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CURRENT INCIDENCE OF RESPIRATORY TRACT INFECTION IN ABIA STATE, NIGERIA

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Abstract
The rapid rise in cases of Respiratory Tract Infection (RTI) is a growing public health concern in Nigeria particularly Abia State. Interventions are often hampered by lack of accurate localized data which informs policy directions and limits effectiveness. This study aims to quantify prevalence, identify demographic patterns, and elucidate environmental and socioeconomic determinants of RTI. It seeks to inform targeted interventions for effective public health results. The current incidence of RTI in Abia State, Nigeria was studied within five primary healthcare centers located in Aba South, Aba North, Osisioma, Umuahia South, and Umuahia North local government areas that serve as referral centers to others within the State. Using microbiology standard methods of sputum and throat swab collection, sample collection was done aseptically. The samples were inoculated into blood agar, MacConkey agar, and chocolate agar and incubated at 37°C for 24-48 hours. After which the bacterial colonies were isolated for further identification using microscopic and biochemical tests for pathogen detection. The study finds*Staphylococcus aureus* 80 (32%)as the highest cause of RTI in Abia State, followed by *Klebsiella pneumoniae 57 (22.8%),Streptococcus pneumonia*e 47 (18.8%), *Pseudomonas aeruginosa* 28 (11.2%), *Escherichia coli* 23 (9.2%), and *Proteus mirabilis* 15 (6.0%).

Keywords: Current, incident, respiratory tract infection, sputum and throat swab

Introduction

Respiratory Tract Infections (RTIs) encompass a broad spectrum of illnesses affecting the upper and lower respiratory systems, ranging from common colds and pharyngitis to more severe conditions like pneumonia and bronchitis (Tobin et al., 2025). These infections are primarily caused by viral, bacterial, or fungal pathogens, with common etiological agents including influenza viruses, *Streptococcus pneumoniae,* and *Haemophilusinfluenza* (Tang et al., 2025). Globally, RTIs are a leading cause of morbidity and mortality, particularly in low- and middle-income countries where access to healthcare is limited and environmental factors exacerbate vulnerability (Abubakar et al., 2025).

The respiratory tract is the site of an exceptionally large range of disorders for three main reasons: (1) it is exposed to the environment and therefore may be affected by inhaled organisms, dusts, or gases; (2) it possesses a large network of capillariesthrough which the entire output of the heart has to pass, which means that diseases that affect the small blood vessels are likely to affect the lung; and (3) it may be the site of "sensitivity" or allergic phenomena that may profoundly affect function. The human respiratory tract is divided into two contiguous spatial environments: the upper tract consisting of the tonsils, nasopharynx, oral cavity, oropharynx, and larynx, and the lower tract which includes the trachea, bronchi, and lungs. Therefore, RTIs are classified as upper respiratory infections (URIs) and lower respiratory infections (LRIs), based on the respiratory tract involved (Grief 2013).

Incidence of Respiratory Tract Infections

Respiratory tract infections (RTIs) are the focus of developments in public health, given their widespread distribution and the high morbidity and mortality rates reported worldwide (WHO2020). The RTIs are defined as diseases of infectious etiology involving the respiratory system (WHO,2014). The clinical spectrum ranges from asymptomatic or mild infection to severe or fatal disease, and the severity is the result of the interaction between three factors: the causative agent, the environmental conditions, and the host (WHO, 2020). These infections typically occur as acute disease with a rapid clinical onset ranging from hours to days after the infection and including a variety of symptoms such as fever, cough, sore throat, coria, shortness of breath, wheezing, and/or difficulty in breathing (WHO, 2020). The epidemiological study of RTIs must keep up with the rapid changes in socio demographic and climate dynamics and needs continuous updating in order to provide important tools for health policies of control and prevention. A prompt and rapid laboratory diagnosis of RTIs is required to support and to guide clinical decisions in favor of appropriate patient management, while also avoiding the inappropriate use of antimicrobials (Calderaro et al., 2022). As a matter of fact, the delay in identifying the causative agent of RTIs could lead to the emergence and spread of antimicrobial-resistant pathogens due to the misuse of broad-spectrum empirical therapy, thus resulting in poor clinical outcomes, increased mortality rates and length of hospital stay (Simoes et al., 2006).

RTIs encompass a broad spectrum of illnesses affecting the upper and lower respiratory systems, ranging from common colds and pharyngitis to more severe conditions like pneumonia and bronchitis (Tobin et al., 2025). These infections are primarily caused by viral, bacterial, or fungal pathogens, with common etiological agents including influenza viruses, *Streptococcus pneumoniae,* and *Haemophilus influenzae*. In Nigeria, RTIs pose a persistent public health threat, influenced by a combination of socioeconomic, environmental, and behavioral factors (Abubakar et al., 2025). National studies indicate a high prevalence of RTIs across various regions, with acute respiratory infections (ARIs) affecting up to 20.5% of infants in community settings. In Benin City, for instance, the overall prevalence of lower respiratory tract infections (LRTIs) was reported at 18.91%, with no significant gender differences (Egbe et al., 2011). Similarly, in Port Harcourt, pneumonia prevalence among children stood at 13.2%, highlighting it as a major contributor to childhood morbidity and mortality (Gabriel-Job & Azubogu, 2020). The annual incidence of ARIs in Nigerian children can range from 6.1 to 8.1 episodes per child, peaking in the first two years of life and declining thereafter (Ujunwa & Ezeonu, 2014). These figures are exacerbated by seasonal patterns, with upper respiratory tract infections (URTIs) comprising over 80% of respiratory cases in some hospitals, followed by asthma and allergic rhinitis (Abubakar et al., 2025).

The burden of RTIs in Nigeria is particularly acute among children and adolescents, a study reports 1,251 respiratory morbidities among 1,213 children, with most cases involving a single morbidity (Ibraheem et al., 2024). Pneumonia remains a "forgotten epidemic," claiming 443 under-5 lives daily in 2018, representing 19% of all child deaths in the country. In Kebbi State, the prevalence and risk factors for LRTIs were explored, emphasizing the need for region-specific data to inform interventions (Kalgo et al., 2023). Adult respiratory diseases also contribute significantly to outpatient burdens, accounting for 8.7-12% of medical admissions, with conditions like tuberculosis and chronic obstructive pulmonary disease (COPD) being predominant (Kalgo et al., 2023).
Focusing on urban areas in developing countries, RTIs are amplified by environmental risk factors such as air pollution, overcrowding, and poor sanitation (Pona et al., 2021). Exposure to indoor air

pollutants from biomass cooking fuels is a major contributor, with population attributable fractions (PAFs) for ARIs reaching 15.7% in global estimates (Shayo & Bintabara, 2022). In urban settings, high population density, vehicular emissions, and industrial activities increase RTI risks, with low temperatures and poor housing conditions further elevating incidence (Mohan et al., 2023). Rural-urban disparities exist, with urban children often facing higher exposure to pollutants despite better healthcare access in some cases (Li et al., 2023). Factors like paternal smoking, low education levels, and rural residency (ironically, due to biomass use) are linked to increased RTI risks, while wealth index plays a protective role (Cortes-Ramirez et al., 2021). In Sub-Saharan Africa, including Nigeria, unclean cooking fuels, maternal illiteracy, and suboptimal breastfeeding practices are key modifiable risks (Odame et al., 2025; Ujunwa & Ezeonu, 2014). In addition, new epidemiological data highlight the considerable impact of RTIs on the quality and the expectancy of life, as well as the severe threat to populations and global public health (WHO, 2014).

Important technological advances have been made over the years to provide new tools for the detection of both bacterial and viral respiratory infections, resulting in the development of accurate, fast, and easy-to-use diagnostic methods. In particular, molecular methods are now widely available in diagnostic laboratories. In this context, the introduction of syndromic panels broke new ground in the field of diagnostic microbiology, since they provide a highly powerful tool capable of detecting a broad array of pathogens that, collectively, could cause a single clinical syndrome; this was achieved by meeting the needs of accuracy and of the shortening of time-to-result (Webber et al., 2014).

This study aims to quantify prevalence, identify demographic patterns, and elucidate environmental and socioeconomic determinants of RTIs in Abia State. By providing empirical evidence, it seeks to inform targeted interventions, such as vaccination drives, pollution control measures, and health education campaigns, ultimately contributing to Nigeria's efforts in reducing RTI-related morbidity and mortality.

Objectives of the Study

This paper aims to study the current incidence of Respiratory Tract Infection in Abia State, Nigeria and has the following objectives:

1. To isolate and identify microbial agents responsible for RTIs.
2. To analyze the distribution of RTIs across different age groups and genders.
3. To carry out antibacterial susceptibility test on the isolates.

Methodology

Study Area

This study was conducted at different Health Centres within Abia State (Aba North, Aba South, Osisioma, Umuahia North and Umuahia South), serving as a referral centre for respiratory infections. This is so because it is a densely populated urban area with a mix of commercial and residential zones. The area faces challenges like poor sanitation, inadequate healthcare facilities and environmental pollution, which can contribute to the spread of respiratory tract infections.

Study Population

Patients presented with respiratory symptoms such as cough, fever and difficulty in breathing and are seeking medical care at Aba North, Aba South, Osisioma, Umuahia South and Umuahia North Health Centres. The population includes both male and females, aged 0-51+ years and are residents within

the study Areas. This observational study was conducted from April to September with an estimated population size of 800 patients and with the aid of a questionnaire this was carried out properly.

Ethical Clearance

Oral permission was taken from all the participants after thoroughly explanation of the importance of the study and their demographic data was collected before sample collection.

Sample Collection

Sputum and throat swab samples were collected using sterile techniques. Participants were categorized as in-patients or out-patients and grouped by gender. Each sample were properly labeled with the patients age, gender and clinical symptom before immediate transfer to the microbiology laboratory for bacterial isolation and identification. Sputum samples were collected in a sterile, wide-mouthed glass bottles with screw-cap tops, while throat swabs were collected by depressing the tongue with a sterile instrument to examine for inflamed membranes, pores or exudates before swabbing the affected area using a swab stick (Cheesbrough, 2006).

Microbiological Analysis

- **Isolation and Identification of Microorganisms:** In micro-biology laboratory, the samples were inoculated into blood agar, Mac Conkey agar and chocolate agar and incubated at 37^0C for 24 – 48 hours. The inoculated plates were streaked with a sterile loop to isolate bacterial colonies and colonies were examined for standard morphological characteristics, suspect colonies were subcultured into selective and differential media for further purification and identification. Microscopic and biochemical tests were also employed for pathogen detection (Cheesbrough 2006).
- **Antibiotic Susceptibility Testing:** The Kirby-Bauer disk diffusion method was employed to determine antibiotic resistance profiles and patterns of bacterial pathogens to provide valuable information on which antibiotics were most likely to be effective against specific infections.

Data Analysis

Gram staining was performed to differentiate bacterial types. Biochemical tests such as catalase, coagulase, oxidase and sugar fermentation were used for further identification. Data was analyzed using descriptive method and results were presented in tables and charts.

Table 1: Distribution of Participants by Demographic Characteristics (N= 707)

Variable	Categories	Frequency (n)	Percentage (%)
Sex	Male	370	52.3
	Female	337	47.7
Age Group	0-10	139	19.7
	11-20	142	20.1
	21-30	133	18.8
	31-40	135	19.1
	41-50	68	9.6

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	51+	90	12.7
LGA	Aba North	170	24.0
	Umuahia South	150	21.2
	Osisioma	151	21.4
	Umuahia North	131	18.5
	Aba South	105	14.8
Education	None/Primary	180	25.5
	Secondary	217	30.7
	Tertiary +	210	43.8
Occupation	Student	385	54.5
	Trader	76	10.7
	Civil Servant	246	34.8

Table 2: Frequency and Percentage Distribution of Major Bacterial Isolates (N = 250 Isolates)

Organisms	Frequency (n)	Percentage (%)
Staphylococcus aureus	80	32
Streptococcus pneumoniae	47	18.8
Klebsiella pneumoniae	57	22.8
Pseudomonas aeruginosa	28	11.2
Escherichia coli	23	9.2
Proteus mirabilis	15	6
Total isolates	**250**	**100**

Figure 1

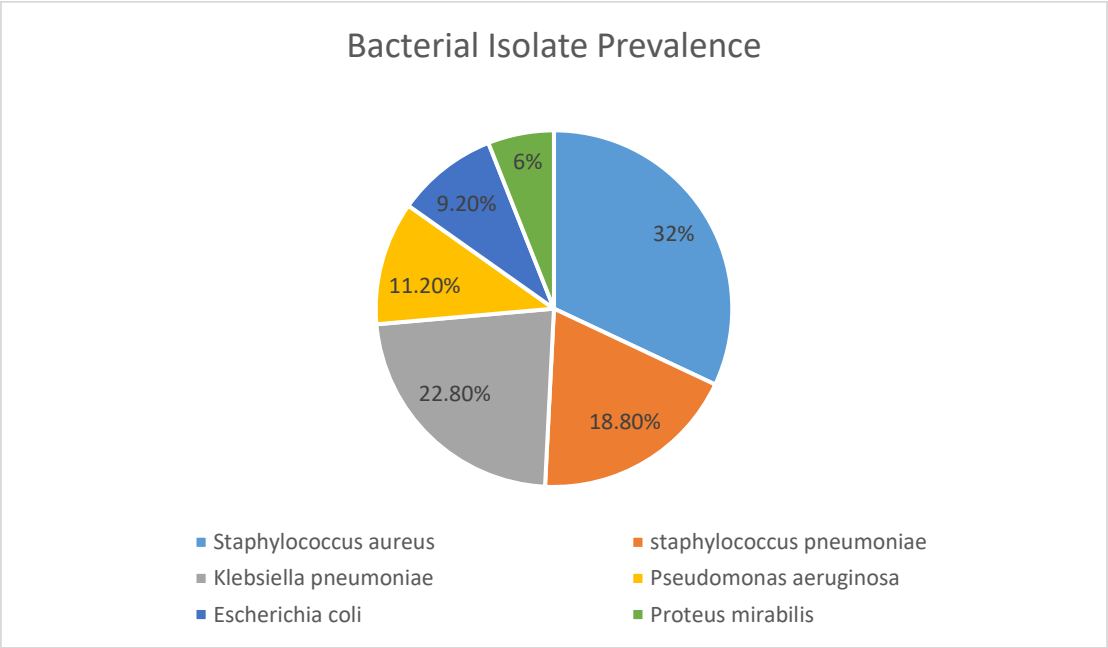


Table 3: Distribution of key Isolates by Clinical Sample Type

Organism	Sputum	Throat Swab	Nasal Swab	Total Isolates
S. aureus	20	35	25	80
S. pneumoniae	29	11	7	47
K. pneumoniae	50	7	0	57
P. aeruginosa	25	3	0	28
E. coli	16	7	0	23
P. mirabilis	12	3	0	15
Total Isolates	152	66	32	250

Table 4: Antibiotic Susceptibility Pattern (Antibiogram) of the isolates

Antibiotic	*S. pneumoniae*	*S. aureus*	*K. pneumoniae*	*P. aeruginosa*
Amoxicillin	R	R	S	R
Ciprofloxacin	S	S	S	S
Erythromycin	S	R	R	R
Ceftriaxone	S	S	R	S

Discussion

Table1 outlines the distribution of participants by demographic characteristics and the total number of participants was 707 with male 370 and female 337. Age group (0-10) was 139, (11-20) was142, (21-30) was 133, (31-40) was 135, (41-50) was 68 and51+ (90). In Local Government Area distribution, Aba North(170), Umuahia South (150), Osisioma (151), Umuahia North (131) and Aba South (105). Educational status distribution, None/Primary (180), Secondary (217) and Tertiary+(210) while by occupation; Students (385) Trader (76) and Civil servants (246). Table2 shows the frequency and percentage distribution of major isolates with *Streptococcus pneumonia*47(18.8%),*Staphylococcus aureus*80(32.0%), *Klebsiella pneumonia*57(22.8%), and *Pseudomonas aeruginosa*28(11.2%),*Escherichia coli* 23(9.2%) and *Proteus mirabilis* 15(6.0%).The significant presence of *S. aureus* and *K. pneumonia* corroborates work by Nwachukwu *et al*., (2021), who noted these organisms as common contributors to RTIs in tropical regions, likely due to environmental factors like humidity and poor ventilation. Figure 1 illustrates the most prevalence bacterial was *Staphylococcus aureus* 80(32%), followed by *Klebsiella pneumonia* 57(22.8%) and the least was *Proteus mirabilis* 15(6.0%). In this study on current occurrence of RTI on *Staphylococcus aureus* was predominance instead of *Streptococcuspneumonia* that was reported by Obi et al.,2019 as the predominant bacterial that causes RTI. The biochemical characteristics of the isolated organisms, confirming their identities. *S. aureus* exhibited beta-hemolysis on blood agar, a key diagnostic feature, while *K. pneumonia* showed positive indole and urease tests, consistent with its metabolic profile. These findings are in line with standard microbiological identification protocols outlined by Murray et al., (2015) in *Manual of Clinical Microbiology*. The consistency of these biochemical profiles with established literature reinforces the reliability of the isolation techniques used in this study.

This study highlighted the relationship between age group, gender, and RTI incidence. The (0-10), (11–20), (21-30) and (31-40) age group exhibited the high incidence likely due to increased exposure

in workplaces and schools, where close contact facilitates pathogen transmission. This finding aligns with studies by Eze et al., (2020), who reported higher RTI rates among young adults in urban settings due to social and occupational interactions. The 0–10 age group that showed a high positivity rate, consistent with global trends indicating children's vulnerability to RTIs due to immature immune systems Onuoha et al., (2018), Gender distribution showed no significant disparity, with males and females equally affected across age groups, corroborating findings by Adegoke et al., (2017), who noted no gender-specific predisposition to RTIs in similar populations.

Table 4 reveals the antibiotic susceptibility patterns of the isolated organisms. Resistance to amoxicillin was widespread, particularly among *S. pneumoniae*, *S. aureus*, and *P. aeruginosa*, while *K. pneumoniae* showed susceptibility. This high level of amoxicillin resistance is consistent with global trends reported by Nwachukwu et al., (2021), who highlighted the overuse of beta-lactam antibiotics as a driver of resistance in low-resource settings. Ciprofloxacin and ceftriaxone showed better efficacy across most isolates, supporting their use as alternative treatments, as suggested by fluoroquinolone recommendations in WHO guidelines (2022). However, resistance to erythromycin in *S. aureus*, *K. pneumoniae*, and *P. aeruginosa* indicates emerging multidrug resistance, a concern also raised by Nwachukwu et al., (2021), in the context of global antimicrobial resistance. These findings underscore the urgent need for antibiotic stewardship programs and the development of alternative therapeutic strategies in Abia State.

Conclusion

The study highlights a significant prevalence of respiratory tract infections, with *S. aureus* being the most common pathogen. Antibiotic resistance patterns indicate the need for judicious antibiotic use to prevent Multi Drug Resistance (MDR) strains. This research provides valuable epidemiological data on RTIs in Abia State, aiding clinicians in effective patient management and policy formulation.

Recommendation

The findings in this study raised concerns for current incidence of RTIs in Abia State, Nigeria. To address this, the study makes the following recommendations;

1. Strengthening infection control measures in healthcare settings.
2. Regular surveillance of microbial patterns and resistance trends.
3. Promoting public health awareness on respiratory hygiene.
4. Encouraging vaccination programs to reduce RTI incidence.
5. Implementation of antibiotic stewardship programs to minimize resistance development.

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