

## Diabetes in Nigeria: Impact, Challenges, Future Directions

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### Abstract

**Background:** Diabetes Mellitus (DM) is a chronic, debilitating and costly disease. Globally, incidence of the disease is growing rapidly, rising to pandemic levels especially in the developing world, impacting it negatively through the gross morbidity and mortality arising from its acute and chronic complications.

**Objective:** To review the literature on the impact of DM in Nigeria, challenges arising from the disease to individuals, families, societies and communities and the way forward in managing this evolving national and global threat.

**Methods:** Data was sourced through internet using Google chrome search engine and data bases of PubMed, Medline, e-Medicine, Medscape etc. Prevalence studies, hospital statistics, registry reports, WHO Reports, IDF declarations and UN resolutions on diabetes also were used.

**Results:** Prevalence of DM is rising to alarming levels. In Africa, Nigeria inclusive, prevalence has risen from < 1 % in the 1950s to 1980s to current values of ≥ 4.5 %. Highest global prevalence is in the Middle East/North Africa region (11 %), while it is 10.7% and 6.7% in North America and Europe respectively. Prevalence of undiagnosed DM is even higher – 80 % in Africa compared to 35 % in Europe and North America. Populations of African origin have a much higher incidence of microvascular complications compared to macrovascular complications. DM is one of the commonest reasons for admission in Tertiary Hospitals in Nigeria with hyperglycemic emergencies and diabetic foot ulceration (DFU) being the commonest indications for admission. DFU is notoriously responsible for prolonged hospital stay, morbidity and mortality.

**Conclusion:** Most Governments of African countries including Nigeria do not recognize the catastrophic potential of the diabetes epidemic and need to reverse the current trend where DM occupies very low priority in their National Health care agenda, before time runs out.

**Keywords:** Diabetes; Nigeria; Impact; Challenges; Future

### Introduction

Diabetes mellitus is a chronic, debilitating and costly disease arising from chronic hyperglycemia. Chronic hyperglycaemia damages almost all cell types in the body. Diabetes is associated with severe complications, poses severe risks to families and seriously challenges achievement of internationally agreed developmental goals, including the Millennium Developmental Goals (MDGs). This article reviews the impact, challenges and future directions of diabetes mellitus in Nigeria.

### Impact of Diabetes Mellitus

#### Global impact

The incidence of diabetes mellitus (DM), especially type 2 DM is rapidly growing. In 1985, 30 million people were estimated to be

suffering from the disease and by the end of 2006, the number had increased to 230 million (approximately 6% of world population). Of this number, 80% are in the developing world [1,2]. By 2011, the International Diabetes Federation (IDF) estimated that 366 million adults aged 20-79 years out of the worlds 7 billion population had DM [3].

Western Pacific (WP) region had the largest number of people (132 million) with diabetes while Africa region had the smallest (15 million). Regarding prevalence of DM, highest prevalence (11.0%) was in the Middle East and North Africa (MENA), followed by North America and Caribbean region (NAC: 10.7%), South and Central America (SACA: 9.2%), South East Asia (SEA: 8.7%), Europe (EUR: 6.7%) and least Africa (AFR: 4.5%) [3]. Table 1 shows the details of the regional estimates.

Region	2011			2030			
	Population Millions	No. of people with DM Millions	Comparative diabetes prevalence %	Population Millions	No. of people with DM Millions	Comparative diabetes prevalence %	Increase in the No. of people with diab %
AFR	387	14.7	4.5	658	28.0	4.9	90
EUR	653	52.8	6.7	673	64.2	6.9	22
MENA	356	32.6	11.0	539	59.7	11.3	83
NAC	322	37.7	10.7	386	51.2	11.2	36
SACA	289	25.1	9.2	376	39.9	9.4	59
SEA	856	71.4	8.7	1188	120.9	10.0	69
WP	1544	131.9	8.3	1766	187.9	8.5	42
WORLD	4407	366.2	8.5	5586	551.8	8.9	51

**Table 1:** Regional estimates for diabetes (20-79 years) 2011 and 2030

IDF Atlas 5<sup>th</sup> Ed

AFR: Africa; EUR: Europe; MENA: Middle East and North Africa; NAC: North America and Caribbean; SACA: South and Central America; SEA: South East Asia; WP: Western Pacific

Globally > 90% of cases of DM are type 2 [4]. High diabetes prevalence's have been reported in adult populations of Indian descent, Africans on the continent and their descendants in the Diaspora, and whites living in Africa, especially in South Africa and Tanzania [5,6].

Amongst Africans, prevalence rate is high in African-Americans (12% - 15%) and Caribbean's of African descent (10% - 13%) compared to Africans (1% - 6%) and the White population in Africa, interestingly record either higher than or comparable rates to those of European whites (6-10%) [7].

Despite the rising global prevalence of DM, the proportion of cases presenting to health facilities with classical symptoms of polyuria, polydipsia, polyphagia and weight loss is small, compared to the prevalence of asymptomatic or undiagnosed DM.

This is worse in Africa and depending on the country; prevalence of undiagnosed DM may be as high as 50% - 85% in the general population [8-10]. Globally, gradual progression of pre-diabetes (impaired fasting glucose IFG; impaired glucose tolerance IGT) to overt type 2 DM may account for much of the high prevalence of asymptomatic and undiagnosed DM. In Africa, even symptomatic DM remains undiagnosed for several reasons, including:

- Ignorance of symptoms
- Attribution of symptoms to other myths
- Absence of hospitals
- Poverty with inability to attend hospitals
- Minimal or non-existent Health Insurance Coverage.

Table 2 shows the burden of undiagnosed DM by IDF regions in 2011, listing Africa as most affected (≥ 80%) with relatively high burdens also in even the most advanced continents - Europe and North America (35%) each [3].

Region	Total Cases (Millions)	No. Undiagnosed (Millions)
Africa	14.7	11.6 (80%)
Europe	52.8	19.0 (35%)
Middle East/North Africa	32.6	19.2 (55%)
North America/Caribbean	37.7	11.9 (35%)
South/Central America	25.1	11.2 (45%)
South East Asia	71.4	36.2 (50%)
Western Pacific	131.9	73.5 (60%)

Africa	14.7	11.6 (80%)
Europe	52.8	19.0 (35%)
Middle East/North Africa	32.6	19.2 (55%)
North America/Caribbean	37.7	11.9 (35%)
South/Central America	25.1	11.2 (45%)
South East Asia	71.4	36.2 (50%)
Western Pacific	131.9	73.5 (60%)

**Table 2:** Burden of undiagnosed DM by IDF regions in 2011

### Impact in Africa

Most Governments of the African countries do not recognize the catastrophic potential of the diabetes epidemic and time may be running out for Africa. Akin to HIV/AIDS, by the time Governments wake up, the epidemic may have overwhelmed the continents already meager resources, resulting in avoidable death of millions of Africans.

For long, Africa was considered safe from many of the "so-called diseases of affluence" plaguing the Western World, especially diabetes mellitus (DM). Indeed, medical statistics from 1959 to the mid-1980s showed the prevalence rate for DM in Africa to be ≤ 1.4% except in South Africa where DM estimate was as high as 3.6% in 2001 [11,12]. From the 1990s to date, the virtually static low prevalence rates appear to have changed drastically [13,14] by 1994, the continent wise prevalence of DM stood at 3 million, with this figure predicted to double or triple by the year 2010 [15,16]. Approximately 7.1million Africans by the year 2000 were reported to be suffering from DM with the figure expected to rise further to 18.6 million by 2030 [17].

Majority (70% - 90%) of African diabetes is of type 2 [18,19] and is more prevalent among the wealthy, hence the tag "disease of opulence". It is more pronounced in urban areas where people tend to be less physically active, eat diets rich in saturated fat and refined sugars and are more obese. Obesity is a pivotal contributor to increased prevalence of DM in both urban and rural areas, but more so in the former [20,21] and the terminology - diabesity - [22] reflects the close relationship between both medical conditions. The World Health Organization (WHO) estimates in Africa on obesity show generally

that more than one-third of the women are obese compared to one-fourth of the men, with the poor being as vulnerable as the rich. Despite worldwide alarm, DM situation on the African continent and elsewhere among people of African descent worsens by the day.

### Impact in Nigeria

Nigeria is the most populous nation in Africa and the 7th most populous nation on earth. Current approximate population is 170 million and counting, with 76 million adults and 3.1 million people with DM [23,24]. IDF 2010 reported a prevalence estimate of 3.9% for

Nigeria [25] and the current prevalence of 4.9% is more than double the previous national prevalence of 2.2% [26] following the landmark Federal Ministry of Health co-ordinated National Survey of 1997.

Most data available for diabetes prevalence in Nigeria are based on the standardized 1985 WHO Criteria [27]. Reports based on the more current 1999 WHO and 2003 American Diabetes Association (ADA) criteria are very limited.

Table 3 shows the detail of data available on the prevalence of DM in Nigeria.

AUTHOR (1985 WHO Criteria)	n	Age (years)	Method	Age-adjusted prevalence of DM (%)
Osuntokun (1971) (Hosp survey) [28]	832			0.4
Ohwovoriole (1988) (Urban) [29]	1627		RCBG	1.7
Erasmus (1989) (Rural & Urban) [30]	2800			1.4
Akinkugbe (ed) 1997 (National survey) [26]				2.2
Cooper 1997 (Rural) [31]	247		FCBG	2.0
Olatubosun 1998 (Urban) [32]	875		OGTT	0.8
Okesina 1999 (Rural) [33]	500	>40	FPG	2.6
Nyenwe 2003 (Urban) [34]	502	≥ 40	OGTT (WHO 1999)	7.9
Oladapo 2010 (Rural) [35]	2000	18-64	FPG	2.5

**Table 3:** Prevalence of Diabetes Mellitus in Nigeria

### Diabetes Complications, Morbidity and Mortality

#### Diabetes complications in nigeria

Complications of DM (acute and chronic) can be severe, debilitating and fatal. The longer the duration of the illness, the greater the possibility of an end organ complication. Some reports have shown that populations of African origin have high prevalence of microvascular (and low of macrovascular) complications [36-39] partly due to co-existent Hypertension, inappropriate diabetic control and limited access to care. Their reports indicate that 21% - 25% of individuals with type 2 diabetes have retinopathy at diagnosis of diabetes and overall, retinopathy affects 15% - 55%, with a high proportion of proliferative retinopathy and macular edema [36]. In addition to diabetic retinopathy being a leading cause of adult

blindness, diabetic subjects are six times more prone to cataracts and 1.4 times more susceptible to open- angle glaucoma [37,38].

In cohorts with mean diabetes duration of 5years - 10 years, 32% - 57% have micro or macroalbuminuria, and a third to half of people on maintenance hemodialysis have diabetes [36]. Coronary heart disease affects 5% - 8% of individuals with type 2 diabetes and cardiomyopathy up to 50% of all patients with type 2 DM. Approximately 15% of people with stroke have diabetes while up to 5% of individuals with diabetes present with Cerebrovascular accidents at diagnosis. Prevalence of peripheral vascular disease (PVD) varies across sites from 4% to 28% and only 20% of diabetic foot lesions are attributable to PVD [39]. Table 4 shows the pattern of chronic complications of DM in Nigeria.

Complication	Author (Yr)	n	Setting	Type of DM	Prevalence %
Foot Ulcers	Ogbera (2006) [40]	1500	Hosp out-patients	Mixed	9.5
	Chinenye (2011) [41] (Diabetes Care Study Group)	531	Hosp out-patients	Mixed	16
Neuropathy					
	Odusan (2008) [42]	108	Hosp out-patients	Type 2	34.2

					(Cardiac Autonomic N)
	Oguejiofor (2009) [43]	120	Hosp out-patients	Type 2	71.1(Bioth)
					89.2 (UKST)
	Chinenye (2011) [41]	531	Hosp out-patients	Mixed	59.2
Retinopathy					
	Rotimi (2003) [44]	840	Hosp out-patients	Mixed	17.9
	Omolase (2010) [45]	100	Hosp out-patients	Mixed	15
	Chinenye (2011) [41]	531	Hosp out-patients	Mixed	35.5
Microalbuminuria					
	Unuigbe (2001) [46]	66		Mixed	50
	Agaba (2004) [47]	65		Type 2	49.2
	Adetunji (2006) [48]	50		Type 2 (> 5yrs)	83
				Non-proteinuric	

**Table 4:** Pattern of chronic complications of diabetes mellitus in Nigeria

Key: UKST = United Kingdom Screening Test; Bioth = Biothesiometry

### Diabetes Morbidity and Mortality in Nigeria

The global chronic killer status of DM emanates not only from its direct systemic complications, but also indirectly from its linkages, particularly in developing countries, with Communicable Diseases - TB, HIV/AIDS -, other Non-Communicable Diseases - cardiovascular diseases, chronic respiratory diseases, renal diseases, cancer - and other modifiable and non-modifiable risk factors including obesity, hypertension, dyslipidemia, physical inactivity, increasing age, ethnicity, poverty, undernutrition, urbanization etc [49]. Diabetes is a component cause of pneumonias, bacteremias and tuberculosis [50] and has been reported to increase the risk of active tuberculosis by upto three times [51]. In South South Nigeria, DM related admissions made up 15% of all medical admissions with a case fatality rate of 16% 41 and 10.4% of all hospital in-patients over a 10 year period, with case fatality of 17.2% [52] In South East Nigeria, the pattern is sustained with DM, hypertension and HIV/AIDS being the commonest causes of admission and death in tertiary health institutions [53,54].

The most common reasons for DM admission were hyperglycemic emergencies 46% and diabetic foot ulcers (DFUs) 30% while DFUs and Cerebrovascular disease have the highest case fatality rates - 28% and 25% - respectively. DFUs have the most prolonged duration of admission ranging from 15 - 122 days. 41 Lower extremity amputation (LEA) resulting from DFUs is particularly worrisome in Nigeria and Africa [55,56]. It is a major debilitating complication of DM and results in long hospital stay and even longer rehabilitation, with huge financial implications, often involving extremely poor people. Traditional common risk factors for foot ulceration which leads to LEA in diabetic subjects are poor glycemic control, infection, dyslipidaemia and poor self care. A study from Nigeria indicates that the Caregiver/Physician may contribute significantly to the risk for

foot ulceration in Nigerian diabetics, and this may not be limited to Nigerian Physicians alone.

As much as 96.4% of diabetic subjects presenting to a tertiary health facility with symptoms of peripheral neuropathy (PN) and 97.3% without symptoms of PN had never had their feet examined by their Physicians [57].

Globally diabetes accounts for 3.8 million deaths annually, a number similar in magnitude to the mortality attributed to HIV/AIDS [58] but the cause of death in DM subjects between the developed Western nations and developing nations appear divergent. In Western countries, cardiovascular disease is the most significant cause of death in the diabetic population [59,60]. In Africa, infection and acute metabolic complications, not cardiovascular or renal, are the commonest causes of death in the same population [61,62].

In Nigeria, acute diabetic complications - ketoacidosis, hyperglycemic hyperosmolar state and hypoglycemia were the commonest causes of death in diabetic patients [52]. Table 5 shows the prognostic indices of diabetes mortality in Nigeria [63] while Table 6 shows the causes of death in same population [63].

Admission Diagnosis	Frequency
Hyperglycemic emergencies	82 (40%)
Poorly controlled blood pressure	44 (21%)
DM foot ulcers	36 (17.5%)
Cerebrovascular disease	20 (9.8%)
Hypoglycemia	7 (3.3%)
Peptic ulcer disease	6 (3%)
Tropical hand ulcer	2 (1%)
Kochs disease	2 (1%)

Retroviral infection	1 (0.7%)
Chronic renal failure	6 (3%)
TOTAL	206 (100%)

**Table 5:** Prognostic Indices of Diabetes Mortality in Nigeria [63].

Causes of Death Rate	% of Total DM Deaths	Case Fatality
Hyperglycemic emergencies	15 (46%)	18%
Cerebrovascular accident	5 (16%)	25%
Diabetic foot ulcer	10 (30%)	28%
Hypoglycemia	1 (3%)	14%
Chronic renal failure	1 (3%)	16%
Bleeding peptic ulcer disease	1 (3%)	16%

**Table 6:** Causes of deaths in DM subjects in Nigeria: 63

### Challenges to Diabetes Care in Nigeria

The diabetes pandemic evolved in association with rapid cultural and behavioral changes, aging population and increasing urbanization without preparedness for prevention and/or control, throwing up a myriad of challenges to diabetes care, especially in developing countries like Nigeria. These challenges are discussed under three major headings, including:

#### Challenges of Detection and Diagnosis

In Nigeria and much of the developing economies, poverty, ignorance, attribution of symptoms to other myths, lack of tools and basic infrastructure and inadequate training of health workers are responsible for much of the failure to detect DM. They also increase the risk of misdiagnosis and late diagnosis such that vast majority of patients are diagnosed late, at complication stages of the disease. A major challenge prevalent in sub-Saharan Africa is the health belief system of patients, with reliance on traditional, rather than on allopathic medicine [64]. The drawback with traditional healers is their limited understanding of the disease. They may recognize the patients' classical symptoms of diabetes but they hang on to the patients, rather than refer them to public health facilities for adequate care, compounding the late presentation dilemma. This challenge is particularly evident for foot complications of DM in Nigeria. This remains the foremost cause of prolonged hospital stay for people with DM and is associated with substantial morbidity and mortality, especially following lower extremity amputation. While ignorance and poverty are basic contributors to this major challenge to diabetes care, presentation to and delay at the traditional healers, who oftentimes are the first recipients of these cases, compound the problems of appropriate diabetes management. Resource depletion and poor Government funding limits access to diabetes care. Access to diabetes care is vital for detection and diagnosis and this is poor in Africa as a whole. In Mozambique, Mali and Zambia, only 15% of the diabetic population have access to diabetes care, 35% have difficulty accessing the care and 50% have no access whatsoever and have never been diagnosed [65]. Diabetes training lacks in virtually all of sub-Saharan Africa. Lack of proper training of health professionals on diabetes

impacts negatively on detection and diagnosis and contributes in no small measure to high non-compliance rates and serious complications [66]. Individual and societal/cultural obstacles including illiteracy, poor quality education, low socio-economic status and stigma associated with the disease which promotes secrecy, all challenge the ability to detect and diagnose DM early. These factors result in high proportions of previously undiagnosed diabetes. Even when diagnosis is made, levels of adequate glucose control is low because average number of visits for care in the diabetic population in sub-Saharan Africa is abysmally poor and is usually triggered by onset of complications [67]. Disparity in healthcare access between urban and rural areas and effects of rural – urban migration also challenge detection and diagnosis of diabetes in Nigeria and result in high mortality and prevalence of diabetes complications.

#### Challenges of Treatment and Cost of Diabetes Management

Diabetes is an expensive disease. Costs result from treating the disease itself, complications of the disease and costs of treating many other diseases where diabetes is an underlying causal factor. Type 2 DM burden is disproportionately borne by people of working age, the same age group profoundly affected by HIV/AIDS.

Reducing the economic productivity of this group through disease and disability introduces huge costs on both household and national economies. Summation of the double costs of diabetes care – costs of treatment and costs of disability which impedes the ability of the diabetic person to be economically viable and generate income to pay for treatment – makes diabetes management humongously expensive and a serious challenge to national economic development and health budgets.

Globally, cost of diabetes care is astronomical, running into billions of US dollars. In 2011, at least USD 465 billion was expended on DM care globally constituting about 11% of the total health expenditure in adults. The proportion of these costs expended on DM care in low and middle income countries, where 80% of people with diabetes live is uncertain. In sub-Saharan Africa, diabetes care presents huge costs to the individual and society but data on socio- economic (both medical care and loss of human resources) costs of diabetes in this region is sparse [68]. One report indicates that the direct economic cost of diabetes care in Africa is not only substantial, but is especially more so for the poorest countries amounting to almost 125% of Gross National Income (GNI) per head for the 34 poorest countries, compared to 25% of GNI per head for the 12 richest countries. Total cost (direct and indirect) of diabetes per person with the disease in these poor countries, is more than twice the GNI [69]. The Nigerian diabetic subject faces several challenges to effective treatment of diabetes mellitus. As applicable to the rest of Africa, lack of regular access to major anti-diabetic drugs and care, especially insulin at affordable cost, is a major challenge, leading to underuse of these agents and avoidable metabolic complications [70].

When they are available, affordability then determines regularity of supply. For many, costs of these medications especially insulin consume monthly minimum wages, in a country where National Health Insurance Scheme (NHIS) coverage is < 5% and most of the coverage still go to the privileged working class. Non-availability of blood glucose monitoring devices (glucometers) to many, even in urban communities, make self home monitoring of blood glucose (SHMBG), a basic tool in diabetes treatment and monitoring



impossible. Lay health beliefs/cultural practices pose strong threats/challenges to the Nigerian diabetic patients' adherence to treatment and control measures and may even worsen prevalence of DM. Non-pharmacological aspects of diabetes treatment, focusing on life style modifications are worst hit. Many believe that physical inactivity has no link with causation of diabetes and thus have no time for physical activity, have poor knowledge about composition of balanced diet and the role dieticians have to play in the management of their diabetes. Many have very favorable disposition to obesity as it is evidence of good living and affluence and believe that diabetes is caused mainly by excessive sugar intake which can be prevented with bitter drinks, including bitter leaf water, bitter alcohols like Stout beer etc. Some of these culture based misconceptions lead to gross insulin under-utilization in diabetes care [71]. These myriad of challenges to treatment result in most DM patients on ambulatory care in Nigeria and sub-Saharan Africa not achieving desired glycaemic targets.

### **Non-Communicable Disease (Ncd) – Communicable Disease (Cd) Challenge**

Nigeria and indeed Africa grapples with high rates of communicable diseases, with high prevalence of HIV/AIDS, TB and Malaria. In addition to cost competition challenges, diabetes worsens certain CDs while treatment of certain CDs may worsen diabetes. Diabetes increases the risk of some of the communicable diseases like tuberculosis, pneumonia and sepsis [50,51]. Treatment of some of the communicable diseases – antiretrovirals for HIV – may increase the risk for obesity and insulin resistance. The association between diabetes and some other non-communicable diseases, especially hypertension, dyslipidemia and obesity, in the currently trending “metabolic syndrome” needs no emphasis. Many of these NCDs increase the risk for Cardiovascular Disease (CVD) among persons with diabetes and globally, particularly in Western Countries, CVD is the most significant cause of death in the diabetic population [59,60]. In Nigeria and other resource poor countries, the main challenge of the NCDs and CDs to diabetes care is in the form of competition for meager resources allocated to and available for health care.

### **Future Directions for Diabetes in Nigeria**

High prevalence of diabetes and high mortality observed in patients with diabetes consequent upon late diagnosis and poor control result in huge costs in managing diabetes in Nigeria, sub-Saharan Africa and the rest of the developing world. These costs very likely far outweigh the cost of effective primary and secondary preventive measures which should form the focus and future of diabetes care.

Key measures for the future in diabetes care include:

### **Improved Organization of Government Role in Diabetes Care**

Less than optimal organization in Government involvement in diabetes care remains the foundation of most of the challenges to diabetes care in Nigeria. Government through its ministries, departments and agencies is the major sponsor of health care services to the people and often prioritizes communicable diseases in its programmes. Absence of medical insurance implies that patients pay for all aspects of medical care and when there is no money, fatalities may occur. Delivery of diabetes care should be integrated into the overall national health care structure and adequately funded

specialized diabetes care centers and teams backed by properly funded community based systems will facilitate better service delivery and cost effective and rational use of scarce resources. Care models especially rural care models founded on simple care systems and based on clear guidelines and operated by healthcare professionals appropriately trained on diabetes care, may be the way forward to successfully challenging the diabetes pandemic. Better funding of diabetes care will depend on improved overall funding of health care through increased Government yearly budget / allocation to Health and Social Development. This currently stands at an undesirable figure of < 10%.

Specific government roles to enhance response to diabetes epidemic threat include:

Developing clear policies on Non Communicable Diseases (NCDs) especially on diabetes care to complement policies on Communicable Diseases (CDs). The interaction between DM and some CDs- TB, HIV/AIDS is significant, underscoring the need for health planners to develop integrated responses to CDs and NCDs. Projections of future diabetes trends not taking cognizance of the potential impact of these associations, could jeopardize projections of future diabetes burden.

Developing clear national guidelines on diabetes care in collaboration with appropriate stakeholders and partners.

Expand the National Health Insurance Scheme and making it more available and accessible to the poor masses that need the services most.

Facilitating effective screening programmes – for early detection of disease. Basic screening tools (blood glucose monitors) should be made available in health centers and screening routinely done for all Nigerians  $\geq 30$  years at least once a year, as life expectancy in Nigeria is low (approximately 48 years).

Ensuring availability of effective and affordable diabetes drugs and drug delivery mechanisms by funding/subsidizing/ partnering with major pharmaceutical companies to make cheap generic glucose lowering drugs similar to drugs for HIV/AIDS. Same should apply to Insulin, a drug declared by WHO as essential for the treatment of DM and still very expensive, consuming monthly minimum wages of many diabetic subjects.

Supporting strategic relationships with groups especially Non-Governmental Organizations (NGOs) not typically associated with health, but their activities have effects on health and healthy lifestyles

Developing and implementing national diabetes prevention programmes especially through co-ordinated policies and legislative changes that ensure that diabetes care competes for political attention and financial investment.

Facilitating multidisciplinary co-ordination in areas of health, finance, education, sports and agriculture to address the underlying causes of the diabetes epidemic and ensure improvement in diabetes health care delivery.

Funding Research especially on alternative sources of cure such as plant extracts which are available in large quantities in Nigeria and tropical Africa. Health outcomes in Africa are hugely dependent on cultural variables. Further research on these variables will aid development and implementation of programmes to prevent and treat diabetes and other chronic diseases.

## Education and Training Programmes

These are vital for the future of diabetes care for several reasons. Health education/Universal Basic Education (UBE), healthy lifestyle, poverty eradication, balanced diet etc are essential requirements to stabilizing the diabetes epidemic. Diabetes education programs are important to both the care giver and the care receiver and is crucial to addressing traditional perceptions and cultural beliefs which fuel health misconceptions and impede application of appropriate preventive and control measures for DM and its risk factors. Need for diabetes education to create awareness and improve patients self care/management is further highlighted by the fact that there is a long window period between onset of undiagnosed metabolic derangements (insulin resistance, impaired glucose tolerance, hyperinsulinaemia) and appearance of symptoms due to hyperglycemia.

Education thaws significantly traditional misconceptions about lifestyle risk factors for DM, especially “perception of obesity as evidence of good living” and buttresses the positive roles of critical non- drug intervention measures – exercise, nutrition/balanced diet, abstention from tobacco – etc to diabetes care. It also makes implementation of socio-culturally appropriate health promotion campaigns much more effective.

Diabetes health education for the future must go beyond focusing on the care giver and care receiver to include education programmes in schools, hospitals, churches, markets, town union meetings, women organization meetings and other fora in which there is gathering of large numbers of people with talks on diabetes from informed physicians, high cadre diabetes educators, nutritionists etc.

The great need for a much more expanded diabetes education programme is underscored by a survey consisting of 10 questions on DM administered to 1700 people in the streets of Nairobi. Only 20% of the respondents had 70% of the questions answered correctly. 58 Education programmes should emphasize Diabetes Self Management (DSME) [72] and also incorporate behavioural and psychological strategies to facilitate improved outcomes. Psychological counseling helps the diabetic patient cope better with extreme stress which diabetes confers on its victims while culture and age appropriate group education programs are most effective.

## Conclusion

Diabetes epidemic is an evolving phenomenon in Nigeria and sub-Saharan Africa. Most African Governments need to reverse the current trend where DM occupies very low priority in their national health care agenda. Diabetes must compete for political attention and financial involvement. Information on the humongous costs of diabetes care (direct, indirect and total costs) in Nigeria and other developing nations needs to be evaluated and documented, such that policy makers and policy drivers will appreciate the need to focus on introducing early, cost effective interventions for both primary and secondary prevention. Diabetes programmes must be integrated and evidence based, highlighting the scale of the problem and areas for effective intervention. This will help trigger shifts in current public health priorities and augment comprehensive efforts from multiple stakeholders – countries, international organizations, academic institutions, civil society and the private sector – in combating the still evolving diabetes epidemic.

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