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REVIEW

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Respiratory Syncytial Virus Pneumonia Among Nigerian Children: Is it Time to Advocate for Routine RSV Vaccine Inclusion into the National Programme on Immunisation?

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Abstract

Respiratory syncytial virus (RSV) is a leading contributor to severe and very severe pneumonia in African children, ahead of *Streptococcus pneumoniae* and *Haemophilus influenzae* type b, which are now largely preventable by virtue of routine immunisation. Studies in Nigeria have suggested that RSV transmission is consistently linked to the rainy season rather than the temperature-driven winter seasonality of temperate countries. RSV is transmitted through respiratory droplets and contact with contaminated secretions or surfaces. The infection progresses from the upper airway to the lower respiratory tract, where inflammatory changes lead to bronchiolitis and pneumonia, with airway obstruction and air-trapping. The clinical pattern of RSV pneumonia in Nigerian children ranges from mild upper respiratory illness to severe bronchiolitis and pneumonia requiring hospitalisation, with infants under six months at greatest risk of severe disease and death. While clinical management is basically pivoted on supportive care with adequate hydration, oxygen therapy and non-invasive respiratory supports, Palivizumab, an RSV-specific monoclonal antibody, may offer a more specific prevention of RSV infections. This agent is administered intramuscularly to infants and young children at risk of RSV. It is recommended for monthly intramuscular administration during the RSV season. This agent has consistently demonstrated significant efficacy and safety in the prevention of severe RSV. Vaccination of the mother to achieve transplacental transfer of antibodies is also achievable but may be costly for a developing economy. The existing clinico-economic gaps in the prospects of RSV can be closed through collaborations between major international and local stakeholders. Ultimately, there is a need for focused investment in RSV surveillance before, during and after implementation of any intervention for the purpose of effective advocacy, monitoring of efficacy and safety.

Keywords: Bronchiolitis, Monoclonal antibody, Acute Respiratory Infection, Palivizumab.

Introduction

Nigeria carries one of the highest absolute burdens of under-five mortality globally, with Nigeria being one of three countries (others being Niger and Somalia) with under-five mortality rates (U5MR) > 100 deaths/1,000 live births in 2024.[1] Although Nigeria's U5MR rate has fallen from 132 to 102 per 1,000 live births between the 2018 and 2023–24 Demographic and Health Surveys, pneumonia and other acute respiratory infections remain a major contributor.[2,3]

Respiratory syncytial virus (RSV) is perhaps the largest contributor to severe and very severe pneumonia burden among African children, ahead of *Streptococcus pneumoniae* and *Haemophilus influenzae* type b.[4] In 2019, RSV-associated acute lower respiratory infection (ALRI) in under-five children caused an estimated 33 million illnesses, 3.6 million hospitalisations, over 26,000 in-hospital deaths and over 100,000 overall deaths globally, with

more than 97% of these RSV-associated deaths occurring in low- and middle-income countries (LMICs). Notably, nearly half of RSV hospitalisations/deaths occurred in the first 6 months of life, and about 2/3 of deaths occurred in the community![5]

Until 2023, RSV prevention was essentially inaccessible in resource-limited settings, since the only licensed product, palivizumab, requires monthly dosing through the RSV season and is poorly suited to LMIC use.[6] However, this has changed rapidly with recent approvals of a maternal RSV vaccine and two RSV monoclonal antibodies,[7,8] followed by the WHO's Strategic Advisory Group of Experts on Immunisation (SAGE) recommendation that all countries introduce products for the prevention of severe RSV disease in infants [9,10] and GAVI subsequently began to design a maternal RSV vaccine support programme for low-income countries.[11] Specifically, WHO-SAGE recommends that "*given the global burden of RSV disease, ...all countries* [should] *introduce products for the prevention of severe RSV disease in infants. Decisions to use maternal RSVPreF vaccination and/or nirsevimab should consider cost, financing, supply, anticipated coverage and feasibility of implementation within the existing health system*".[10] This evolving landscape makes it timely to ask whether Nigeria should now pursue RSV immunisation. This paper addresses that question based on a synopsis of decades of RSV pneumonia research in Nigeria, culminating in an advocacy for expedited action for the Nigerian child, bearing in mind that history has shown that life-saving vaccines are often implemented in LMICs, including Nigeria, many years after roll-out in high-income countries![12] Such delays should be measured in *lives lost*, and not just *years lost*. Paediatricians should be at the forefront of ensuring this does not repeat itself with RSV preventives.

RSV pneumonia in children

A recent paper by Garba and Shaaban[13] provides an elaborate synopsis of RSV pneumonia in children, highlighting clinical features, aetiopathogenesis, diagnosis and complications. Respiratory syncytial virus (RSV) is an enveloped, single-stranded, negative-sense RNA virus of the family Pneumoviridae, genus Orthopneumovirus, classified into two antigenic subgroups, A and B, defined largely by variation in the attachment (G) glycoprotein.[14] Both subgroups co-circulate among Nigerian children.[15] Transmission occurs via respiratory droplets and contact with contaminated secretions or surfaces, with the virus entering through the nasopharyngeal or ocular mucosa. The fusion (F) and attachment (G) glycoproteins mediate cell binding and entry, and the F protein drives fusion of infected cells into characteristic multinucleated syncytia. Infection begins in the upper airway and spreads to the lower respiratory tract, where epithelial necrosis, peribronchiolar inflammation, oedema, and mucus plugging produce bronchiolitis and pneumonia with airway obstruction and air-trapping. Clinically, illness ranges from coryza and cough to tachypnoea, wheeze, chest wall retractions, hypoxaemia, and apnoea in young infants, who bear the greatest severity. Diagnosis is principally by detection of viral nucleic acid using reverse-transcription PCR on nasopharyngeal samples, which is more sensitive than antigen detection or viral culture. [14]

Epidemiology of RSV-associated pneumonia in Nigeria

The epidemiology of RSV pneumonia in Africa must be understood within the broader landscape of childhood pneumonia aetiology which includes both bacterial and viral surveillance[16] and identifies *Streptococcus pneumoniae*, *Klebsiella* spp. and *Haemophilus influenzae* as the leading bacterial causes and RSV as the leading viral cause.[4] Limited syntheses of empirical reports from Nigeria reflect this.[13,17]

From the early 1990s, a series of prospective hospital-based studies from the University College Hospital, Ibadan, have characterised RSV's contribution to severe childhood respiratory disease (Table I). Johnson *et al.*,[18] in a virological study of 35 urban pre-school Nigerian children hospitalised with ALRI, reported that viral pathogens — including RSV — were identified among the children.

Table Ia: Summary of studies on RSV prevalence among children with pneumonia in Nigeria

Author	Study site	Age group	Year of sample collection	RSV prevale-nce	Method of RSV diagnosis	Peak RSV season	Mortalit y/case fatality	Identified risk factors
Johnson *et al.*18	University College Hospital (UCH), Ibadan	Pre-school children (<5 yr), hospitalised	Early 1990s (pub. 1993)	28.6%	Viral isolation/im munofluores cence	Rainy season	-	Malnutrition
Aderele *et al.*19	University College Hospital (UCH), Ibadan	1–23 months, hospitalised	Early 1990s (pub. 1995)	Study of children with RSV	Viral isolation/im munof-luorescence	Rainy season	-	None grossly malnourished
Johnson *et al.*20 (bronchiolitis study)	University College Hospital (UCH), Ibadan	Pre-school children, hospitalised	30-month study (pub. 1996)	RSV ~38% of virologicall y tested bronchiolit is cases	Viral immunofluo rescence/ser odiagnosis	Wet/rainy season (May–Oct)	None reported	Young infancy; male sex (infants ≤6 mo, M:F 2.9:1)
Robertson *et al.*21	Multi-country (incl. Nigeria) denominator-based study	Children <5 yr	pub. 2004	34.7%	(Denominat or-based surveillance synthesis)	Not specified for Nigeria	Not reported	Young age
Johnson *et al.*22	University College Hospital (UCH), Ibadan	Under-5 children admitted with ALRI	30-month study (pub. 2008)	RSV in 28/92 viral identificati ons (30.4%); 92 viruses identified in 61 of 122 analyses	Immunofluo rescence and serology	-	-	infants <1 yr
Akinloye *et al.*23	Hospital clinics, Nigeria (Ibadan/Osun region)	Children with acute respiratory symptoms	Feb–May 2009	0.005% (seasonal timing of sampling)	Real-time RT-PCR	(Sampling outside peak)	Not reported	Not specifically studied

The authors highlighted the clinical significance of multiple concurrent microbial identifications in about 40% of them, with about 80% being malnourished. Aderele *et al.*[19] in an analysis of RSV-associated ALRI in 21 hospitalised pre-school children in Ibadan, found that RSV-associated illness was clinically similar to ALRI due to other agents, with presentations including bronchiolitis, bronchopneumonia, lobar pneumonia, croup and pleural effusion/empyema.

Similar to the finding in the study of Jonson *et al*., the authors found multiple viral pathogens in about 40% of the samples, but none of the children was malnourished. A separate hospital-based study of acute bronchiolitis in Ibadan at about this time identified RSV in 38% of 26 virologically characterised cases, with peak prevalence in the rainy season (May–October).[20]

Outside the hospital, a population-based study of RSV infection, including Indonesia, Mozambique, Nigeria, and South Africa, contributed some of the earliest community-level RSV incidence data from Nigeria.[21] RSV was present in 34.7% of community-dwelling children in Ibadan, Nigeria, with symptoms of ALRI.

Table Ib: Summary of studies on RSV prevalence among children with pneumonia in Nigeria

Author	Study site	Age group	Year of sample collection	RSV prevalence	Method of RSV diagnosis	Peak RSV season	Mortality/case fatality	Identified risk factors
Ogunsemowo *et al.*15,37	Health facilities and immunisation centres, Ibadan	Children with respiratory infections	pub. 2018	RSV in 41/231 (17.7%); 34.6% among hospital cohort;sub groups A (ON1, NA2) and B (BA)	RT-PCR + genotyping (G gene HVR2)	Not the focus	Not reported	Not specifically studied
Oladele *et al.* 26	Ilorin, Kwara State	2–59 months, hospitalised with ALRI	(pub. 2019)	34.20%	?	Rainy months	Not reported	Infancy (RSV+ significantly more often infants: 82.9% vs 54.4%)
Garba et al..27	Emergency Paediatric Unit, Ahmadu Bello University Teaching Hospital, Zaria, Kaduna State	1 month–5 yr, hospitalised with ALRTI	Nov 2018 – Oct 2019	33% (35/106); two-thirds (68.6%, 24/35) <12 months	Point-of-care immunoassay (QuickVue RSV, Quidel; sens. 90%, spec. 98.8%)	Two peaks: March (minor) and July (major); detected 10 months of year (none in May/Oct)	5.7% (2/35) both aged 4 months	Young age (<12 mo); median age RSV+ 8 mo
Obe and Amoo29	Lagos State University Teaching Hospital, Ikeja, Lagos	< 5 years	-	22.5%	Reverse transcription PCR (RT-PCR).	-	-	Non-exclusive breastfeeding
RSV GOLD—ICU Network collaborators28	ABUTH (Nigerian site)	4 days to < 2 years with severe ALRI admitted into paediatric emergency	April 2021 – September 2023	29.7%	A molecular point-of-care RSV test	April–November	9%	Young age

Johnson *et al.*[22] in another study at UCH, Ibadan, reported that RSV was the commonest viral pathogen in 30.8% of the children with ALRI. About 40% of the children had concomitant bacteraemia, with S*treptococcus pneumoniae* being the commonest bacterial pathogen. However, neither haematologic parameters nor clinical presentation could differentiate between viral and bacterial aetiology. In contrast to the findings of the earlier-mentioned studies, a virological survey of Nigerian children hospitalised with acute respiratory symptoms in three paediatric hospitals in Ibadan found that only one out of 189 samples was positive for RSV, while rhinoviruses were the most frequently detected agents.[23] The researchers attributed the scarcity of RSV in their cohort to the seasonal nature of RSV circulation, as the samples were taken between February and May.

Ogunsemowo[24] in Ibadan reported an RSV prevalence of 34.6% among hospitalised and outpatient children with respiratory symptoms at a secondary healthcare facility in Ibadan; they also found an RSV prevalence of 8.7% among children who presented at immunisation clinics with respiratory symptoms. Notably, although both subtypes A and B co-circulated among the participants, subtype A was commoner among the sicker children at the secondary facility while subtype B predominated among those from the immunisation clinic who had milder symptoms. They subsequently reported that three RSV genotypes circulated in their cohort.[15]

Fewer studies have been conducted on RSV pneumonia outside of Ibadan. Kolawole *et al.*[25] found RSV to be the second most common viral pathogen among children with ALRI in a paediatric hospital in Ilorin. More recently, Oladele *et al.* [26] in a cross-sectional study of 120 children aged 2–59 months with ALRI at Ilorin, including at a children's hospital, found an RSV prevalence of 34.2%, peaking in the rainy months, with infants comprising a significantly higher proportion of the RSV-positive than RSV-negative group (82.9% vs 54.4%).[26] From Northern Nigeria, Garba *et al.*[27] reported a similar RSV prevalence of 33.0% among 106 children hospitalised for ALRI at the Ahmadu Bello University Teaching Hospital, Zaria. In this prospective cohort study conducted among children aged 1 month to 5 years from November 2018 to October 2019, RSV infection occurred in 10 months of the year with peaks in March and July, and the case fatality rate was 5.7%. Another report from ABUTH, Zaria, reported an RSV prevalence of 29.7% among children less than 2 years who were enrolled on a prospective, multi-country observational study of children with severe ALRI admitted into a paediatric intensive care unit/children emergency units in 10 GAVI-eligible countries (RSV GOLD—ICU study). Although RSV-associated fatality was 5% across all sites, it was 9% at the Nigerian site.[28]

Apart from Ibadan, another south-western Nigerian study was a recent report from the Lagos State University Teaching Hospital, Ikeja, by Obe and Amoo[29] who reported an RSV prevalence of 22.5% among children admitted with ALRI at the Lagos State University Teaching Hospital, Ikeja, Lagos. The identified risk factors included creche attendance and non-exclusive breastfeeding.

Taken together, these studies place Nigerian RSV prevalence among hospitalised under-fives at roughly 22–35% (without Akinloye study; Table 1),[15,19,21,26,27] — consistent with the wider sub-Saharan African picture, in which a seven-country PERCH case-control study (including African sites) found RSV had the single highest aetiological fraction (31.1%) of all pathogens among children hospitalised with severe pneumonia.[4]

RSV seasonality in Nigeria

Across the Ibadan, Ilorin, and Zaria studies, RSV transmission is consistently linked to the rainy

season rather than the temperature-driven winter seasonality of temperate countries (Table I).[18,26,27] A comparable pattern has been reported elsewhere in West Africa: in a cohort of hospitalised children in Sierra Leone, RSV cases surged during the rainy seasons of 2021–2022 (May–November) and fell during the dry season.[30] This predictability is relevant to the timing of any future maternal immunisation or seasonal monoclonal antibody programme in Nigeria, though intra-country climatic variation should be considered in programme design.

Clinical Burden and Outcomes of RSV Disease

RSV pneumonia in Nigerian children ranges from mild upper respiratory illness to severe bronchiolitis and pneumonia requiring hospitalisation, with infants under six months at greatest risk of severe disease and death, consistent with the global pattern.[5,28] While the RSV-associated case fatality may appear to be low to moderate (5-9% from two studies in Zaria[27,28]; Table I), the high prevalence suggests that RSV's highest impact may be most felt in the high contribution to the hospitalisation rate, especially among young infants (< 6 months), in a setting with scarcity of intensive care.[28] Related to this is the cost of care in the context of out-of-pocket payment. A systematic review of cost-of-illness studies in LMICs found direct medical costs per severe RSV episode ranging from $92 (Malawi) to $4,114 (Malaysia), with episodes consuming roughly a quarter to over a third of affected households' monthly income in some settings[31]. Nigeria-specific household cost data remain scarce — an important evidence gap.

Current and Emerging RSV Prevention Tools

Supportive care

Current management of RSV pneumonia relies on supportive care, including oxygen and non-invasive respiratory support such as high-flow nasal cannula or continuous positive airway pressure (CPAP). Children with severe pneumonia may require invasive mechanical ventilation (iMV)- a scarce commodity in most of Nigerian public and private healthcare facilities. This itself is a reason for urgent prophylaxis (to reduce risk of severe RSV pneumonia warranting iMV). Other supportive modalities are discussed by Garba and Shaaban.[13]

RSV prophylactics: from monoclonal antibodies and maternal vaccines

Palivizumab is an RSV-specific monoclonal antibody administered intramuscularly to infants and young children at risk of RSV. For several decades following its licensure in 1998, it has shown remarkable efficacy and safety for the prevention of severe RSV. It is administered monthly during the RSV season. However, this monthly-dosing requirement and high cost have made it a poor fit for LMICs, including Nigeria, where its use remains non-existent or at most negligible.[6] This necessitated a search for longer-acting monoclonal antibodies as well as vaccines, particularly maternal vaccines. These efforts have yielded fruitful outcomes culminating in the licensing of two products in the last few years: a bivalent prefusion F protein maternal vaccine for inducing maternal antibodies which cross placentally to the foetus and provide passive protection for up to 150 days, and nirvesimab, a long-acting intramuscularly-administered monoclonal antibody which provides passive protection to children for up to six months.[8–10,32,33] Both agents have shown remarkable efficacy (up to 70%) and safety both in clinical trials and real-world post-marketing surveillance/studies. Although there is some concern of a little risk of preterm birth with the maternal vaccine (possibly due to coincidence with COVID-19 outbreaks), data so far do not support this.[9] A second long-acting monoclonal antibody, clesrovimab, was approved in 2025, which, unlike nirsevimab, does not require separate doses for children of different body weights.[7]

Global policy shift

WHO SAGE's September 2024 recommendations and GAVI's design of a maternal RSV vaccine support programme for low-income countries[10,11] mark a turning point, but pharmaceutical companies are unlikely to seek LMIC regulatory approval until GAVI commits to procurement and funding.[34] Thankfully, however, this is now anticipated.[11] As a GAVI-eligible country, Nigeria is positioned to access concessional pricing once a funding window opens.

The case for, and challenges to, RSV vaccine inclusion in Nigeria's National Programme on Immunisation

Cost-effectiveness in comparable settings

A static cohort model across 131 LMICs projected that, at US$3–5 per dose, a maternal vaccine and long-acting monoclonal antibody could avert roughly 25% and 55% of RSV-related infant deaths, respectively.[35] Kenya/South Africa modelling found the interventions cost-saving in South Africa and cost-effective in Kenya at $5 per dose. A Mali-specific model concluded that affordably priced RSV products, including maternal vaccines meeting WHO's preferred product characteristics, would be cost-effective even in a low-income setting.[36] No Nigeria-specific analysis yet exists, but the consistency of favourable findings across comparable African settings is encouraging.

Health system readiness

Nigeria's NPI has previously introduced vaccines such as pneumococcal conjugate and rotavirus vaccines, demonstrating institutional capacity. However, only 52% of births were attended by skilled health personnel per the NDHS 2023–24; routine immunisation coverage remains well below WHO-recommended thresholds, and Nigeria had the world's largest population of "zero-dose" children in 2023.[2] RSV product introduction will therefore depend heavily on broader gains in antenatal care attendance and routine immunisation coverage.

Evidence gaps

Nigeria lacks nationally-representative RSV incidence/mortality estimates, local cost-of-illness and cost-effectiveness analyses, and formal health technology assessment comparing maternal vaccination against infant monoclonal antibody strategies under local conditions. Closing these gaps, through collaboration among the Nigeria Centre for Disease Control, the National Primary Health Care Development Agency (NPHCDA), academic paediatric departments, and partners such as WHO, GAVI, and PATH, would strengthen any advocacy effort. The Paediatric Association of Nigeria, along with national and international partners, has a significant role in bringing about a fruitful advocacy for RSV vaccination as it has done successfully with several vaccine initiatives over the years. However, there needs to be serious investment in RSV surveillance (along with existing influenza surveillance, for example) before, during and after implementation of any intervention for the purpose of effective advocacy, monitoring of efficacy and safety.

Recommendations

To surmount these challenges, the following are recommended:

i. Urgent need for more epidemiological and clinical studies, preferably prospective multi-centre cohort in-hospital studies to characterise the burden, profile and outcomes of RSV pneumonia and its contribution to post-discharge complications and disability among Nigerian children
ii. Establish/strengthen RSV surveillance: integrating RSV testing into existing severe acute respiratory infection (SARI) sentinel platforms (influenza) beyond the academic centres currently reporting data

(a role for the Nigerian Centre for Disease Control and Prevention)

iii. Conduct of local cost-effectiveness analysis, adapting existing LMIC decision-support models to Nigerian epidemiological and cost data.

iv. Engage early with GAVI and WHO: so, the NPHCDA is positioned to access concessional pricing once a GAVI RSV funding window opens.

v. Strengthen underlying delivery platforms — antenatal care attendance and routine immunisation coverage.

vi. Build diagnostic and clinical capacity: including point-of-care RSV testing, to support surveillance and future impact monitoring.

vii. Continued engagement of the populace to mitigate widespread vaccine hesitancy and misinformation.

Conclusion

RSV pneumonia has been a substantial contributor to severe childhood pneumonia in Nigeria for over three decades, concentrated in the youngest, most vulnerable infants. The global RSV prevention landscape has shifted decisively since 2023. This combination of long-recognised domestic burden and narrowing global access gaps makes a strong case for Nigeria to begin formally evaluating RSV prevention products for NPI inclusion — paired with better local evidence generation and continued strengthening of antenatal and immunisation platforms.

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