www.idosr.org Nambi, 2026

©IDOSR PUBLICATIONS

ISSN: 2579-0811

International Digital Organization for Scientific Research IDOSR JBBAF2026/113
IDOSR JOURNAL OF BIOCHEMISTRY, BIOTECHNOLOGY AND ALLIED FIELDS 11(3):42-47, 2026.
https://doi.org/10.59298/IDOSR/JBBAF/2026/1134247

Diabetes and COVID-19 in Nigeria: Clinical Outcomes, Risk Factors, and Lessons for Public Health Preparedness

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ABSTRACT

The coronavirus disease 2019 (COVID-19) pandemic disproportionately affected individuals with underlying non-communicable diseases (NCDs), particularly diabetes mellitus (DM). Nigeria, which bears a rising burden of diabetes alongside infectious diseases, faced significant challenges in managing patients with metabolic comorbidities during the pandemic. This review examines the impact of diabetes on COVID-19 severity and mortality in Nigeria, analyzes contributory biological and socio-health system risk factors, evaluates Nigeria's response to managing high-risk comorbid patients, and proposes strategies to strengthen resilience for future pandemics. Evidence indicates that diabetes significantly increased hospitalization rates, intensive care admission, complications, and mortality among Nigerian COVID-19 patients. Key mechanisms include immune dysregulation, chronic inflammation, hypercoagulability, endothelial dysfunction, and glycemic variability. Structural health system constraints—including limited ICU capacity, fragmented NCD services, medication supply disruptions, and poor risk communication—amplified adverse outcomes. Nigeria's pandemic response demonstrated strengths in rapid public health coordination but exposed weaknesses in integrated chronic disease care and emergency preparedness. Future resilience requires integrated NCD-infectious disease surveillance, decentralized diabetes care models, telemedicine expansion, strengthened supply chains, targeted vaccination strategies, and risk-stratified emergency protocols. Addressing diabetes as a central pandemic vulnerability is essential for safeguarding population health in Nigeria and comparable low- and middle-income settings.

Keywords: Diabetes mellitus, COVID-19, Nigeria, Non-communicable diseases, Pandemic preparedness.

INTRODUCTION

Coronavirus disease 2019 (COVID-19), caused by the novel severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), emerged in late 2019 and rapidly escalated into a global public health emergency. The World Health Organization (WHO) declared COVID-19 a pandemic in March 2020 following its rapid international spread, overwhelming healthcare systems and disrupting socioeconomic structures worldwide [1]. Although the infection affected individuals across all age groups and demographic categories, disease severity and mortality were disproportionately concentrated among individuals with underlying comorbidities, particularly non-communicable diseases (NCDs) such as diabetes mellitus (DM), hypertension, cardiovascular disease, and obesity [2]. Globally, diabetes mellitus has been consistently identified as a major independent risk factor for severe COVID-19 outcomes, including acute respiratory distress syndrome (ARDS), intensive care unit (ICU) admission, mechanical ventilation requirement, and mortality. Hyperglycemia, chronic inflammation, immune dysregulation, endothelial dysfunction, and prothrombotic states associated with diabetes contribute to increased vulnerability during viral infections. Furthermore, COVID-19 itself can induce metabolic complications, including stress hyperglycemia, diabetic ketoacidosis (DKA), and worsening glycemic instability, thereby creating a bidirectional and synergistic pathophysiological interaction [3]. Nigeria, the most populous country in Africa with over 220 million inhabitants, presents a unique epidemiological landscape characterized by a dual burden of communicable and non-communicable diseases. While infectious diseases such as malaria, tuberculosis, and HIV/AIDS remain prevalent, Nigeria has experienced a steady rise in NCDs over the past two decades. Urbanization, nutritional transitions toward high-calorie processed diets, reduced physical activity, increasing obesity rates, and population aging have contributed to the growing prevalence of diabetes [4].

Recent national and regional estimates suggest that millions of Nigerians live with diabetes, with a substantial proportion remaining undiagnosed. The International Diabetes Federation (IDF) estimates that a significant

percentage of adults with diabetes in Sub-Saharan Africa are unaware of their condition. In Nigeria, poor glycemic control is common due to limited access to structured diabetes care, financial constraints, inadequate health insurance coverage, drug stock-outs, and limited specialist services, particularly in rural settings [5]. Consequently, many patients present late with complications such as nephropathy, neuropathy, cardiovascular disease, and impaired immunity. When COVID-19 reached Nigeria in February 2020, concerns quickly emerged regarding the potential impact on vulnerable populations, including individuals with diabetes. Nigeria's healthcare system, already constrained by workforce shortages, limited ICU capacity, and infrastructural deficits, faced additional strain [6]. The convergence of rising diabetes prevalence and an emerging infectious pandemic created a critical public health intersection. Understanding the clinical outcomes of COVID-19 among diabetic patients in Nigeria is therefore essential for evidence-based policy, clinical management optimization, and future pandemic preparedness [7].

Although global evidence shows that diabetes significantly increases the risk of severe COVID-19 outcomes, Nigeria lacks consolidated, context-specific data synthesizing this association. Early evidence largely originated from high-income countries with stronger health systems, broader testing capacity, and advanced ICU infrastructure, limiting its applicability to low- and middle-income settings [8]. In Nigeria, vulnerability among diabetic patients may be amplified by high rates of undiagnosed disease, poor baseline glycemic control, limited HbA1c monitoring, delayed care-seeking, financial barriers, weak intensive care capacity, and restricted access to advanced therapeutics. Pandemic-related disruptions lockdowns, medication supply interruptions, reduced outpatient services, and fear of hospital visits likely further compromised diabetes management and worsened outcomes. Despite emerging hospital-based reports, no comprehensive synthesis exists on mortality rates, severity patterns, glycemic status at admission, risk modifiers (age, obesity, hypertension, renal disease), or health system responses and policy adaptations This review therefore aims to evaluate clinical outcomes among diabetic COVID-19 patients in Nigeria, analyze biological and systemic risk factors, assess healthcare and policy responses, identify lessons learned, and propose strategies for integrated NCD–infectious disease preparedness. The study holds clinical, public health, policy, and research significance by informing risk stratification, strengthening chronic disease surveillance, guiding resource allocation, and addressing evidence gaps to enhance resilience against future pandemics.

Epidemiological Context: Diabetes and COVID-19 in Nigeria

Nigeria entered the COVID-19 pandemic with a growing burden of type 2 diabetes mellitus (T2DM), driven by rapid urbanization, lifestyle transitions, rising obesity, increased consumption of processed foods, reduced physical activity, and an aging population. Diabetes-related complications, particularly hypertension, chronic kidney disease (CKD), and cardiovascular disease, are highly prevalent, further increasing susceptibility to severe infectious outcomes. Structural health system weaknesses compounded this risk profile [9]. Delayed diagnosis and poor glycemic monitoring are common due to limited screening programs, high out-of-pocket healthcare costs, weak integration of diabetes care into primary health services, and a shortage of endocrinology specialists. Consequently, many individuals entered the pandemic with undetected or poorly controlled disease. Nigeria reported its first COVID-19 case in February 2020, and subsequent waves placed substantial pressure on healthcare infrastructure, especially in densely populated urban centers such as Lagos and Abuja [9]. Although reported case-fatality rates were lower than in several high-income settings, limited testing capacity and under-reporting constrain accurate interpretation. Hospital-based data consistently showed that comorbidities, including diabetes, hypertension, and obesity were strongly associated with severe COVID-19 outcomes and mortality, underscoring the intersection between chronic metabolic disease and pandemic vulnerability in Nigeria [10].

Clinical Outcomes of COVID-19 in Diabetic Patients

Multiple Nigerian hospital-based studies and regional analyses consistently demonstrate that diabetes significantly increases the risk of adverse COVID-19 outcomes. Diabetic patients were more likely to present with severe pneumonia, acute respiratory distress syndrome (ARDS), and hypoxemia requiring oxygen therapy, often resulting in prolonged hospital stays. Poor baseline glycemic control was strongly associated with heightened inflammatory responses and accelerated clinical deterioration [11]. In addition, individuals with diabetes had higher rates of intensive care unit (ICU) admission, greater need for mechanical ventilation, and increased incidence of multiorgan dysfunction. Given Nigeria's limited ICU capacity, progression to critical illness substantially amplified mortality risk. Across several cohorts, diabetes emerged as an independent predictor of death, particularly among patients with uncontrolled hyperglycemia, coexisting hypertension, chronic kidney disease (CKD), advanced age, and obesity [12]. Acute metabolic complications, including diabetic ketoacidosis (DKA) and hyperosmolar hyperglycemic state (HHS) were also reported in COVID-19 cases, further worsening prognosis. Overall, the evidence highlights diabetes as a major determinant of severity, resource utilization, and mortality in Nigerian COVID-19 patients, underscoring the importance of optimal glycemic control and early risk stratification [13].

Biological Mechanisms Linking Diabetes and COVID-19 Severity

Diabetes increases COVID-19 severity through multiple interrelated biological mechanisms. First, immune dysregulation in diabetes affects both innate and adaptive responses, including reduced neutrophil chemotaxis and phagocytosis, impaired T-cell function, and altered cytokine signaling. These defects compromise viral clearance and heighten susceptibility to secondary infections. Second, chronic low-grade systemic inflammation characteristic of T2DM synergizes with the hyperinflammatory response triggered by SARS-CoV-2 [14]. The combined amplification of IL-6, TNF-α, CRP, and other pro-inflammatory mediators contributes to cytokine storm, acute respiratory distress syndrome (ARDS), and multiorgan injury. Third, both conditions promote hypercoagulability and endothelial dysfunction, characterized by endothelial injury, platelet activation, elevated D-dimer levels, and microthrombosis, thereby increasing the risk of pulmonary embolism, stroke, and myocardial infarction [15]. Additionally, SARS-CoV-2 entry via ACE2 receptors may be influenced by altered ACE2 expression and renin–angiotensin–aldosterone system (RAAS) dysregulation in diabetic individuals, potentially worsening disease progression. Finally, glycemic variability plays a critical role: acute and stress-induced hyperglycemia independently predict poor outcomes, while steroid therapy during COVID-19 treatment further destabilizes glucose control, compounding metabolic and inflammatory stress [16].

Health System Challenges in Nigeria During the Pandemic

During the COVID-19 pandemic, Nigeria's health system faced major constraints that disproportionately affected people living with diabetes. Lockdowns and movement restrictions disrupted routine diabetes care, leading to missed clinic appointments, reduced access to insulin and oral hypoglycemics, limited laboratory monitoring (e.g., HbA1c testing), and decreased physical activity. Concurrent supply chain disruptions increased medication costs and worsened shortages, further compromising glycemic control [17]. Financial barriers intensified these challenges, as Nigeria's largely out-of-pocket healthcare financing model left many patients unable to afford medications, glucose monitoring supplies, or timely medical consultations during the economic downturn. Delayed care-seeking contributed to poor metabolic control and more severe presentations. At the same time, limited pre-pandemic critical care capacity, including shortages of ICU beds, ventilators, and trained intensivists, strained the system's ability to manage severe COVID-19 cases, particularly among high-risk individuals with comorbidities such as diabetes. Resource allocation pressures may have disproportionately disadvantaged these vulnerable groups. Additionally, weak non-communicable disease (NCD) surveillance systems and poor integration between COVID-19 and chronic disease registries created significant data gaps, limiting real-time risk stratification, targeted interventions, and coordinated policy responses [18].

Nigeria's Response to Managing Comorbid Patients

Nigeria's response to managing comorbid patients, particularly those with diabetes during the COVID-19 pandemic, combined public health coordination, clinical guidance, vaccination prioritization, and emerging digital strategies. At the national level, authorities rapidly activated a Presidential Task Force, which later transitioned to coordination under the Nigeria Centre for Disease Control (NCDC) to oversee response efforts. Contact tracing systems, isolation centers, and nationwide risk communication campaigns were deployed to contain transmission and inform the public [19]. Clinical management guidelines identified diabetes as a high-risk condition and emphasized strict glycemic monitoring, appropriate anticoagulation, oxygen therapy, and corticosteroid use in severe cases. However, implementation varied across facilities due to differences in resources, workforce capacity, and infrastructure. During vaccine rollout phases, individuals with diabetes were prioritized, reflecting their elevated risk of severe disease. Nonetheless, uptake was constrained by vaccine hesitancy, rural access limitations, and cold chain logistics challenges [20]. Some tertiary institutions introduced telemedicine for non-communicable disease follow-up and decentralized care models to reduce exposure risk, but national scale-up remained limited by the digital divide, poor internet connectivity, and the absence of structured reimbursement mechanisms for virtual care services.

Lessons Learned

The pandemic generated critical lessons regarding the intersection of non-communicable diseases (NCDs) and health system resilience. First, it became evident that NCDs such as diabetes significantly amplify infectious disease risk, transforming what is often viewed as a long-term chronic condition into a major determinant of acute infectious morbidity and mortality. Poor glycemic control and associated comorbidities increased vulnerability to severe outcomes, underscoring the need for proactive chronic disease management [21]. Second, fragmented care models weakened system responsiveness; the separation of NCD and infectious disease services limited coordinated risk stratification, continuity of care, and rapid clinical decision-making during crisis conditions. Third, the overreliance on tertiary hospitals exposed structural fragility, as disruptions in referral systems and hospital overcrowding constrained access, highlighting the necessity of strong community-level chronic care platforms capable of maintaining essential services during emergencies. Finally, weaknesses in health financing, particularly dependence on out-of-pocket expenditure undermined continuity of chronic disease management during economic shocks, leading to treatment interruptions and poorer outcomes [22]. Together, these lessons emphasize the urgency of

integrated care models, decentralized service delivery, and sustainable financing reform to strengthen preparedness for future public health crises.

Strategies for Strengthening Public Health Preparedness

Strengthening public health preparedness requires an integrated, systems-based approach that embeds diabetes and other NCD management within emergency response frameworks. Integrated surveillance systems should link NCD registries with infectious disease reporting to enable real-time risk stratification dashboards and guide rapid response, while scaling community-based diabetes screening to detect high-risk individuals early [23]. Decentralized diabetes care is critical: primary healthcare centers must be strengthened, with task-shifting to trained nurses and community health workers, supported by local insulin distribution hubs to ensure uninterrupted access. Telemedicine expansion should include a national telehealth framework, subsidized digital platforms, and integration of remote glucose monitoring to maintain continuity of care during crises. Standardized emergency glycemic management protocols are needed, alongside frontline clinician training and stockpiling of essential diabetes medications. Targeted vaccination and booster campaigns should prioritize high-risk individuals, expand rural outreach, and engage diabetes associations [24]. Preparedness also depends on stronger critical care infrastructure, including expanded ICU capacity, trained specialists, and reliable oxygen supply chains. Finally, health financing reform through expanded National Health Insurance coverage, subsidized essential NCD medicines, and emergency chronic disease protection funds is essential to ensure equitable access and financial risk protection.

Policy Implications for Nigeria and Similar Settings

The intersection of diabetes and COVID-19 highlights a critical policy lesson for Nigeria and comparable Sub-Saharan African settings: pandemic resilience is inseparable from the strength of chronic disease management systems. The disproportionate morbidity and mortality observed among individuals with metabolic disorders demonstrate that noncommunicable disease (NCD) control should be embedded within national security and emergency preparedness strategies [25]. Pandemic response frameworks must explicitly account for metabolic disease vulnerability, ensuring continuity of care, medication access, and risk stratification during public health crises. Strategic investments in primary healthcare are particularly important, as they generate dual benefits, strengthening both infectious disease control and long-term NCD management. These insights are highly relevant for countries undergoing epidemiological transition, where rising diabetes prevalence intersects with persistent infectious disease burdens. Future research should examine long COVID outcomes among diabetic Nigerian patients, quantify how glycemic control levels influence mortality risk, and evaluate the cost-effectiveness of tele-diabetes care models [26]. Additional priorities include assessing rural–urban disparities in outcomes and investigating vaccine immunogenicity and durability in diabetic populations to guide targeted clinical and public health interventions.

CONCLUSION

In conclusion, the diabetes–COVID-19 nexus in Nigeria underscores a fundamental public health imperative: resilient health systems must be built on strong chronic disease foundations. The elevated risk of severe outcomes among individuals with diabetes reveals structural gaps in prevention, early detection, continuity of care, and emergency preparedness. Integrating NCD management into pandemic planning is no longer optional but essential for reducing excess mortality during future outbreaks. Strengthening primary healthcare, ensuring uninterrupted access to essential medicines, scaling digital care innovations, and embedding metabolic risk profiling into surveillance systems will enhance both infectious disease responsiveness and long-term NCD control. For Nigeria and similar Sub-Saharan African countries undergoing rapid epidemiological transition, coordinated, equity-focused strategies are critical to addressing rural–urban disparities and protecting vulnerable populations. Ultimately, sustained investment in diabetes prevention and control represents a strategic safeguard against future health shocks, reinforcing the principle that pandemic resilience begins with robust, inclusive, and adaptable chronic disease systems.

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CITE AS: Nambi Namusisi H. (2026). Diabetes and COVID-19 in Nigeria: Clinical Outcomes, Risk Factors, and Lessons for Public Health Preparedness. IDOSR JOURNAL OF BIOCHEMISTRY, BIOTECHNOLOGY AND ALLIED FIELDS 11(3):42-47.
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