REVIEW

Diabetes Care in Nigeria

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Abstract

BACKGROUND Diabetes is a noncommunicable disease that has attained great significance in the sub-Saharan region, with Nigeria being the most affected. Many persons with the condition suffer a reduced life expectancy and quality of life. Diabetes places an extra burden on the individuals and families affected, especially for the majority of patients unable to access quality health care.

OBJECTIVE To describe the elements of diabetes management in Nigeria, areas for improvement, and proposed strategies to optimize care.

METHODS A systematic literature search was performed on diabetes in Nigeria. Local and non-indexed literature, PubMed, and Google Scholar were used to source information on the subject.

FINDINGS Diabetes-related morbidity and mortality continue to increase due to population expansion, urban migration, declining physical activity, and dietary factors. The organization of diabetes care is poorly coordinated, especially at the primary and secondary tiers of the public health care system, with consequent poor outcomes. Thus life expectancy (just about 50 years), which is low in the region, is further reduced by the double jeopardy of communicable (eg, tuberculosis, HIV/AIDS, and malaria) and noncommunicable diseases, such as diabetes and its closely related comorbidity, hypertension.

CONCLUSIONS The way forward is to improve maternal and child care, promote screening of at-risk populations, and develop strategies for primary prevention and early intervention to optimize glycemic control. Greater commitment to health care by the government and nongovernmental organizations and greater awareness by Nigerians should facilitate the desired improvements in disease prevention and glycemic control in those who are already affected.

KEY WORDS diabetes care, diabetes mellitus, morbidity, mortality, Nigeria, patient profile

HEALTH INDICES IN NIGERIA

Nigeria is a multiethnic (more than 300 distinct ethnic nationalities), sub-Saharan African country. A mainly agrarian country, most of the Nigerian population are peasant farmers, whereas others are shepherds, nomadic cattle herdsmen, hunters, and fishermen. The Nigerian population is undergoing transition with people moving from these traditional rural jobs to urban areas in the thousands on a daily basis to take on semi-skilled and unskilled labor. Nigeria is located in West Africa with a vast terrain extending from the humid Atlantic equatorial/coastal southern part to the semi-arid northern part with close proximity to the Sahara Desert. It is a low-middle income country with a population of about 173.6 million people. It is the most populous black nation in the world: 1 in 4 blacks is a

Nigerian. The gross domestic product (GDP) per capita is US$2800, 90% of the income is generated from oil/petroleum, and the economy is growing at 6%-7% per annum.[1,2]

Unfortunately, the budget for health in Nigeria often falls much lower than the amount recommended by the International Monetary Fund (IMF) and World Health Organization (WHO). The 2012 total health expenditure per capita in Nigeria was US$161 (compare in the United States it was US$8895), and the total expenditure on health as a percentage of the GDP is 6.1% (compare to the USA where it was 17.9%).[3] The adult literacy rate for the English language is about 57.9%, whereas the adult literacy in any language stood at 71.6% in 2010.[4] The health indices of the country are generally poor with life expectancy at birth of 54 years (compared with 56 years for South Africa, 71 years for Egypt, and 78 years for the United States), infant mortality rates of 78 per 1000 (compared with 33/1000 for South Africa, 63/1000 for Egypt, and 6/1000 for the United States) in 2010-2014, and crude birth rates of 42 per 1000 (compared with 21.1/1000 for South Africa, 23.5/1000 for Egypt, and 13/1000 for the United States).[5] The country has a twin burden of noncommunicable diseases (NCD) and communicable diseases. The communicable diseases that are rampant in Nigeria are HIV/AIDS (prevalence is 3.2% with mortality of 215,000 people in 2013), malaria (prevalence is 100,000 cases per annum with mortality of 300,000 cases per annum), and tuberculosis (TB; prevalence is 280,000 cases per annum with mortality of 170,000 cases per annum).[6,7] The NCD are also quite prevalent with more than 30% of adults suffering from hypertension, as well as 0%-33% for goiter,[8] 7%-18% for asthma,[9] and 20%-30% for sickle cell disease,[10] among others.

EPIDEMIOLOGY OF DIABETES IN NIGERIA

There are about 387 million people afflicted with diabetes in the world today. Of this large number, 22 million reside in sub-Saharan Africa. Nigeria is the most populated country in Africa and is home to 4 million people with diabetes, or a fifth of all diabetes cases in sub-Saharan Africa.[11]

More worrisome than the absolute number of people with diabetes in Nigeria is the number who remain undiagnosed or untreated (70%-80% of the 4 million).[11] This relatively large number poses a great strain on the meager health budget in Nigeria.

The net effect is that many patients present to secondary and tertiary health care centers with advanced disease and attendant high morbidity and mortality.

Diabetes has a wide range of prevalence across the country. In the rural areas of Nigeria, diabetes is prevalent in 0%-2% of the population, whereas in the urban regions the figures are much higher at 5%-10%.[12-14] In selected urban cities, diabetes is seen in up to 23.4% of the higher socioeconomic members of the community in the staff of oil industry of the urban Port Harcourt.[15] This is higher than those of the lower socioeconomic people (16%) of the same community.[15] The difference in prevalence values is often seen as a result of westernization and demographic transition—the progressive shift in the population from rural to urban centers—raising fears that a diabetes epidemic is on the horizon.

Diabetes is not common in children in Nigeria, but local anecdotal and clinic reports suggest the number of children and adolescents with diabetes is gradually rising.[16]

IMPACT OF DIABETES ON NIGERIA

Diabetes undoubtedly has changed the landscape of health care in Nigeria over the decades. Diabetes has been associated with the resurgence of tuberculosis and with the rising prevalence of end-stage kidney disease, erectile dysfunction, and stroke.[17-20] Diabetes has also led to higher numbers and the majority of cases of lower extremity amputation (LEA) in Nigeria.[21] On medical wards, patients with diabetes have the longest hospital stay and highest medical bills with diverse complications, such as stroke, heart failure, and LEA from foot gangrene.[22] Not surprisingly, diabetes remains one of the costliest diseases to manage largely because of the associated complications and the comorbidities.[23] Diabetes is observed in a quarter to a third of all admissions in Nigerian medical (nonsurgical) wards[24,25] and is one of the leading predisposing factors to operative obstetric delivery, premature births, and neonatal mortality.[26]

ORGANIZATION OF DIABETES CARE IN NIGERIA

Most Nigerians with diabetes are seen in the secondary institutions (general hospitals, specialist hospitals, and private hospitals). More complicated cases are seen in the few tertiary centers (fewer than 60

exist in Nigeria). Many times, patients with diabetes are diagnosed with classic symptoms or complications. A small number are discovered during public health screening programs, routine medical screening programs, and pre-employment medical checks, or for investigation of other conditions, such as infertility, hypertension, or stroke. Approximately 4%-5% of people with HIV/AIDS or TB have diabetes diagnosed during the course of evaluation.[17,27]

The few patients diagnosed in primary care centers are rarely treated or poorly managed. The patients with diabetes presenting at this level are generally referred to the secondary care centers because these primary centers often only have nurses with little experience in diabetes care. At the secondary care centers, there are medical officers and sometimes consultant (specialist) physicians with advanced knowledge and experience in managing diabetes and, hence, most patients are adequately treated. Other patients who cannot be managed at the secondary health centers because of comorbidities or severity of diabetes complications are referred to tertiary health institutions. (However, some patients at secondary centers not requiring referral are still sent to tertiary centers at the behest of the patients or their relatives.)

The primary care health centers are generally not able to manage or follow-up patients with diabetes and related comorbidities/complications as a result of limited resources, such as diagnostic and monitoring equipment. Most of these primary care centers only have urine testing for glucose and very few have blood glucose meters. The dispensaries of primary centers in Nigeria rarely have more than metformin and sulfonylureas as available medications. Health care professionals, such as dietitians, nutritionists, diabetes educators, and chiropodists, are virtually absent at this lower tier of care. Nurses, and in a few instances medical officers or physicians (or general practitioners), staff these primary care centers and have very basic or rudimentary knowledge about the diagnosis and treatment of diabetes.

The secondary health centers almost always have nurses, pharmacists, dietitians, and general internists, but rarely have diabetologists/endocrinologists. This means that patients with diabetes are typically managed by physicians who do not have more than limited subspecialty training in diabetes. In addition, diabetes educators and chiropodists are scarce, and therefore medical officers often need to assume these roles, while physical therapists or nurses double as diabetes educators. Some of these secondary

centers have functioning glucose meters, point-of-care hemoglobin A1c (A1C) machines, and full laboratory and other diagnostic services. A few secondary centers are equipped with facilities to care for complicated diabetes. Such facilities include intensive care units, dialysis units, partially equipped eye clinics, electrocardiogram machines, and prosthetic/orthotic units.

The tertiary health centers have specialized units for some of the advanced treatments, such as retinal surgery, laser eye treatment, and echocardiography (but rarely cardiac catheterization or other cardiac or vascular imaging). Very few tertiary centers have vascular surgery facilities, and the number of bypass surgeries for peripheral artery disease or coronary artery bypass number fewer than 5 per annum, even in the best tertiary centers. Nevertheless, some of these tertiary centers have a small number of endocrinologists, diabetologists, dietitians, nutritionists, physical therapists, diabetes nurses, etc., but only 1 or 2 hospitals in the entire country have the full complement of chiropodists, podiatrists, and certified diabetes educators. In addition to the usual services available in the secondary centers, some tertiary centers have kidney transplant units. However, there is no government center where more than 10 kidney transplants have been performed. Notably, a private multispecialty hospital in Lagos—the St. Nicholas Hospital—is the leading center for the number of transplants offered (about 150 transplants) over the last decade.[28] No medical center performs whole pancreatic or islet cell transplants. Some tertiary centers also have access to high-tech devices, such as magnetic resonance imaging and high performance liquid chromatography for A1C. Almost all the tertiary centers have access to point-of-care devices for A1C, most of which are regularly calibrated to provide fairly accurate results. Despite these limitations, patient adherence with medications is only 60.2%, self-blood glucose monitoring is only accomplished in 25.4%, and last glucose readings are only known by 58.8%.[29] This compares with adherence in the United States, where Rubin[30] described antidiabetes medication adherence of 60%-85% and Hertz et al.[31] described adherence of 36% in patients with newly diagnosed type 2 diabetes with employer-sponsored insurance.

In general, there are still gaps in major specialized diabetes services at this higher level of care, including insulin pumps and insulin pump clinics, biothesiometry (vibration perception thresholds for peripheral neuropathy), Doppler studies with

vascular ultrasound, Harris mats (foot imprinter to identify high-pressure points with potential for ulceration), pedography (radiographs of the forefoot to detect pathologic changes), bariatric surgical procedures, and, as mentioned earlier, kidney and islet cell transplants, as well as lower extremity and cardiac vascular bypass surgeries. These specialized procedures are most often referred to foreign countries, particularly India, United Arab Emirates, South Africa, and some of the North African countries.

HUMAN RESOURCES

Nurses. There are no nurses who specialize in diabetes care in Nigeria—all nurses are trained to provide basic care for patients at all tiers of care. Nurses are responsible for bedside urine tests, point-of-care blood glucose determinations, basic nutritional advice, education for insulin self-injection, and insulin administration for patients with cognitive dysfunction or who are otherwise unable to self-inject. Some of these nurses have been exposed to informal or ad-hoc diabetes training sponsored by a nongovernmental organization (NGO) or multinational pharmaceutical company, such as the Eli Lily–driven use of "Conversation Maps."[32] These nurses do not have the rights or license to prescribe medications, except in some rural areas where there are no physicians at all.

Physicians. The physician/patient ratio in Nigeria is very poor. Hence, in both secondary and tertiary centers, diabetes clinics are typically overburdened with about 5 to 10 physicians seeing 100 to 200 patients with diabetes in the space of just a few hours (most diabetes clinics are run once a week from 8 or 9 AM to 1 to 2 PM). The chaotic nature of these clinics means that physicians will spend less than 15 minutes seeing each patient. Many of these diabetes clinics are staffed by internists (consultant physicians), consultant family physicians, or consultant endocrinologists. These busy clinics often have just one of these highly trained personnel, with the others being residents (fellows in training) or medical officers (general practitioners or general duty doctors). As a result, there is barely enough time to examine the feet or eyes of the patient, let alone adequately reviewing glucose meter results or scrutinizing dietary or exercise records. Fortunately, the number of endocrinologists/diabetologists has increased significantly in the last 3 decades. In the 1980s there were fewer than 10 endocrinologists/diabetologists in Nigeria, with

half of these in the southwest, 1 of the 6 geopolitical zones of the country, and most others having none. In the last few years this number has increased steadily to about 100, including pediatric endocrinologists.[33]

Other Allied Health Personnel. Having a nutritionist, physical therapist, podiatrist, dietitian, or certified diabetes educator is often a luxury in Nigeria, and very few secondary or tertiary centers have these allied health personnel. In fact, there are fewer than 5 certified diabetes educators and podiatrists together in the entire country, thus attracting a podiatry initiative by the World Diabetes Foundation in 2013.[34]

PROFILE OF PATIENTS WITH DIABETES IN NIGERIA

The typical patient with diabetes seen in Nigeria is diagnosed in the fifth to sixth decade of life. More than 95% have type 2 diabetes (T2D), whereas the remaining 5% have type 1 diabetes (T1D), gestational diabetes (GDM), and secondary diabetes.[35] There is little data on the rarer forms of diabetes like mitochondrial diabetes, maturity-onset diabetes of the young, and latent autoimmune diabetes of adults. In most hospital-based studies, patients with T2D are overweight or normal weight, with less than 15% being obese (defined as having a body mass index > 30 kg/m^2).[36] About 60% of Nigerian patients with diabetes are hypertensive and more than 90% have some form of dyslipidemia.[37] The mean A1C is usually between 8% and 9% in tertiary centers, with scant data from the secondary and primary centers.[38,39] Less than a third of patients attain International Diabetes Federation (IDF) or American Diabetes Association (ADA) glycemic targets. Less than 10% of patients with diabetes in Nigeria are on the National Health Insurance Scheme (NHIS), or any other insurance scheme, and consequently the cost of care is borne by the patient and their relatives. Under a study by the Structured Healthcare Initiative (STRUHI) headed by Dr. Ogbera, a Nigerian diabetologist supported by a World Diabetes Foundation (WDF) grant, 12.3% of patients found to have TB after screening had diabetes, compared with only 5.6% among those without TB.[40]

The level of care received by patients with diabetes is often perceived as low because of prolonged waiting times for appointments, long waiting hours in the outpatient clinics, and long queues waiting for medications. This has led to a greater reliance

on unorthodox medicine, complimentary or alternative medicine, and faith healers with disastrous consequences, the most common of which is acute kidney injury in almost a tenth of patients.[41] Studies have demonstrated that 46%-83% of patients resort to these unorthodox methods of diabetes management.[42-44]

PROGNOSTIC INDICES OF DIABETES IN NIGERIA

Several studies have described diabetes-related morbidity and mortality in various parts of Nigeria. In the 1990s, mortality from diabetes was very high with large numbers of patients succumbing to hyperglycemic emergencies. In a study in Port Harcourt, which is a southern Nigerian urban city, Dagogo-Jack demonstrated that diabetes was responsible for 7.8% of admissions to tertiary centers with as many as 35.5% of these patients with diabetes dying within 24 hours of admission, most of them from hyperglycemic emergencies.[45] In a prospective study of the diabetes admission pattern by Ogbera et al.[38] in a tertiary center in Lagos, the commercial capital of Nigeria, a total of 1320 participants were admitted to the adult medical (nonsurgical and nongynecologic) wards during the period of 1997 to 2002. Diabetes-related admissions comprised 206 (15%) of total medical admissions, with a case fatality rate of 16%.[38] The most common cause of death (46%) in these diabetes-related admissions was hyperglycemic emergencies (diabetic ketoacidosis, hyperosmolar hyperglycemic states, and other mixed hyperglycemic emergencies).[38] The next most common cause was diabetic foot ulcers (10%).[38] Diabetes mellitus foot syndrome and stroke had the highest case fatality rate and were the most predictive of mortality in the same study. In a similar study by Unachukwu et al.[25] around the same time in Port Harcourt, the case fatality rate of diabetes-related admissions was 17%, and the highest causes of mortality were acute metabolic complications (hyperglycemic and hypoglycemic emergencies), seen in 39.8% of the patients. This study was very similar to an earlier one in the same location by Dagogo-Jack[46] about a decade earlier. In another retrospective study[47] in Owo, a southwestern Nigerian town, 8.8% of admitted patients with diabetes died, with 70% of these deaths in the first week of admission. In another study, in the southeastern part of the country, Unadike et al.[48] observed that 8.1% of 407 patients admitted with diabetes died and the commonest cause of death was acute metabolic complications (hyperglycemic hyperosmolar state and diabetic ketoacidosis). Several other studies in Nigeria similarly demonstrate high mortalities from infections, hyperglycemic emergencies, and cardiovascular morbidities.[49-51] Before this time myocardial infarction was rare and only seldom reported in Nigerians. In short, diabetes is a key driver in the rising incidence of cardiovascular disease in Nigeria in particular, and Africa, in general.[52]
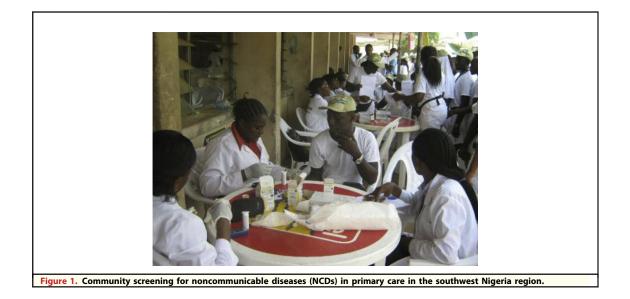
DIABETES SUPPORT GROUPS

The Diabetes Association of Nigeria (DAN) is the national body for diabetes. It is a patient-centered initiative with a mandate of providing a platform to meet the needs of patients with diabetes in Nigeria. Having a large membership spanning almost all the states of the nation, DAN has collaborated with the IDF and other societies and associations to highlight the problems of diabetes, to raise awareness, and to proffer solutions to the suffering of those with the disease. The second author of this paper (SDJ) was instrumental in establishing one of the first local branches of DAN in the southern part of Nigeria with immense benefit on patient care.[53] Funding sources for DAN include patients' subscription fees and voluntary donations, philanthropic bodies contributions/donations, and sales of various diabetes devices, medications, and supplies. Of note, there is very little government funding.[54]

STRUHI is a not-for-profit organization dedicated to the advancement of health care in Nigeria in the area of NCD, including diabetes as a key area of focus. STRUHI mainly operates out of Lagos and partners with the WDF to study diabetes, tuberculosis, and other NCD.[55]

The Strategies for Improving Diabetes Care in Nigeria (SIDCAIN) study group was formed about 7 years ago by physicians from 3 tertiary hospitals in southwestern Nigeria with the aim of improving care for diabetes and hypertension.[56] The director, Prof. Christopher Alebiosu, is a nephrologist with a particular interest in diabetes care. This study group has set up several primary and secondary centers for NCD screening and care in some states in the southwest Nigeria region (Figs. 1 and 2). SIDCAIN has also rolled out treatment guidelines, educational material, and patient support programs.[57]

The Sonny Kuku Foundation (SKF) is an NGO created by a renowned Nigerian

Figure 1. Community screening for noncommunicable diseases (NCDs) in primary care in the southwest Nigeria region.

endocrinologist, businessman, and philanthropist, Dr. Sonny Kuku.[58] The center provides support for patients with sickle cell disease, diabetes, and hypertension.

The Lee Maeba Foundation and its Diabetes Centre of Excellence is a charitable organization set up by Senator Lee Maeba (who lost his father to diabetes) to provide diabetes support services, including care, counseling, nutrition and cooking classes, and free supplies and consultation to diabetes patients and their families.[59] Their services are available mainly in the federal capital city of Abuja.

The Podiatry Initiative in Nigeria (PIN) is supported by a WDF grant with an ambitious target to strengthen 11 clinics, train 301 health care

professionals (HCP) in 3 years (2014-2017), and screen more than 10,000 people with diabetes for foot complications in Lagos, Nigeria.[34] Similarly, another WDF grant funded diabetes foot boot camps for 2014 through 2016. This WDF grant plans to establish 20 foot clinics, train 300 HCP, and provide local audiovisual and print material for diabetes mellitus foot syndrome (DMFS) prevention and treatment. These 2 projects would generate US$500,000 for DMFS care, one of the costliest diabetic complications in Nigeria.[60] These programs were designed to reduce the burden of DMFS, which is responsible for almost 12% of diabetes admissions and afflicts almost 10% of all patients with diabetes in Nigeria.[61]

Figure 2. The book launch of *Strategies for Improving Diabetes Care in Nigeria* (SIDCAIN) handbook.

THE NIGERIAN HEALTH CARE SYSTEM

About 80% of patients finance their medical bills from their personal income or from the income of a member of the immediate or extended family.[62,63] Insurance coverage of medications and tests were seen in less than a tenth of the patients. The majority (62%) of Nigerians earn less than US$1000 per annum. It is, therefore, not surprising that only a fifth of the patients in Nigeria perform self–blood glucose monitoring (SBGM).[64] Many patients in secondary health care facilities do not know what cholesterol or A1C are or what they assess. In some centers, 80% of the patients didn't know what medications they were using.[63,64] Health care management of most patients with diabetes is pluralistic with many patients using traditional and complementary alternative medicine options.[63,64] This admixture of treatment options and types leads to confusion, poor orthodox medication adherence, and increased morbidity and mortality.[62,63] The high dependence on complementary/alternative medicine is corroborated by a study in Lagos (which is the most enlightened and cosmopolitan Nigeria city) demonstrating that 46% of patients with diabetes use complementary or alternative medicine.[42]

THE WAY FORWARD

Nigeria will need to devise ingenious means of combating the emerging trend of larger numbers of people afflicted with NCD, such as diabetes.[65,66] This is increasingly important with the dwindling resources of the national budget for health care and the low coverage level of the population by the National Health Insurance Scheme. One solution is to bundle well-funded communicable disease programs with that of less privileged NCD (Table 1). In this way, several HIV/AIDS treatment centers now serve as centers for treating diabetes, hypertension, and other conditions in their "free time" or simultaneously with great cost saving.[62] Also, more government agencies are involved in promoting health through lifestyle changes, while other agencies engage in screening programs for vulnerable groups, encouraging early detection and improving health awareness.[67] Improving health indices in Nigeria, such as maternal and child health, poverty, literacy, health education, health care funding, and insurance coverage can lead to earlier diabetes detection and reduced disease prevalence and burden.

The earliest level of prevention should start even before birth, often called primordial prevention. Thus, greater attention to maternal care, including simple screening to detect GDM, is critical as both low birth weight and high birth weight can predispose to higher diabetes rates in later life among offspring of GDM pregnancies.[68]

Thereafter, regular community screening can identify large numbers of asymptomatic people with differing degrees of dysglycemia.[13] Then, people with prediabetes would benefit from primary prevention strategies, such as lifestyle intervention or metformin, as with the Diabetes Prevention Program.[69-71] It is well known that half of the people with diabetes are not diagnosed, and of those diagnosed, only a half are usually on any treatment, and in turn, of those treated only half adhere well, and of these just about a half achieve their targets.[72] This ominous rule of halves is why diabetes and other NCD have such a high mortality. Thus, focusing on these "dropouts" is essential for improving patient outcomes.[73] In resource-poor communities, much more can be done to improve diabetes outcomes. Simple measures as lifestyle changes, regular self–blood glucose monitoring, improved medication adherence, and regular clinic attendance and follow-up are cost effective and in many countries have led to improved health indices among the people with diabetes.

Table 1. Summary of Key Recommendations to Improve Diabetes Care in Nigeria	
Intervention	Implementer
Increased investment in health	Federal, state, and local government
Better management of health resources	Three tiers of government as above
Twinning or pairing of health intervention projects	Three tiers of government as above
Universal health coverage	Three tiers of government as above, health maintenance organizations, general public
Diabetes prevention programs and promotion of healthy lifestyle	Ministries of health, information, environment and infrastructure, and youth and sports
Community screening programs	Three tiers of government, community leaders, social groups

Diabetes, along with other NCDs, has had a great impact on health, quality of life, and life expectancy in Nigeria, a country that had, before the advent of diabetes, been weighed under by the communicable diseases, such as malaria, HIV/AIDS, diarrheal diseases, and respiratory diseases. Halting or reversing the diabetes epidemic will go a long way in improving the health indices and life expectancy in this low- to middle-income country. This view is aspirational but hopefully also a realistic goal for those with diabetes in Nigeria.

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