's t-test used to analyze continuous variables and the chi-square test used to analyze categorical variables. A P-value of <0.05 was considered statistically significant.

RESULTS

Table 1: Demographic characteristics of the study patients.

Year of Diagnosis	Frequency (n=771)	Percent (%)
2020	117	15.2
2021	146	18.9
2022	194	25.2
2023	158	20.5
2024	156	20.2
Age (years)		
1month-1year	412	53.4
2-3	204	26.5
4-12	130	16.9
13-18	25	3.2
Mean ±SD	2.8±3.3	
Gender		
Male	462	59.9
Female	309	40.1

The year 2022 recorded the highest number of cases (194 cases, 25.2%), indicating a possible peak in disease occurrence. The highest disease burden was observed among infants (1 month-1 year), who constituted 53.4% (412 cases), Adolescents (13-18 years) were the least affected, with only 3.2% (25 cases), suggesting a lower risk exposure or improved immunity in this age group. Males had a higher prevalence of respiratory diseases (59.9%, 462 cases) compared to females (40.1%, 309 cases), resulting in a male-to-female ratio of approximately 1.5:1. The mean age of the population was 2.8±3.3

Table 2: comparison of significance btw communicable and non-communicable diseases, Gender and year

Variables	Communicable disease (n=702)	Non-Communicable disease (n=69)	χ^2	P-Value
Age (years)				
≤ 1	393 (56.0)	19 (27.5)		
2-3	191 (27.2)	13 (18.8)		
4-12	101 (14.4)	29 (42.1)	55.94	0.001*

13-18	17 (2.4)	8 (11.6)		
Mean±SD	2.56 ± 2.9	5.68 ± 3.2		
Gender				
Male	411 (58.5)	51 (73.9)	6.18	0.013*
Female	291 (41.5)	18 (26.1)		
Year				
2020	106 (15.1)	11 (15.9)		
2021	136 (19.4)	10 (14.5)	2.97	0.564
2022	177 (25.2)	17 (24.6)		
2023	139 (19.8)	19 (27.5)		
2024	144(0.5)	12(17.4)		

*Statistically significant

In this five-year study, from 2020 to 2024, age and sex were significantly associated with the prevalence of communicable and non-communicable diseases; however, the year was not significant.

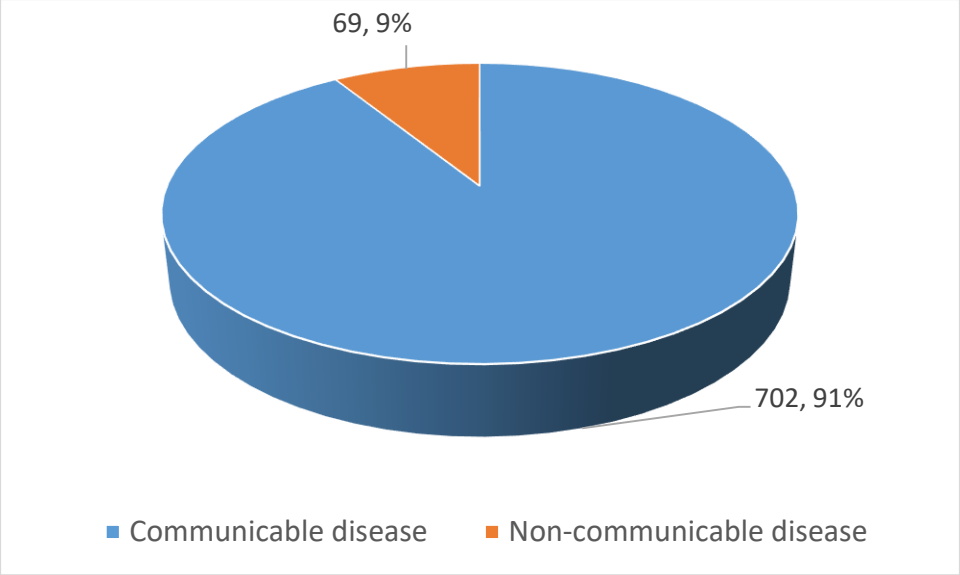

Figure 1: Distribution of respiratory diseases.

Table 2: Frequency of respiratory diseases.

Respiratory diseases	Frequency (n=771)	Percent (%)
Bronchopneumonia	253	32.8
Pharyngotonsillitis	236	30.6
Bronchiolitis	100	13.0
Acute Otitis Media	85	11.0
Bronchial Asthma	32	4.2
Aspiration Pneumonitis	30	3.9
Lobar Pneumonia	13	1.7
Croup	5	0.7
Adenoidal hypertrophy	5	0.7
Pulmonary tuberculosis	5	0.7
Corona virus disease-19	3	0.4

Lung abscess	1	0.1
Diphtheria	1	0.1
Pertussis	1	0.1
Peritonsillar abscess	1	0.1

Among the **771** reported cases, the prevalence of communicable respiratory diseases was 91.0% (702 cases), while non-communicable respiratory diseases accounted for only 9.0% (69 cases). Bronchopneumonia had the highest disease burden, with a case proportion of 32.8% (253 cases). Pharyngotonsillitis had a prevalence of 30.6% (236 cases), making it the second most common condition, followed by bronchiolitis, which accounted for 13.0% (100 cases).

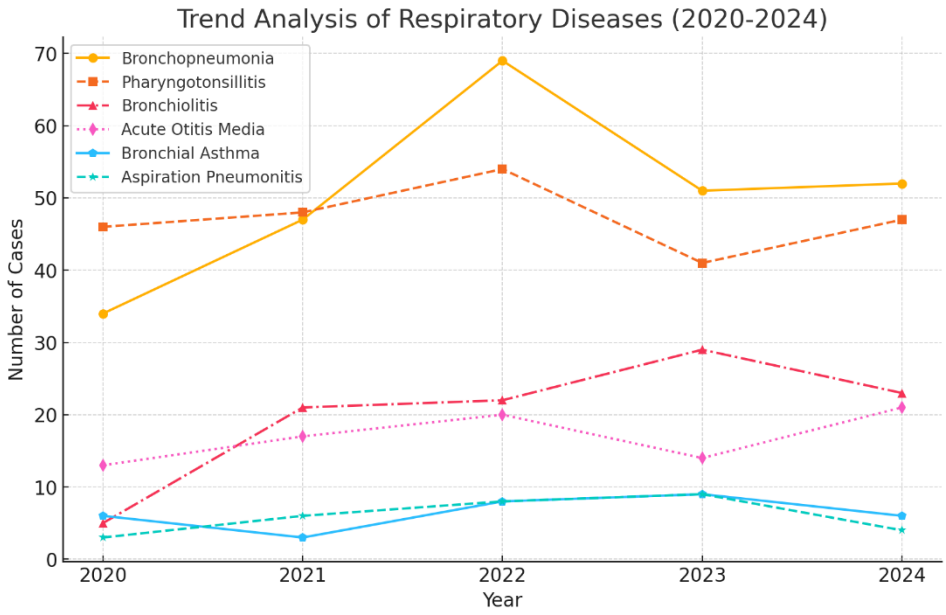

Figure 2: Trend Analysis of Respiratory Diseases (2020-2024)

The trend analysis graph illustrates the variation in respiratory conditions from 2020 to 2024. Bronchopneumonia showed a significant peak in 2022, followed by a decline, but remained the most common condition. Pharyngotonsillitis remained relatively stable, fluctuating between 41 and 54 cases over the period. Bronchiolitis showed a steady increase, peaking in 2023(29 cases) before slightly decreasing in 2024 (23 cases). Acute Otitis Media cases also varied, with a significant increase in 2024 (21 cases) after a dip in 2023. Bronchial Asthma and Aspiration Pneumonitis showed fluctuating but relatively lower-case numbers, with a slight decline in the most recent year.

Table 3: Demographic distribution of the top six respiratory diseases.

Variables	Bronchopneumonia (n=253)	Pharyngotonsillitis (n=236)	Bronchiolitis (n=100)	Acute Otitis Media(n=85)	Bronchial Asthma (n=32)	Aspiration Pneumonitis (n=30)
Year						
2020	34 (13.4)	46 (19.5)	05 (5.0)	13 (15.3)	6 (18.8)	03 (10.0)
2021	47 (18.6)	48 (20.3)	21 (21.0)	17 (20.0)	3 (9.4)	06 (20.0)
2022	69 (27.3)	54 (22.9)	22 (22.0)	20 (23.5)	8 (25.0)	08 (26.7)
2023	51 (20.2)	41 (17.4)	29 (29.0)	14 (16.5)	9 (28.0)	09 (30.0)

2024	52 (20.5)	47 (19.9)	23 (23.0)	21 (24.7)	6 (18.8)	04 (13.3)
Age group (Years)						
0-1	163 (64.4)	91 (38.6)	93 (93.0)	39 (45.9)	02 (06.2)	16 (53.3)
2-3	56 (22.1)	88 (37.3)	05 (05.0)	38 (44.7)	06 (18.8)	04 (13.3)
4-12	28 (11.1)	51 (21.6)	02 (02.0)	08 (09.4)	20 (62.5)	07 (23.4)
13-18	6 (2.4)	06 (2.5)	00 (00.0)	00 (00.0)	04 (12.5)	03 (10.0)
Gender						
Male	146 (57.7)	145 (61.4)	61 (61.0)	49 (57.6)	21 (65.6)	24 (80.0)
Female	107 (42.3)	91 (38.6)	39 (39.0)	36 (42.4)	11 (34.4)	06 (20.0)

The highest burden of bronchopneumonia (64.4%), Pharyngotonsillitis (41.1%), and bronchiolitis (93.0%) was observed in infants (0-1 year), reinforcing their high susceptibility to severe respiratory infections. Older children (4-12 years) had the highest proportion of Bronchial Asthma (62.5%).

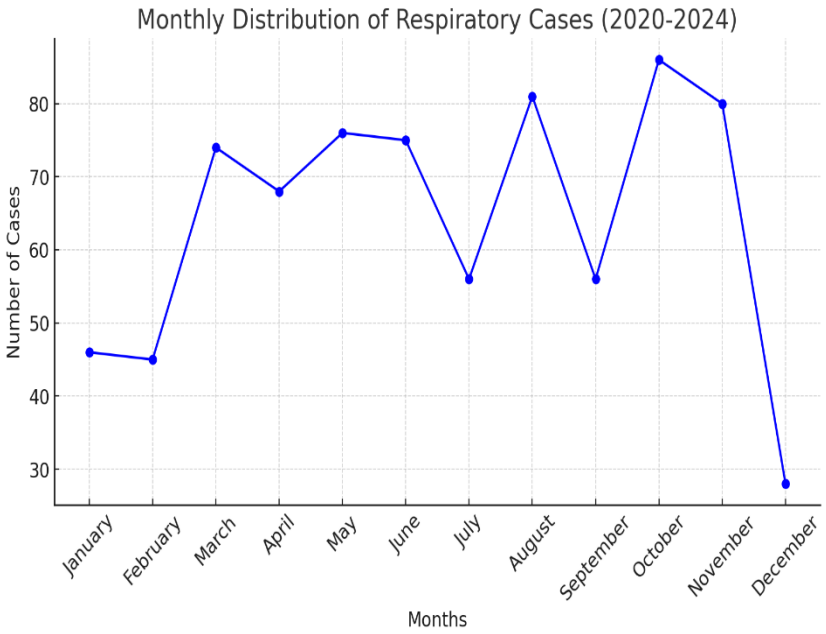

Figure 3: Monthly Distribution of Respiratory Cases (2020-2024)

The line graph illustrates the monthly distribution of respiratory cases recorded from 2020 to 2024. The trend shows fluctuations throughout the year, with notable peaks in October (86 cases), August (81 cases), and November (80 cases). The lowest number of cases was recorded in December (28 cases), suggesting a seasonal variation in respiratory illnesses. A significant increase was observed from February (45 cases) to March (74 cases), followed by fluctuations in subsequent months.

DISCUSSION

A retrospective study was conducted on pediatric respiratory admissions from 2020 to 2024. The highest burden of respiratory illness was observed in infants aged 1month-1 year, with a higher incidence occurring in males. The study also revealed a very high prevalence of communicable diseases, accounting for 91% of all cases admitted to the pediatric ward during this period. This finding aligns with most studies involving pediatric subjects, as the more immature and less functional immunologic systems in children significantly contribute to their susceptibility to communicable diseases (Oloyede and Ekrikpo, 2020). Notably, studies involving adult populations (Emorinken *et*

al., 2023) have demonstrated that chronic obstructive airway diseases are more prevalent, attributed to their more mature and fully integrated immune systems,(World Health Organization, [WHO] Chronic Respiratory Diseases ,n.d; Adeoti *et al*., 2015). The highest burden of respiratory illness in infants aged 1 month-1 year may be due to their immature immune systems and anatomical factors. Environmental factors such as overcrowding and poor sanitation are well-established causes in this age group (Begum *et al*., 2018; Rakshit *et al*., 2020). In this study, age and sex were significantly associated with the prevalence of communicable and non-communicable diseases.

The increased incidence in this demographic is corroborated by studies conducted in different geopolitical zones of Nigeria (Yiltok *et al*., 2017; Oloyede and Ijezie, 2020; Yilgwan *et al*., 2013). For instance, Oloyede *et al*.(2020) in the South-South geopolitical zone identified pneumonia as the most common morbidity in children aged 0-11 months. Other studies in the North-Central, South-South, and Northwest regions have reported higher prevalence in children under five years of age (Oloyede and Ekrikpo, 2020; Yiltok *et al*., 2017; Mustapha *et al*., 2013). An increased incidence in the male gender's susceptibility to respiratory tract infections (RTIs) has been observed unanimously in reviewed studies(Agbesanwa *et al*.,2023; Garba *et al*.,2018) and is theorized to be due to several factors, including the role of male hormones in downregulating the immune system (Oguonu *et al*., 2014). Other factors include behavioral aspects, such as a higher incidence of smoking among males, which tends to increase their susceptibility, particularly in adults and adolescents (Oguonu *et al*., 2014). Chukwu *et al*. (2013) postulated that the absence of the Y chromosome confers an inherent survival advantage in females. In this study, there was a statistically significant difference in the gender distribution of the six most common respiratory diseases as the gender distribution of respiratory diseases in this study showed that males had a higher prevalence across most diseases. Bronchopneumonia remains the world's most prevalent respiratory disease, often with fatal outcomes (World Health Organization, [WHO], n.d.; Walker *et al*., 2013; Forum of International Respiratory Societies, 2013). It was recorded as the most prevalent of the top six respiratory tract diseases in this study, with a frequency of 253 (32.8%), and consistently remained the most common condition throughout the analysis.

Bronchopneumonia has consistently led all communicable respiratory tract disorders, as observed in other studies (Agbesanwa *et al*., 2023; Yiltok *et al*., 2017; Begum *et al*., 2018). The findings in this study are lower than those reported by Yiltok *et al*.(2017), who stated a prevalence of 54.4% of all respiratory admissions in Jos, while incidences of 78.8% and 71.2% were reported in Port Harcourt and Bangladesh, respectively (Nneka and Chidiebere, 2024; Begum *et al*., 2018). The high immunization rate in the study area may account for this lower incidence (Ohonsi *et al*. 2025). These differences could also result from the involved areas of the study, which were respiratory unit (Begum *et al*., 2018; Rakshit *et al*., 2020), paediatric ward admissions (Oloyede and Ijezie, 2020), and emergency wards (Yiltok *et al*., 2017; Nneka and Chidiebere, 2024). Other respiratory tract morbidities observed include pharyngotonsillitis, whose incidence is closely related to bronchopneumonia in this study

Yiltok *et al* (2017) identified pharyngotonsillitis as the second most prevalent respiratory condition in Jos. The notable incidence suggests shared etiological agents and risk factors with bronchopneumonia, which is also evident in the high occurrence of acute otitis media. The study area in Edo State, Nigeria, is characterized by a tropical wet and dry or savannah climate, with an average temperature of 28.78°C, which supports the proliferation of bacterial and viral pathogens, potentially contributing to the observed morbidity. This study found a 13% incidence of bronchiolitis, aligning with its recognition as a common cause of respiratory admissions in other research (Oguonu *et al*., 2014). Yilgwan *et al*., (2013) reported a high incidence in Jos, while Oguonu *et al*., (2014) documented a significant 98.7% incidence in children under five in Enugu. Conversely, a lower incidence has been noted in northern Nigeria (Ahmed *et al*., 2015). In Bangladesh, the incidence rates are reported as 20.1% (Begum *et al*., 2018) and 22.6% (Rakshit *et al*., 2020), and 12.8% in Calabar(Enyuma *et al*., 2019). The reduced incidence of bronchial asthma in this study, at 4.2%, is significant when compared to other studies that have reported higher incidences, such as 11.4% in Uyo (Oloyede and Ekrikpo, 2020), 13.1% in Bangladesh (Rakshit *et al*., 2020), and 16.3% in India (Nagaraj *et al*., 2016). The lower values observed in this study, compared to Jos (Yiltok *et al*., 2017) and Enugu

(Oguonu *et al*., 2014), which attributed their lower incidence to admitting only patients with exacerbations, may be due to the suburban location of our centre, when compared to these studies that are located in Urban settings, while the lower incidence of asthma observed in our institution compared to global rates of 9.1% in children and 11% in adolescents (Global Asthma Report, 2022) may be attributed to the fact that global statistics encompass data aggregated from multiple centers which utilized different survey methods and differences in diagnosis and reporting of Asthma (Global Asthma Report, 2022). Established factors for increasing trend in global rates also include exposure to air pollution, urbanization and changes in air quality due to climate change (Global Asthma Report, 2022). In contrast, our study focused exclusively on asthma cases necessitating hospital admission. Additionally, the suburban location of our study area is associated with reduced biogas emissions, which is a notable risk factor. Our department also features a well-functioning asthma unit within the outpatient clinic and emergency ward and consequently, most asthma cases are managed in these settings, with only severe or complicated cases requiring inpatient care.

The lowest point in admission trends was in 2020, due to the COVID-19 pandemic, which restricted movement nationwide and reduced access to healthcare facilities. This trend was noted in several studies, which reported a decrease in respiratory admissions during the COVID 19 Pandemic (Huh *et al*., 2021; Taylor *et al*.. 2021). The peak in respiratory admissions occurred in 2022, reflecting the post-COVID period, as restrictions and fear associated with COVID diminished, leading to an influx of patients into healthcare facilities. The trend analysis from 2020 to 2024 revealed variations in respiratory conditions. Bronchopneumonia peaked significantly in 2022, followed by a decline, yet remained the most prevalent condition. This aligns with the majority of admissions in this study. Increased admissions may be attributed to the easing of post-COVID restrictions and fear, resulting in a surge in medical facility visits. Pharyngotonsillitis remained relatively stable throughout the period. Bronchiolitis showed a steady increase, peaking in 2023 before slightly decreasing in 2024. Acute otitis media cases fluctuated, with a notable increase in 2024 following a dip in 2023.

The data indicate variability, with a notable increase in 2024 following a decline in 2023. Bronchial Asthma and Aspiration Pneumonitis exhibited fluctuating but relatively lower case numbers, with a slight decrease in the most recent year. The graph underscores the dynamic nature of respiratory illnesses over time. This study emphasizes the importance of age and gender in the incidence and distribution of respiratory diseases, revealing distinct variations across different age groups. The highest burden of bronchopneumonia, pharyngotonsillitis, and bronchiolitis was observed in infants (1 month-1 year), highlighting their high susceptibility to severe respiratory infections. Older children (4-12 years) exhibited the highest proportion of Bronchial Asthma, suggesting a delayed onset or different risk factors for these conditions (Global Asthma Report, 2022). Fluctuations in the incidence of admissions were noted throughout the years, with significant peaks in August, October, and November. The highest peak occurred in October, with 86 cases. Biannual peaks in the occurrence of respiratory diseases have been reported in most studies from Nigeria, with peaks during the rainy and dry seasons (Oloyede and Ijezie, 2020; Ibeziako and Ibekwe, 2002). Similar findings have been reported in India and Bangladesh, where higher incidence rates were observed in the late autumn and winter months (Begum *et al*., 2018; Rakshit *et al*., 2020; Nagaraj *et al*., 2016), similarly to the aforementioned studies, this study reported peaks during the dry season/harmattan period, possibly due to closer clustering of family members, facilitating easy transmission of infections. The sharp decline in December reflects low admissions during the festive period, as parents generally avoid inpatient admissions at our center due to ongoing festivities.

One limitation of this study is the retrospective nature of the data collection, resulting in incomplete data regarding the outcomes of admissions. Additionally, since the study was conducted at a single center, generalizing the results should be approached with caution. Further research is necessary to enhance our understanding of the underlying causes, outcomes, and risk factors of these respiratory diseases and their impact on overall health and well-being.

CONCLUSION

The pattern of respiratory admissions has not changed significantly in the pediatric population over the years, as infectious diseases remain the primary reasons of admission. This trend necessitates modification through sustained collaboration with public health organizations, governments, and policymakers to achieve effective vaccination, improved living standards, and enhanced health services, thereby disrupting this concerning pattern. Determining the burden of respiratory diseases as a group can help ascertain their collective impact on health systems, thereby facilitating the development of appropriate strategies and intervention measures to address this burden.

STATEMENT OF ETHICS

Approval for the study was obtained from the Health Research Ethical Committee of ISTH. A waiver of consent was granted by the Ethics Committee.

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CONFLICT OF INTEREST/COMPETING INTEREST

The Authors declare that they have no conflicts of interest or competing interests.

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