

Epidemiology of Diarrheal Diseases in Nigeria: Trends and Patterns

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ABSTRACT

Nigeria can accelerate reductions in diarrheal morbidity and deaths by combining high-coverage clinical case management with durable, risk-targeted public health action. At facility and community levels, rapid dehydration assessment, routine oral rehydration solution (ORS) plus zinc for childhood diarrhea, continued feeding, and timely referral for intravenous fluids in severe cases remain the most dependable mortality-reduction package. Yet these gains will be fragile without sustained water, sanitation and hygiene (WASH) investments: safe and consistently treated water, protected sources, functional sanitation, and handwashing with soap, backed by long-term financing, maintenance systems, and behavior change that outlasts short campaigns. Because diarrheal incidence often rises during rains and flooding, hotspot strategies that intensify pre-rainy season preparedness can blunt predictable seasonal surges. Vaccination strengthens prevention: rotavirus vaccine reduces severe pediatric gastroenteritis and admissions, while oral cholera vaccine supports outbreak control and preventive use in high-risk and displacement settings. Strengthened surveillance and preparedness early warning, environmental monitoring, flood forecasting, pre-positioned supplies, rapid response teams, and clear risk communication—enable faster containment. Research priorities include state-level pathogen attribution, rainfall-linked seasonality mapping, antimicrobial resistance tracking (especially *Shigella*), and evaluation of integrated WASH-plus-vaccine packages targeting inequities.

Keywords: Nigeria, diarrhea, epidemiology, cholera, rotavirus, WASH, seasonality, surveillance, under-five mortality

INTRODUCTION

Diarrheal diseases commonly defined as the passage of three or more loose or watery stools within a 24-hour period remain a major public health challenge globally and in Nigeria. They arise from a broad spectrum of enteric pathogens, including bacteria (e.g., *Vibrio cholerae*, diarrheagenic *Escherichia coli*, *Shigella* spp., *Salmonella* spp.), viruses (notably rotavirus and norovirus), and parasites (such as *Giardia duodenalis*, *Cryptosporidium* spp., and *Entamoeba histolytica*). Transmission typically occurs via the fecal–oral route through contaminated water, unsafe food [1], poor sanitation, inadequate hygiene practices, and person-to-person contact especially in crowded settings. While most diarrheal episodes are self-limiting, severe disease can lead to dehydration, electrolyte imbalance, malnutrition, impaired cognitive development in children, and death when timely treatment is unavailable or delayed [2].

In Nigeria, diarrhea is both endemic and epidemic. Endemic transmission contributes persistently to high outpatient attendance, pediatric admissions, lost productivity, and household economic strain. At the same time, periodic outbreaks particularly cholera cause sharp surges in morbidity and mortality and place acute pressure on surveillance systems and health facility capacity. These epidemic spikes often coincide with seasonal and climate-linked stressors such as rainfall variability, flooding, and disruptions to water supply and sanitation infrastructure. The implications extend beyond immediate case counts: outbreaks intensify community vulnerability, widen inequities in access to care, and amplify the socioeconomic consequences of illness in already resource-constrained contexts [3].

Nigeria's diarrheal disease burden is not uniform. The country's heterogeneous geography, ecological zones, population distribution, and sociocultural contexts create marked differences in exposure, transmission dynamics, and outcomes across states. Northern arid and semi-arid areas may experience water scarcity that promotes unsafe water storage and reliance on unimproved sources, while riverine and coastal regions are highly susceptible to

flooding and water contamination. Urban centers face challenges driven by population density, informal settlements, poor drainage, and overstretched WASH (water, sanitation, and hygiene) infrastructure; rural communities may face long distances to safe water sources and limited access to health services [4]. These variations are further shaped by poverty, educational status, dietary practices, food handling behaviors, conflict-related displacement, and the functioning of local health systems. Internally displaced persons (IDPs) and communities in conflict-affected settings are often at heightened risk due to crowding, disrupted services, and constrained access to clean water, sanitation facilities, and essential medicines [5].

WASH conditions and food safety remain core determinants of diarrheal disease transmission in Nigeria. Households without access to safely managed water and sanitation are more likely to rely on contaminated sources and practice open defecation or use shared sanitation facilities that may be poorly maintained. Inadequate hand hygiene, often linked to limited water availability, lack of soap, or poor hygiene infrastructure in schools and markets, facilitates transmission. Foodborne routes are also critical: street-vended foods, unsafe storage, insufficient cooking, cross-contamination, and poor regulation of food handling can promote pathogen spread [6]. Importantly, these environmental and behavioral factors interact with host-level vulnerabilities, including young age, malnutrition, immunosuppression, and comorbid infections, creating a cycle where diarrhea worsens nutritional status and weakened immunity increases susceptibility to recurrent infections.

Seasonality adds another layer of complexity. In many Nigerian settings, diarrheal incidence rises during rainy seasons due to flooding, run-off contamination of water sources, latrine overflow, and breakdown of sanitation systems. Conversely, dry-season peaks may occur in areas where water scarcity forces households to use lower-quality water sources or store water under conditions that increase contamination. Cholera outbreaks often follow rainfall patterns and flooding events, but transmission can be sustained where WASH conditions remain poor and surveillance and rapid response are insufficient [7]. Understanding these spatial and seasonal patterns is essential for designing early warning systems, targeting interventions, and optimizing resource allocation for preparedness and response.

Despite longstanding recognition of diarrheal diseases as a priority, persistent gaps remain in Nigeria's surveillance, etiologic characterization, and translation of evidence into targeted interventions. Diarrhea is frequently managed syndromically, and laboratory confirmation is often limited to outbreak investigations or a few sentinel sites. As a result, the true distribution of pathogens, co-circulating agents, antimicrobial resistance patterns, and changing trends may be incompletely captured. Underreporting, fragmented data systems, variable diagnostic capacity across states, and disruptions from insecurity further weaken the evidence base needed for effective planning [8]. These challenges make it difficult to determine where the burden is concentrated, which populations are most at risk, how patterns shift over time, and which interventions offer the best return in specific contexts.

Against this backdrop, the present review synthesizes evidence on diarrheal diseases in Nigeria with attention to burden and trends, spatial and seasonal distribution, demographic and contextual risk factors, major etiologies and co-circulating pathogens, and surveillance gaps and intervention priorities. By integrating findings across ecological zones and sociopolitical contexts, the review aims to support a more nuanced understanding of diarrheal disease epidemiology in Nigeria and inform practical, equity-oriented public health strategies [9].

Diarrheal diseases remain a major cause of preventable morbidity and mortality, especially among children under five, and their persistence reflects powerful structural drivers including inadequate WASH access, poverty, undernutrition, and uneven health system performance. In Nigeria, these risks are intensified by rapid urbanization, the expansion of informal settlements, climate variability (including flooding and drought), population displacement, and periodic humanitarian crises, all of which shape exposure pathways and amplify outbreak potential [9]. Proven interventions oral rehydration therapy, zinc supplementation, rotavirus vaccination, safer and more reliable water supplies, improved sanitation coverage, hygiene promotion, and stronger food safety regulation can substantially reduce disease, but their real-world impact depends on sustained coverage, service continuity, and fit with local ecological and sociocultural contexts. Despite broad recognition of diarrheal disease as a national public health priority, Nigeria's epidemiology is still unevenly characterized across states and ecological zones. Available data are frequently fragmented, syndromic, or concentrated in a limited number of sites, constraining understanding of geographic hotspots, seasonal dynamics, pathogen-specific contributions, and context-specific risk factors. Recurrent cholera outbreaks underscore gaps in preparedness and response, while endemic diarrhea continues to impose heavy health and economic burdens. This review therefore aims to synthesize and critically appraise evidence on Nigeria's diarrheal diseases by mapping burden and time trends, describing spatial and seasonal patterns, identifying demographic and contextual risks (WASH, food safety, poverty, displacement, and climate-related events), clarifying dominant etiologies and co-circulating enteric pathogens, and highlighting surveillance weaknesses alongside priority prevention and response areas. The resulting consolidated evidence base will support policy and planning, enable targeted intervention design, strengthen surveillance systems, advance equity for vulnerable populations, and guide future research priorities.

Methods

This narrative review synthesizes evidence on diarrheal diseases in Nigeria from multiple high-quality sources, including peer-reviewed journal articles, nationally representative surveys, routine surveillance outputs, and official outbreak and situation reports. Eligible materials were identified for their relevance to diarrheal morbidity and acute watery diarrhea events, then extracted and integrated using a descriptive, interpretive approach rather than formal meta-analytic pooling. To ensure coherence and comparability across heterogeneous data streams, findings are organized thematically into five domains: (i) overall burden and temporal trends; (ii) spatial distribution and seasonality; (iii) predominant etiologic agents and transmission settings; (iv) key risk factors across household, environmental, and health-system levels; and (v) programmatic and policy implications for prevention, preparedness, and response. Outcomes prioritized for synthesis include diarrhea prevalence, especially among children under five years, incidence rates where available, healthcare utilization (including clinic visits and hospitalizations), and outbreak metrics such as suspected and confirmed cases, geographic spread, case fatality patterns, and response timelines for cholera and related acute watery diarrhea outbreaks. The review emphasizes triangulation across sources to highlight consistencies, identify data gaps, and inform actionable priorities for control and surveillance strengthening nationally.

Burden of Diarrheal Diseases in Nigeria

Diarrheal diseases remain a major public health challenge in Nigeria, with the heaviest toll borne by children under five, who face the highest incidence and worst outcomes because of immature immunity, frequent exposure to contaminated water/food, and the compounding effects of malnutrition [10]. Recurrent diarrhea drives growth faltering via nutrient malabsorption and repeated inflammatory injury to the gut, while stunting and micronutrient deficiencies simultaneously increase susceptibility and disease severity, creating a vicious, self-reinforcing cycle. In many settings, diarrhea continues to rank among the leading causes of under-five morbidity and mortality, especially where access to timely oral rehydration therapy (ORT), zinc supplementation, and efficient referral care is limited. Beyond early childhood, diarrhea also imposes a substantial burden on older children and adults through foodborne transmission, school and workplace absenteeism, and amplified risk during outbreaks. Among adults, severe dehydration is often linked to cholera and other bacterial causes of acute watery diarrhea, with heightened vulnerability in conflict-affected communities and displaced populations where safe water and sanitation are disrupted. Economically, the disease load translates into high outpatient visits, frequent pediatric admissions for dehydration, antibiotic misuse, and added pressure on constrained laboratory services during outbreaks [11]. Households incur direct and indirect costs—transport, repeated care-seeking, and lost income that can become catastrophic for poorer families.

Trends Over Time: What Has Changed, What Hasn't

Over time, Nigeria's diarrhea landscape shows both incremental progress and stubborn persistence. Nationally, multiple policy and program shifts expanded routine immunization (including the relatively recent introduction of rotavirus vaccine), wider promotion of oral rehydration solution (ORS) plus zinc, and recurring water, sanitation and hygiene (WASH) initiatives have contributed to modest declines in childhood diarrhea prevalence and, in some settings, mortality [12]. Yet these gains remain uneven across states and communities, reflecting disparities in infrastructure, service delivery, and access to timely care. As a result, the overall trend is best described as gradual improvement punctuated by abrupt reversals. Cholera outbreaks are the clearest “trend disruptors”: they can rapidly erase hard-won reductions when contaminated water supplies, sanitation failures, population displacement, and delayed surveillance or response converge. In particular, years marked by widespread flooding, conflict-related insecurity, or humanitarian disruption often coincide with larger, more prolonged outbreaks and higher case burdens. Meanwhile, the etiologic profile is also shifting. Rotavirus historically accounted for a large share of severe pediatric gastroenteritis, and vaccine roll-out should progressively reduce severe cases and hospitalizations. However, total diarrhea incidence may remain substantial because other pathogens (e.g., norovirus, enterotoxigenic *E. coli*), malnutrition, and ongoing environmental exposures continue to sustain transmission [13].

Surveillance, Data Sources, and Measurement Challenges

In Nigeria, surveillance for under-five diarrhea relies on multiple data streams, each capturing different parts of the burden. Household surveys such as DHS/MICS provide caregiver-reported prevalence and help describe community-level patterns, while facility-based surveillance tracks severe cases, admission trends, and seasonal shifts. During suspected cholera or acute watery diarrhea (AWD) events, outbreak reports and line lists are used to document case counts, locations, and immediate response needs [14]. Where available, laboratory networks add value by confirming pathogens and supporting targeted control measures. However, major measurement challenges persist: substantial underreporting occurs because many children are treated at home, through self-medication, or by informal providers outside routine reporting systems. Misclassification is common in outbreaks, with many cases labeled “cholera” without laboratory confirmation, inflating or distorting true cholera burden. Routine stool testing remains limited, and genomic/AMR surveillance is weak, reducing visibility of circulating strains and resistance trends. Subnational data gaps, inconsistent denominators, and uneven reporting completeness further undermine

comparability across states and time. Improving representativeness requires integrating community-based signals, expanding rapid diagnostic testing, and strengthening lab confirmation systems [15]. Meanwhile, although most childhood AWD is viral and self-limiting with rehydration, antibiotics are widely used, accelerating AMR in enteric bacteria (e.g., Shigella, diarrheagenic E. coli, Salmonella), complicating dysentery management, and increasing costs, highlighting the need for stewardship, clear algorithms, and better diagnostics.

Prevention and Control: What Works in Nigeria's Context

In Nigeria, effective prevention and control of diarrheal diseases depend on combining proven clinical care with sustained public health investments tailored to local risk patterns. For case management, oral rehydration salts (ORS) plus zinc remain the cornerstone for childhood diarrhea, while rapid recognition of dehydration, timely referral, and IV fluids for severe cases are critical to reducing mortality. Continued feeding and nutritional support further limit complications and speed recovery [16]. Beyond the clinic, WASH interventions safe water access through treatment or chlorination, protected sources, improved sanitation infrastructure, and consistent handwashing with soap deliver high impact, but only when financing, maintenance, and behavior change efforts are maintained over time. Because diarrheal peaks often coincide with rains and flooding, targeted pre-rainy season actions in identified hotspots can blunt predictable seasonal surges. Vaccination strengthens prevention: rotavirus vaccine reduces severe pediatric gastroenteritis and hospitalizations, while oral cholera vaccine (OCV) supports both outbreak control and preventive campaigns in high-risk areas, including displacement settings [17]. Strong outbreak preparedness early warning systems, prepositioned ORS/IV fluids, rapid response teams, and risk communication enable faster containment, and can be enhanced through flood forecasting and environmental surveillance. Key research priorities include state-level pathogen attribution using standardized diagnostics, pathogen-specific seasonality mapping linked to rainfall/flood data, and studies in urban informal settlements on water quality, sanitation chains, and food safety. Expanded AMR surveillance (notably for Shigella), evaluations of combined WASH-plus-vaccine packages in hotspots, and equity-focused analyses for IDPs, peri-urban poor, and riverine communities are also urgent [18].

CONCLUSION

In Nigeria, reducing diarrheal morbidity and deaths requires pairing high-coverage clinical case management with durable, risk-targeted public health action. At facility and community levels, prompt assessment of dehydration, routine ORS plus zinc for childhood diarrhea, continued feeding, and rapid referral with IV fluids for severe cases remain the most reliable mortality-reduction package. However, these gains will be short-lived without sustained investments in WASH safe and consistently treated water, protected sources, functional sanitation, and handwashing with soap supported by long-term financing, maintenance systems, and behavior change that persists beyond campaigns. Because incidence often rises with rains and flooding, a hotspot approach that intensifies pre-rainy season preparedness can blunt predictable seasonal surges. Vaccination adds essential prevention capacity: rotavirus vaccine lowers severe pediatric gastroenteritis and admissions, while OCV is valuable for outbreak control and preventive use in high-risk and displacement settings. Strengthened surveillance and preparedness, warning, environmental monitoring, flood forecasting, stocked supplies, rapid response teams, and clear risk communication enable faster containment. Research should prioritize standardized state-level pathogen attribution, rainfall-linked seasonality mapping, AMR tracking (especially Shigella), and evaluations of integrated WASH-plus-vaccine packages that address inequities in informal settlements, riverine areas, peri-urban poverty, and IDPs.

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