

UNIVERSITY OF PORT HARCOURT

LIVING WITH DIABETES IN NIGERIA
The Care, Cure & Prevention

An Inaugural Lecture

By

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Dedication

This Lecture is first and foremost dedicated to my Late mother who lived very well with diabetes, for about four decades and passed on at the age of 87 years; and to over five million Nigerians living with diabetes mellitus who strive every day of their life to remain healthy, resilient and adherent to treatment.

Acknowledgement

My special gratitude to my teachers and mentors, most especially Professor C.O. Anah who has remained a father indeed (he guided me in choosing the title, read and edited every section); to Professors O.J. Odia, A.E Ihekweba, A.C Onwuchekwa, F.S Wokoma and Dr. Mrs. Ngozi Ordu.

To all my patients whose treatment and response led to the conceptualization of this lecture; including the experience of serving the Diabetes Association of Nigeria.

Special thanks also to my colleagues, resident doctors and medical students for the team work, collaborations, communications, creativity and critical thinking in learning and discharge of our duties.

Thanks to my darling wife for her love, encouragements and constructive criticisms.

I appreciate my children (my special brothers and sisters) and all other family & community members.

All Glory to Almighty God for the vision and wisdom in all my life endeavours.

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ACRONYMS

ADA - American Diabetes Association
AHS - Abuja Heart Study
BMI – Body Mass Index
CBOs - Community Based Organizations
CCM - Chronic Disease Care Model
CHD – Coronary Heart Disease
CHF - Congestive Heart Failure
CVD – Cardiovascular Disease
CKD - Chronic Kidney Disease
CSOs -Civil Society Organizations
CSI - Continuous Subcutaneous Infusion
C/S – Caeserian Section
DAN – Diabetes Association of Nigeria
DM – Diabetes Mellitus
DFU - DM Foot Ulcers
DPP-4 - Dipeptidyl petidase-4
DPN - Diabetic Peripheral Neuropathy
DKA - Diabetic Ketoacidosis
DRS - Diabetes Retinopathy Study
DSME - Diabetes Self-Management Education
ECG - Electrocardiogram
ED – Erectile Dysfunction
ESRD - End-Stage Renal Disease
FBOs - Faith Based Organization
FBG – Fasting Blood Glucose
FBS – Fasting Blood Sugar
FDA – Food and Drug Administration, USA
FGN – Federal Government of Nigeria
FPG – Fasting Plasma Glucose
GDM - Gestational Diabetes or Pregnancy-induced Diabetes
GIP - Gastric Inhibitory Peptide (aka glucose-dependent Insulinotropic peptide)
GLP-1- Glucagon Like Peptides
2-HrPP -2 Hour Post-Prandial
HbA1c - Glycosylated Haemoglobin
HDL-C – High Density Cholesterol

HE -HyperGlycaemic Emergencies
HHS – Hyperosmolar Hyperglycaemic State
ICCCF -Innovative Care for Chronic Conditions Framework
IDF - International Diabetes Federation
IFG - Impaired Fasting Glucose
IGT - Impaired glucose tolerance
LDL-C- Low Density Cholesterol
LOPS - Loss of Peripheral Sensation
MDG(s) - Millennium Development Goal (s)
MNT - Medical Nutrition Therapy
MODY - Maturity-Onset Diabetes in Young
MRDM - Malnutrition Related Diabetes Mellitus
NAFDAC- National Food Drug Administration and Control
NCD(s) - Non-communicable Disease(s)
NDLEA -National Drug Law Enforcement Agency
NGOs - Non-Governmental Organizations
NHIS – National Health Insurance Scheme
NICE – National Institute of Clinical Excellence
NPDR - Nonproliferative Diabetes Retinopathy
NPI - National Programme on Immunization
OGTT - Oral Glucose Tolerance Test
PAD - Peripheral Arterial Disease
PATH - Program for Appropriate Technology in Health
PDR - Proliferative Diabetic Retinopathy
PLWD – People Living With Diabetes
SMBG - Self-Monitoring of Blood Glucose
TB - Tuberculosis
TCHOL – Total Cholesterol
TG- Triglycerides
TDHS - Tropical Hand Ulcer
TZD - Thiazolidinediones
UKPDS - UK Prospective Diabetes Study
WHO- World Health Organization
WHO FCTC - WHO Framework Convention on Tobacco Control
WHA - World Health Assembly

PREAMBLE

Vice Chancellor Sir, I wish to express my gratitude for this opportunity to deliver the 126th Inaugural Lecture of the University of Port Harcourt, from the Department of Medicine (commonly called Internal Medicine, *the core of medicine*).

A historical appraisal of our inaugural lecture series show that Internal medicine has produced three inaugural lectures as tabulated below:

Table 1:

Topic	Lecturer	Specialty	Date
You and Your Heart	Prof. C.O. Anah	Cardiology	30 th Oct. 1995
Sudden Death: The Heart of the Matter	Prof. O.J. Odia	Cardiology	19 th June 2003
Eat Right, Live Right that your Liver will be Right	Prof. A.E Ihekwaba	Gastroenterology	27 th Oct. 2011

This inaugural lecture today is the 4th from Internal Medicine and the 1st from the specialty of Endocrinology.

THE TITLE OF THE LECTURE

Vice Chancellor Sir, in a nutshell this title was chosen to bring to the fore this 21st century pandemic – **Diabetes**, which has become a health scourge in Nigeria. This is to enable our leaders, health decision makers, academicians, students, patients, relatives and the general public to be well informed about diabetes in the Nigerian setting as a basis for good care and health policy formulation to enhance Care and Support.

The emphasis on Nigeria is deliberate.

By World Health Organization (WHO)/IDF statistics, Nigeria has the highest number of diabetics in Sub-Saharan Africa with over 5 million Nigerians living with diabetes.

Therefore, diabetes should be of paramount importance to all Nigerians. Though diabetes is an ancient and world-wide disease and the protocol of care is universal, socioeconomic and cultural behaviours to the disease, its medications, care, support and diet differ from country to country and these do affect treatment outcomes.

My experiences as Vice President, Diabetes Association of Nigeria [DAN] and subsequently National President for two tenures each, coupled with several landmark Nigerian studies we conducted exposed me to the multi-faceted nature of diabetes in Nigeria. These Nigerian experiences are what I intend to share with you in this 126th inaugural lecture today.

Furthermore, local staple foods recommended for diabetics in Europe and North America are also quite different from those in African populations. Similarly sociocultural attitudes and illness behaviour differ from culture to culture, even within Nigeria.

The word “LIVING” in the title was also chosen to emphasize the fact that diabetes is no longer a death sentence because people can and do live through life with diabetes and longevity may be unaffected. The key to living well with diabetes is proper management anchored on “well informed self-care practices”.

Deliberate effort has been made to limit the use of medical terms as much as possible. Where unavoidable, my apologies, and such medical term is followed by simplified explanatory clause.

ENDOCRINOLOGY: HISTORICAL PERSPECTIVES

Endocrinology is the study of the endocrine glands and responses to their secretions, chemical integration and communication within the body.

Endocrinology is as old as creation because the Almighty God as the first endocrinologist created Eve out of Adam (Genesis 2:21-22)

through the process of differentiating and putting into compartments their hormonal organs and its secretions.

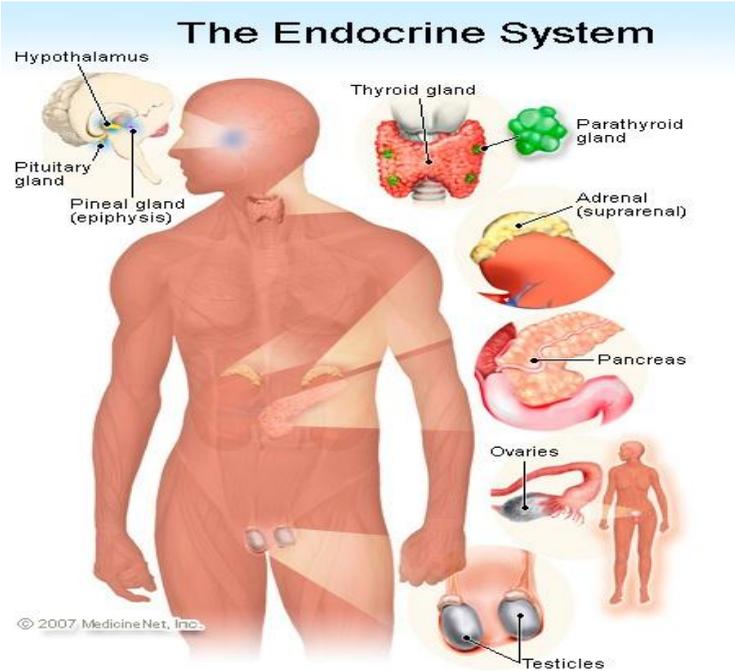


Fig. 1: The Human Endocrine System

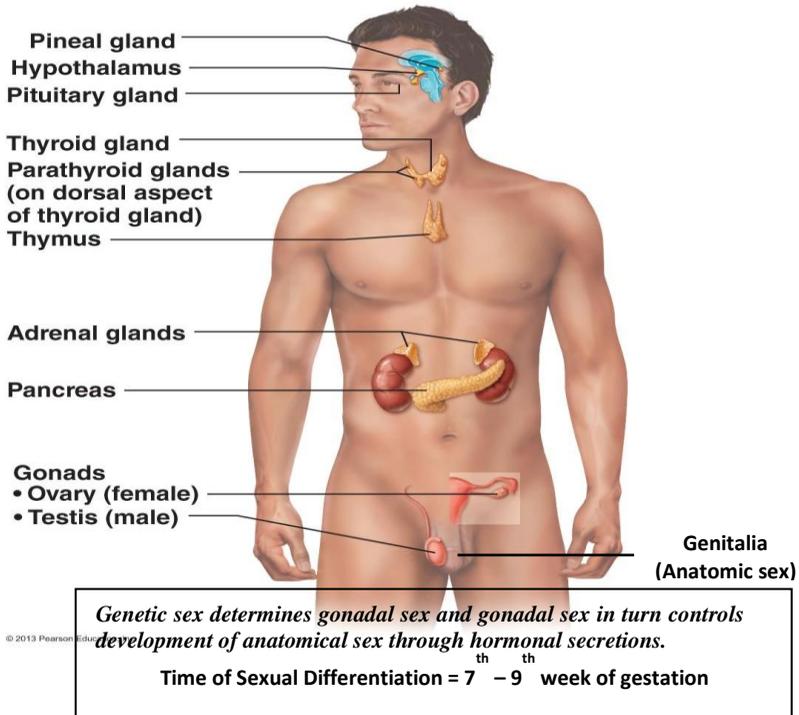


Fig. 2: Human Endocrine Glands

Biblically also, Eunuchs (castrated men) guarded the women’s quarters of Hebrew Kings and Princes (Esther 1:10), probably because they were incapable of reproduction and could possibly not sexually harass those beautiful Queens!!!

Professor Charles Brown-Sequard is reputed to be the father of modern endocrinology following the Seminal work he delivered in 1889 to the Societe de Biologie in Paris... titled “Chemical messengers secreted into the blood to exert systemic effects”. Born in the British Island of

Mauritius, his father was a sea captain from Philadelphia and his mother was French (*Wilson JD 2005*).

In 1903 Ernest Starling chose the term “Hormone” to describe all chemical messengers. By this time it was clear that hormones influence almost every function in the body.

The term “hormone” is derived from a Greek phrase meaning “to set in motion, to excite or to arouse” and aptly describes the dynamic actions of hormones as they elicit cellular responses and regulate physiologic processes through feedback mechanisms (Jameson et al 2012).

Hormone development involves a series of stages namely:

1. Identification of the tissue organ that produces the hormone.
2. Development of bioassay methods to identify the hormone.
3. Preparation of active extracts that can be purified using the relevant bioassay.
4. Isolation, identification of structure and synthesis of the hormone.

Three periods can be distinguished in the historical development of endocrinology namely the Descriptive period, the period of Analytical endocrinology and the third, Contemporary period, that of Synthetic endocrinology.

Each of these periods is based on certain special directive lines of scientific research, but although they follow each other chronologically in their beginnings there is much overlapping. For instance, even in our times research on the lines of the descriptive period is still being pursued.

In endocrinology, the scientific reasoning is that every single tissue and in general, every separate cell of the body secretes certain products (hormones) which are poured into the blood current, and which influence every other cell. In this way solidarity is established among all the cells of the body by means other than the nervous or immune systems.

Endocrine science continues to be one of the most dynamic disciplines of medical science; and endocrinology is the most quantitative of the clinical specialties.

There is probably no arena of medicine in which collaboration between the clinical and basic sciences has been more rewarding as endocrinology.

Probably the most important impact endocrinology has had is in scientifically designed treatments such as insulin and oral contraceptives, two of the very important therapeutic advances of the twentieth century.

The fact that many advances in Endocrinology have been recognized by the scientific world through award of Nobel Prizes is a source of pride.

Today, endocrinology involves neural science, immunology, genetics, cell and molecular biology as much as it deals with hormones per se.

Pattern of Endocrine Disorders

The specialty of endocrinology deals with the diagnosis and treatment of diverse range of hormonal and metabolic disorders. It encompasses a wide variety of conditions ranging from the most common, **Diabetes Mellitus**, (the subject of this lecture), thyroid diseases and to those that are rare but eminently treatable e.g. pituitary tumours.

Most endocrine conditions are **CHRONIC (i.e. slow in progression, requiring long-term and often life-long treatment)**.

There is a strong scientific evidence base for the treatment of disorders encountered within the specialty of endocrinology. Delayed, inadequate or inappropriate Care leads to poor health, reduced life-span and increased burden on the health service.

DIABETES MELLITUS: DEFINITIONS AND HISTORICAL PERSPECTIVES

Definition:

Diabetes is a “chronic” condition that occurs when the body cannot produce enough or effectively use insulin [IDF Diabetes Atlas, 6th edition 2013].

Insulin is a hormone (chemical messenger) produced by the pancreas that allows glucose (and other nutrients) from food to enter the body’s cells where it is converted into energy needed by muscles and tissues to function.

As a result, a person with diabetes does not utilize glucose (and other nutrients) properly, and glucose stays circulating in the blood (hyperglycaemia) damaging tissues over time. This damage leads to life-threatening health complications.

Technically, diabetes is defined as a syndrome of multiple aetiology (inherited or acquired) characterized by chronic Hyperglycaemia with disturbances of carbohydrate, fat and protein metabolism due to deficient action of insulin on target tissues (resulting from inadequate insulin secretion, insulin resistance or both) *WHO, 1999* .

Diabetes mellitus, often simply referred to as Diabetes, is a disorder of the very engine of life because when the body cells cannot utilize glucose, a number of vital mechanisms will breakdown with life-threatening consequences. This high blood sugar produces the classical symptoms of polyuria (frequent urination), polydipsia (increased thirst) and polyphagia (increased hunger).

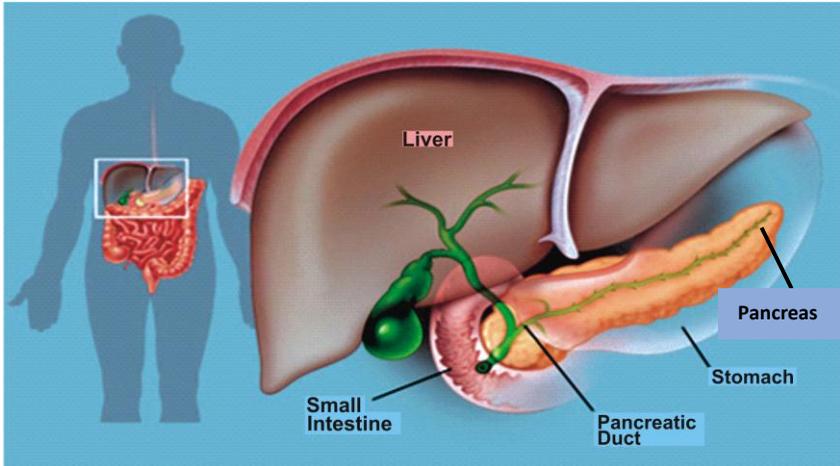


Fig. 3: Picture of the pancreas

Source: Picture of the Pancrease, www.webmd.com(c)2009webMD,LLC.

Front view of the Pancreas

- *The pancreas is about 6 inches long (15cm)*
- *Sits across the back of the abdomen behind the stomach*
- *The head is on the right side of the abdomen*
- *The head is connected to the duodenum (the 1st section of the small intestine) through a small tube called the pancreatic duct.*
- *The narrow end of the pancreas, called the tail, extends to the left side of the body.*
- *The tail end harbours the clusters of cells that produce insulin.*

What is the pancreas?

The pancreas is a gland deep in the abdomen that performs two key functions.

Aids digestion

- Secretes enzymes into small intestine to help break down protein, carbohydrates, fats

Regulates metabolism

- Secretes hormones insulin and glucagon into bloodstream to maintain proper glucose (sugar) levels

© 2009 MCT

Source: Sol Goldman Pancreatic Cancer Research Center at Johns Hopkins

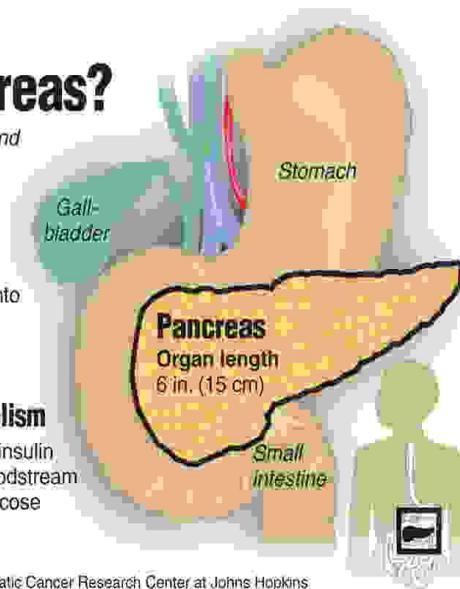


Fig. 4: The Pancreas and its Functions

Historically, diabetes is an ancient disease with descriptions dating back to 3000 years ago in ancient Egyptian writings.

Differences in the clinical features of types 1 and 2 were described by Charuka & Susruta in India about 400BC.

Diabetes (from ‘diabe’ meaning ‘siphon’) and mellitus (‘melli’ means ‘honey or sweet’), were terms first used by Aretaeus of Cappadocia in the 2nd century AD (Chinenye et al. Lecture Notes and Essays in Internal Medicine vol. 1, 2013).

Diabetes Mellitus was a death sentence in the ancient era. Hippocrates, the father of modern medicine, made not much mention of it because he felt the disease was incurable. Aretaeus did attempt to treat it but could not give a prognosis; he commented that “life (with diabetes) is short, disgusting and painful”.

Diabetes mellitus, a non-communicable disease is certainly a scourge in this millennium. The discovery of insulin by Frederick Banting & Charles Best in collaboration with two other researchers in 1921 was a significant landmark in the management of diabetes.

Prior to discovery of insulin in 1921, diabetes was a dreaded disease and planning for the future was unimportant.

The Islet of Langerhans

These are groups of pancreatic cells secreting insulin and glucagon first described in 1869 by Paul Langerhans, a German pathologist.

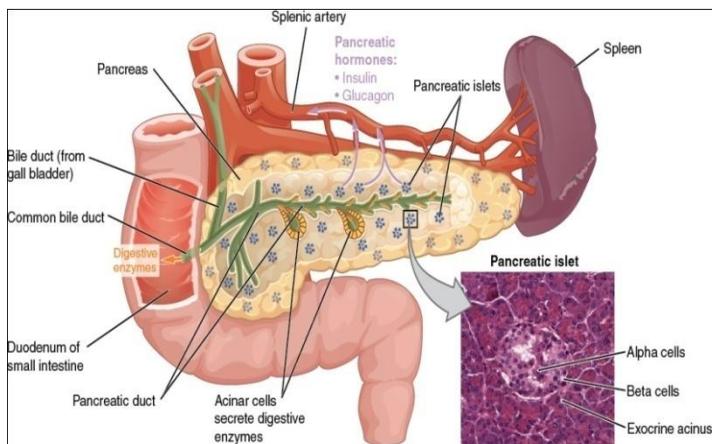


Fig. 5: The Pancreas & Islet of Langerhans

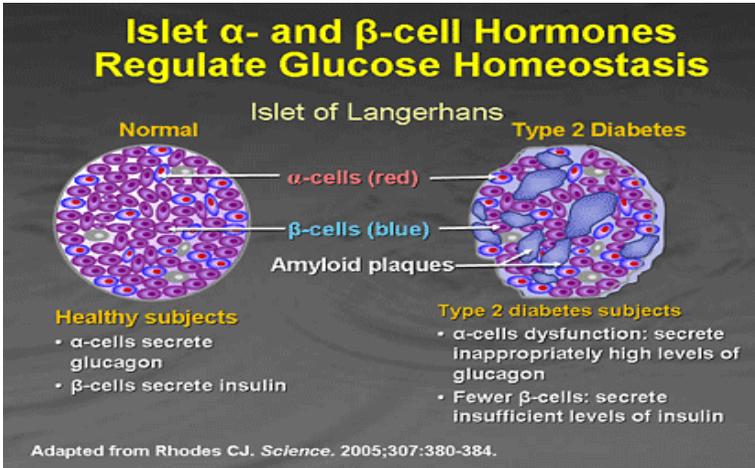


Fig. 6: Islet cell in Health and Disease

EPIDEMIOLOGY OF DIABETES IN NIGERIA (DISTRIBUTION & DETERMINANTS)

Mirroring the global increase in diabetes prevalence, Nigeria has been recording rising diabetes prevalence since 1960. See table below (Chinenye et al. Diabetes Advocacy and Care in Nigeria 2014):

Table 2: DM-Global and Nigerian Landscape

• Global Diabetes Landscape						
Year	1994	2000	2007	2011	2013	2035
Global DM Burden (millions)	100	171	250	366	382	592
• Nigerian Diabetes Landscape						
Year	1960s Lagos	1988 Lagos	1997 FMOH	2003 PortHarcourt	2012 Uyo	
DM Prevalence (%)	<1.0	1.8	2.2	6.8	10.5	
<p><i>Current estimates of DM prevalence are 1-2% in rural adults and 6-10% in urban dwelling adults in Nigeria. This translates to at least 5 million people living with DM, a large proportion of which are undiagnosed.</i></p>						

Source: Chinenye et al. Diabetes Advocacy and Care in Nigeria 2014

As Nigeria modernizes and copies western lifestyles, the disease frequency is on the increase among top executives, politicians, academicians, civil servants, farmers, traditional rulers, traders, businessmen, teachers, students, pupils, pre-school children and pregnant women.

It is obvious that diabetes mellitus touches almost every family and constitutes a drain on the economy and social life of sufferers and their families.

CLASSIFICATION OF DIABETES MELLITUS

The classification of Diabetes according to the World Health includes four classes:

- 1. Type-1 Diabetes:** Usually first diagnosed in children and young adults, although it can occur at any age. In Type-1 diabetes, the immune system abnormally attacks and destroys the insulin producing beta cells of the pancreas. There is beta cell loss leading to complete insulin deficiency. Thus, it is termed an autoimmune disease where there are anti-insulin or anti-islet cell antibodies present in the blood. The destruction may take time but the onset of the disease is rapid and may occur over a few days to weeks. Type 1 diabetes always require insulin treatment and will not respond to oral glucose-lowering drugs. It accounts for about 3-5% in Nigeria (Chinenye et al. National Clinical Practice Guideline for Diabetes Management in Nigeria 2013; 2nd edition).
- 2. Type-2 Diabetes:** This accounts for 90-95% of diabetes cases in Nigeria and is usually associated with older age, obesity, physical inactivity, family history of Type-2 diabetes in first, 2nd or 3rd degree family members, or a personal history of gestational diabetes. It typically affects the black race and constitutes the main burden of diabetes in Nigeria. Although Type2 diabetes typically affects individuals older than 40 years, it has been diagnosed in children and adolescents and this emerging scenario is the result of the epidemic of obesity and inactivity in children these days. Type-2 diabetes can be prevented through healthy food choices, physical activity and weight loss. Confirmed cases can be

controlled with these same activities but oral medications or insulin may be necessary in addition.

Obesity and Type 2 Diabetes in Nigeria: Highlights from our studies

(Ogbera AO, Fasanmade O, Chinenye S, Onyekwere C 2007).

1. Confirmed the association between obesity and Type 2 DM.
2. Earlier onset of Type 2 diabetes is associated with a higher BMI (weight in kg divided by height m²) of over 25
3. Increasing prevalence of overweight and obesity is the most important factor in the increasing number of younger people being diagnosed with Type 2 DM.
4. High waist circumference (≥ 94 cm in men and ≥ 80 cm in women) increases the risk of developing diabetes, independent of the risk reflected by high BMI.
5. Diabetes can be prevented or delayed in people at high risk of diabetes through a combination of healthy diet/lifestyle and modest weight loss.

Obesity is not because it runs in the family. It is because NO ONE RUNS (exercises) in the family!!! *Anonymous*

3. **Gestational Diabetes:** Is a form of diabetes that is diagnosed only during pregnancy. It occurs in African women who are obese or have a family history of type-2 diabetes. It requires treatment to bring the maternal blood glucose to normal levels and avoid complications of pregnancy wastage and other complications in the baby.

The outcome of recent Gestational Diabetes Study in UPTH using the new WHO Criteria revealed... that the overall prevalence among antenatal attendees is 15.2% (Chinenye, Akhidue, Ogu. Diabetes In Pregnancy: The Nigerian Perspectives using the new WHO criteria 2014).

Gestational diabetes

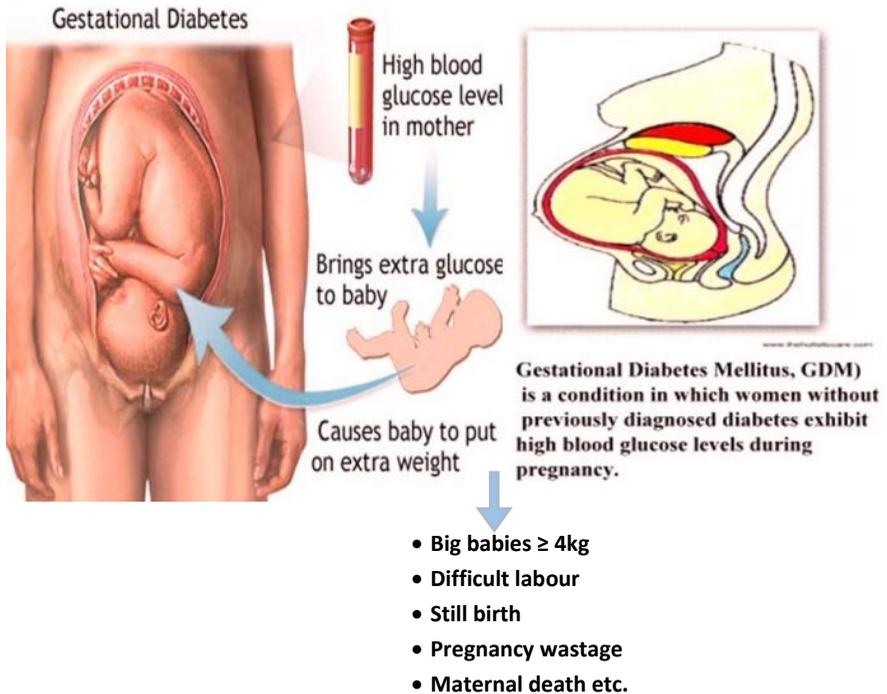


Fig. 7: Pregnancy-induced Diabetes (source: www.bing.com/images)

4. **Other specific types of Diabetes or Secondary Diabetes:** It results from other specific genetic conditions, medications, infections and other hormonal disorders. Secondary type of diabetes account for less than 3% of all diagnosed cases in Nigeria.

CAUSES OF DIABETES (ESPECIALLY TYPE 2 DIABETES)

Diabetes occurs when there is an imbalance between the demand and production of the hormone insulin due to interplay of genetic and environmental factors.



Fig. 8: Multi-factorial Causes of Diabetes

THE NATURAL HISTORY (PROGRESSION) OF DIABETES

Insulin is the main reason for diabetes. Insulin is a hormone produced by some special cells of the pancreas, to regulate the level of glucose in the blood. The special cells of the pancreas are the beta cells. Type 1 diabetes, as earlier stated, results when the beta cells are unable to produce enough insulin, often because they have been destroyed by the body's immune system, a process called autoimmune reaction.

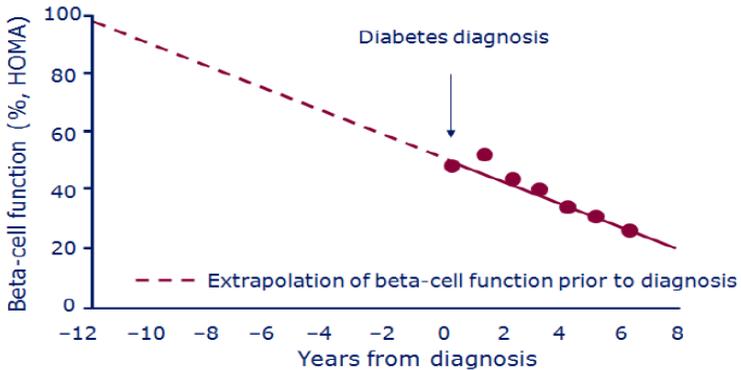
Type 2 diabetes on the other hand, is a progressive disease that first results due to the insensitivity of the cells of the body to the actions of insulin, which triggers increased activity of the beta cells to surmount the resistance, resulting in the exhaustion of the beta cells and their loss of function.

It is estimated that patients with Type 2 diabetes have lost about 50-70% of the total stock of their beta cells, by the time they are diagnosed. This loss continues with the disease, at the rate of about 4% every year, such that most patients with Type 2 diabetes are without any functional beta cells, after about ten years with the disease.

Take Home Message

Patients with Type 2 diabetes at this later stage of the disease need insulin injections, for the control of the disease in addition to the oral drugs.

Beta-cell function progressively declines



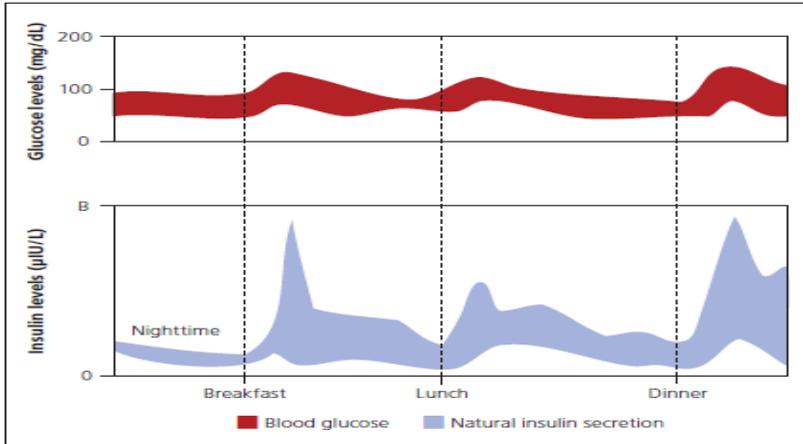
HOMA, homeostasis model assessment

Lebovitz. *Diabetes Reviews* 1999; 7:139-53

(data are from the UKPDS population: UKPDS 16. *Diabetes* 1995; 44:1249-58)

Fig. 9: Beta-cell function progressively decline over time

The injection of insulin for the treatment of diabetes aims to mimic how insulin is normally released by the beta cells of the pancreas. The beta cells normally release insulin in two patterns: Small amounts of insulin are continuously released by the beta cells, to maintain the blood sugar at the normal level, and to ensure that glucose is continuously pushed into the cells of the body, as and when the glucose is needed by the body cells. This continuous release is called **basal insulin production**. The beta cells release high doses of insulin, immediately after a meal, first to stop the liver from pushing out more stored glucose into the blood, and then to deal with the increased glucose level that follows the consumption of a meal. This post-meal release of insulin is called **bolus insulin production**. The amount of insulin released by the beta cells is influenced by the carbohydrate content of the meal; the higher the glycaemic index and the glycaemic load of the meal, the more the insulin that is released to deal with the carbohydrate content of the meal.



Insulin is secreted by the pancreas in a glucose-dependent manner continuously throughout the day, as well as in response to oral carbohydrate loads

Fig. 10: Pattern of natural insulin release *vis-a-vis* Glucose Level

When insulin is used to treat diabetes, it is injected to meet the basal insulin need, the bolus or meal-related insulin need, or both. Patients with type 1 diabetes and those in the late stage of type 2 diabetes need insulin injections to cover both the basal needs and the bolus needs, due to the total inability of their beta cells to produce insulin. Doctors refer to this as **basal-bolus insulin treatment**.

Patients in the early stage of Type 2 diabetes who require insulin are given smaller doses, and are not often placed on basal-bolus insulin treatment, because their beta cells are still producing insulin, and several of the oral anti-diabetes drugs are still very effective in them. Insulin is often the drug of last resort, these patients are therefore only given the insulin that help address the specific problems that could not be resolved with the other anti-diabetic drugs. For example, patients on oral anti-diabetes drugs who have problem of high blood sugar level in the morning (fasting hyperglycaemia) are often given a basal dose of insulin injection at night to help them deal with the problem; while those with high blood sugar levels after a meal (post-prandial hyperglycaemia) are given bolus doses of insulin injection with meals.

The Key Problems in Diabetes

- Insufficient production of insulin (either absolutely or relatively to the body's needs)
- Inability of body cells to use insulin properly and efficiently, leading to hyperglycaemia and diabetes (insulin resistance)
- Production of defective insulin (uncommon)
- Steady decline in number of Beta-cells, adding to the process of elevated blood sugars.

DIAGNOSIS OF DIABETES MELLITUS: SCREENING TESTS AND CONFIRMATION

Table 3: Diagnosis of Diabetes Mellitus: Screening tests and confirmation

WHO: Diagnostic Criteria for Diabetes Mellitus			
Plasma Venous Glucose Concentration			
Parameter & Year		mmol/L	mg/dL
Overt Diabetes	Diabetes Mellitus		
	Fasting*or 2-h post-load glucoseor both	≥7.0 ≥11.1	≥126 ≥200
Pre-Diabetes	IGT (Impaired Glucose Tolerance)	<7.0	<126
	Fasting* and 2-h post-load glucose	≥7.8 and <11.1	≥140 and <200
	IFG:(Impaired Fasting Glucose) Fasting*	6.1 – 6.9	110 – 125
	2010 (DM)	HbA1c ≥6.5%	HbA1c >7.0 is call for action to initiate or change therapy

IFG=impaired fasting glucose; IGT=impaired glucose tolerance; T2DM=type 2 diabetes mellitus; WHO=World Health Organization

**In asymptomatic patients, 2 abnormal fasting values are required for diagnosis*

Adapted from World Health Organization. Definition, Diagnosis and Classification of Diabetes Mellitus and Its Complications. Geneva: WHO; 2006 & 2010.

DEALING WITH A POSITIVE RESULT OF DIABETES

The reactions to a positive result of diabetes are varied; however they are always powerful.

Emotions may range from shock, disbelief to even suicidal tendencies. These emotions are completely normal and have been found to be similar to the bereavement felt with the death of a loved one.

The emotions come in five stages, as put forward by Elizabeth Kubler-Ross following her study on terminally ill patients.

The stages and intensity of their expression in a person is as unique as the person expressing them.

The five stages of the emotions are:

Stage 1: Denial (“I reject it! It’s not my portion!!”)

Stage 2: Anger

Stage 3: Bargaining

Stage 4: Depression; and

Stage 5: Acceptance

The danger is that in-between Denial and Acceptance many Nigerians diagnosed with diabetes derail and may die from acute or chronic life-threatening complications.

DIABETES IN NIGERIA: FEATURES AND MANIFESTATIONS

Diabetes as a chronic condition is characterized by patterns of symptoms, stages of clinical severity and natural progression and all these have impact on health and social function.

Symptoms of Type 1 diabetes usually develop quickly over a few days to weeks and are caused by high blood sugar. At first, symptoms may be overlooked or mistaken for another illness like malaria or typhoid etc.

High blood sugar symptoms include:

- Urinating a lot (polyuria) which may be more noticeable at night. The kidneys are trying to get rid of the excess sugar in the blood. To do that, they have to get rid of more water. More water means more urine.

- Being very thirsty (polydipsia) – This happens because urinating so often, you lose much water to become dehydrated.
- Losing weight, but not intentionally. This results from loss of water and sugar (calories) including proteins.
- Increased hunger (polyphagia) – They feel hungry because the cells aren't using the calories they need. Calories leave the body via the urine.
- Blurry vision – when sugar builds up in the lens of the eyes, it sucks extra water into the eyes. This changes the shape of the lens and density of the eye fluids.
- Feeling very tired – you aren't using the calories you are consuming and the body isn't getting the energy it needs. It's like starvation in the midst of 'wasted' plenty.

The diagnosis of type 2 diabetes is readily recognised when a patient presents with classic symptoms of polyuria, polydipsia, polyphagia and blurring of vision; however as many as 50% of Nigerians with type 2 diabetes are symptomless and their disease remains undiagnosed for many years... that is the danger, so go for screening!!! (Chinenye et al Clinical Practice Guidelines for Diabetes Management in Nigeria 2013).

DIABETES: KNOW THE SYMPTOMS

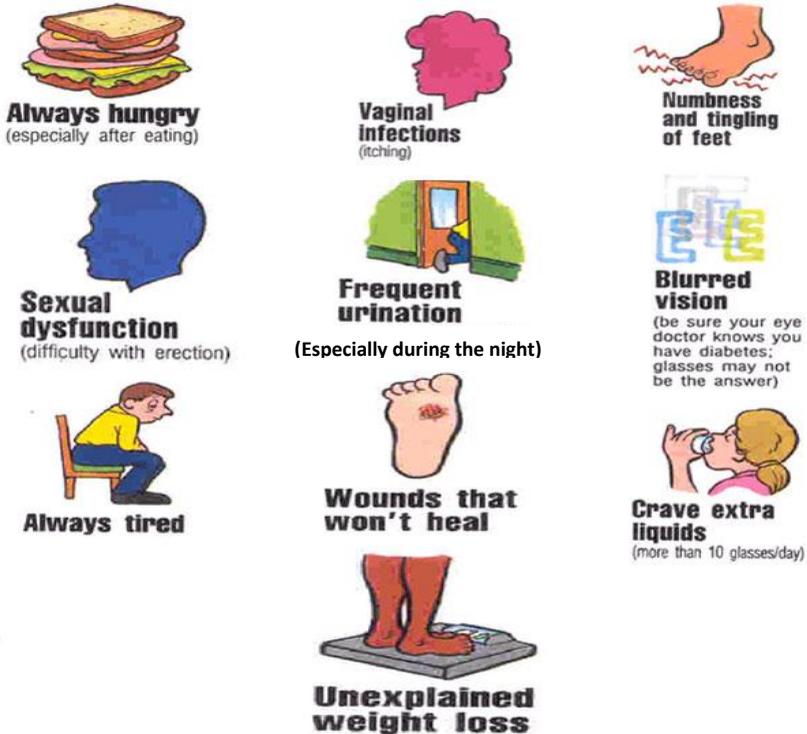


Fig. 11: Diabetes: Know the Symptoms (source: www.bing.com/images)

Associated Multiple Chronic Conditions

The burden of diabetes is often compounded by multiple chronic conditions (MCCs) or comorbidities that contribute to worse outcomes, multiple organ systems involvement, complex treatment approaches and decreased adherence to treatment (Chinenye et al. Diabetes Advocacy and Care in Nigeria 2014). The prevalence of MCCs increases substantially among adults with diabetes over age 45 years.

The difference between older and younger persons with diabetes must be considered in population-based approaches to living well with diabetes.

Similarly, the social determinants of health as the context for a population-based approach to living well with diabetes must be recognized.

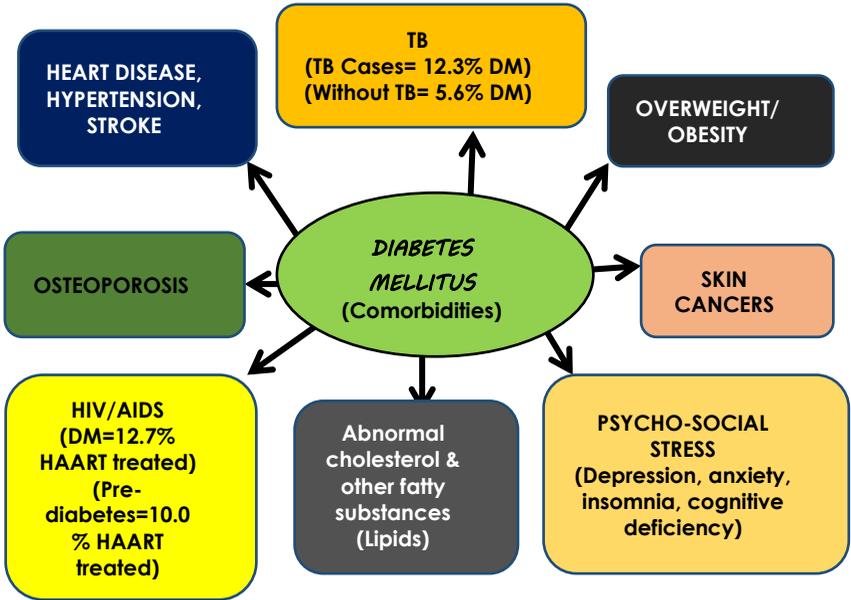


Fig. 12: Associated Multiple Chronic Conditions
(Ogbera, Chinenye et al 2007; Uloko, Gezawa, Mohammed et al 2014; Ogbera, Kapur, Chinenye et al 2014)

DIABETES: COMPLICATIONS

The burden of diabetes lies in the complications of diabetes. The complications of diabetes are also responsible for much of the ill health and deaths that results from the disease. How well you are able to deal with the complications of diabetes would therefore determine how well you would live with the disease.

The complications of diabetes are of two types – acute and chronic. Acute complications result from the massive disruptions caused by diabetes to the proper functioning of the body, which present as medical

emergencies that require immediate medical treatment, to save the life of the patient. Chronic complications on the other are caused by the cumulative damages done to the body, by the tissue starvation and high blood sugar level created by diabetes.

Acute diabetic emergencies often present as diabetic coma, but are specifically caused by (Ogbera AO, Chinenye S, Onyekwere A, Fasanmade O 2007):

- Diabetic ketoacidosis (toxic metabolic acids builds up from high blood sugar).
- Hyperosmolar hyperglycaemic state.

In acute complications, there may be nausea, vomiting, sweet smelling breath, fast breathing, abdominal pain and irritability.

Although diabetes affects every part of the body, the following chronic complications have been noted to have more significant effects on health and wellbeing:

- Problems that affects the heart and the blood vessels (cardiovascular problems)
- Problems that affects the kidneys (diabetic nephropathy)
- Problems that affects the eyes (diabetic retinopathy)
- Problems with the nerves of the body (Diabetic Neuropathies)
- Problems with the feet (Diabetic foot);
- Teeth problems
- Sexual problems; and
- Problem with infections

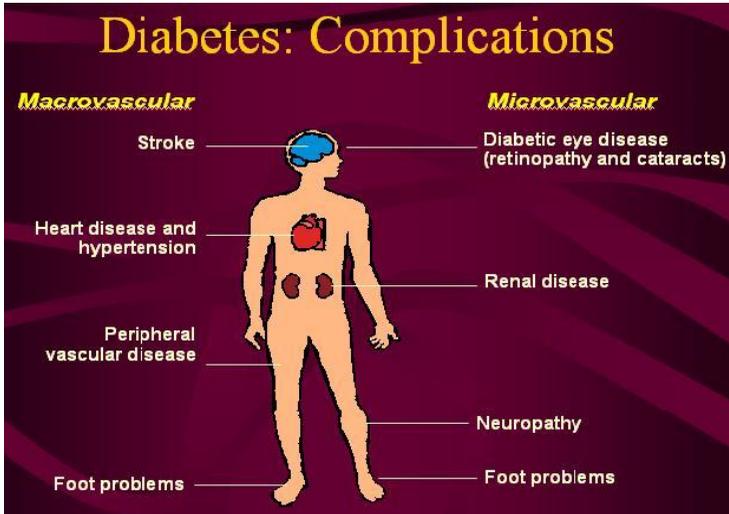


Fig. 13: Diabetes Complications (source: www.bing.com/images)

Uncontrolled diabetes results in multiple complications e.g. heart disease, stroke, kidney failure, blood vessel disease, nerve damage, impotence, infertility, difficult labours, intra-uterine deaths, still births, amputations, blindness and even sudden death.

There is no corner of our dear country today that is free of diabetes. Wherever you live, work or play, someone you know – maybe even you seated in this auditorium – may be struggling with diabetes and its complications.

THE BURDEN AND STATUS OF DIABETES CARE IN NIGERIA

In collaboration with my colleagues, I pioneered some landmark studies to ascertain the State of Diabetes Care in Nigeria.

Some of these studies are summarized:

(A) The Pattern of Diabetes mellitus in Rivers State, Nigeria: This was a cross-sectional study of people living with diabetes attending the local diabetes association meetings and diabetes clinics at the University of Port Harcourt Teaching Hospital (UPTH) and BMSH over

a five year period [Jan. 2001 to Dec. 2005] (Chinenye et al. The Pattern of Diabetes mellitus in Rivers State, Nigeria 2008).

They were recruited after ethical approval and obtaining their informed consent. They were either newly diagnosed or old patients. Physical and biochemical evaluations were carried out. A total of 10,518 people living with diabetes were seen during the study period from the 23 Local Governments (LGAs) of Rivers State. There were 5,350 females (50.9%) and 5,168 males (49.1%) giving F:M ratio of approx 1:1.

The majority were adults (93.9%) aged 20 years and above (**see Table below**). 830 of the newly diagnosed subjects were further evaluated for clinical/biochemical characteristics, modes of treatment and complications on initial presentation.

These comprised 25 type 1 diabetes (3.0%), 780 type 2 (98.0%), 10 (1.2%) Other specific types and 15 (1.8%) with Gestational diabetes. At diagnosis, the type 2 subjects (780) had the following complications namely: Neuropathy 439 (56.3%), erectile dysfunction 283 (36.3%), nephropathy 72 (9.2%) and retinopathy 57 (7.3%).

Table 4: LGA Distribution of Diabetics seen in Rivers State

LOCAL GOVERNMENT AREA	No. OF DIABETICS	% DIABETICS
AHOADA-EAST	213	2.0
ASARI-TORU	540	5.1
BONNY	274	2.6
DEGEMA	310	3.0
ETCHE	502	4.8
TAI	258	2.3
IKWERRE	484	4.6
KHANA	600	5.7
OBIO-AKPOR	800	7.6
OKRIKA	496	4.7
PORT HARCOURT	1420	13.5
OGBA/EGBEMA/NDONI	620	5.9
ABUA/ODUAL	434	4.1
AKUKUTORU	468	4.5
EMOHUA	516	4.9
OYIGBO	367	3.5
ANDONI	620	5.9
GOKANA	510	4.9
AHOADA-WEST	413	3.9
ELEME	207	2.0
OGU/BOLO	156	1.5
OPOBO-NKORO	165	1.6
OMUMA	145	1.4
TOTAL	10, 518	100

Table 5: Clinical Features of 830 Diabetics

PARAMETERS	TYPE 1	TYPE 2	OTHER TYPES	GDM
TOTAL NUMBER (n) %	25 (3.0%)	780 (94%)	10 (1.2%)	15 (1.8%)
Positive Family History OF DM (1ST Degree)	3 (12%)	408 (52.3%)	-	8 (53.3%)
Polyuria	25 (100%)	713 (91.4%)	10 (100%)	11 (73.3%)
Polydipsia	25 (100%)	720 (92.3%)	10 (100%)	11 (73.3%)
Polyphagia	12 (48%)	392 (50.3%)	-	-
Lassitude	25 (100%)	655 (84%)	10 (100%)	13 (86.7%)
Weight Loss	25 (100%)	590 (75.6%)	10 (100%)	7 (46.7%)
Blurring Of Vision	13 (52 %)	491 (62.9%)	10 (100%)	4 (26.7 %)
Recurrent Carbuncles (Boils)	9 (36%)	79 (10.1%)	-	-
Pruritic Vulvae	8 (32%)	223 (28.6%)	-	15 (100 %)
Coma	8 (32%)	39 (5.1 %)	-	-
Pancreatic Calcification	-	-	10 (100%)	-
Peripheral Neuropathy	3 (12%)	439 (56.3%)	-	7 (46.7 %)
Erectile Dysfunction	-	283 (36.3%)	-	-
Hypertension:			-	-
*Antedated	-	106 (13.6%)	-	5 (33.3 %)
*Simultaneously	-	197 (25.3%)	-	
Retinopathy:			-	-
*Background	-	57 (7.3%)	-	-
*Proliferative	-	-	-	-
Nephropathy	-	72 (9.3%)	-	-
Dietary (Mono)Therapy	-	7 (0.9%)	-	-
Insulin Therapy	25 (100%)	176 (22.6%)	10 (100%)	15 (100 %)
Oral Hypoglycaemic Agents (OHA)	-	593 (76.0%)	-	-

Note: DM – Diabetes Mellitus

GDM – Gestational Diabetes Mellitus

Erectile Dysfunction (ED): Defined as the inability to achieve and maintain erection sufficiently enough to allow satisfactory sexual intercourse

(B) Nigerian DiabCare Study: In a multicentre study involving seven teaching hospitals in Nigeria including UPTH, we set out in 2008 under the auspices of Diabetes Association of Nigeria to assess the clinical and laboratory profile of Nigerians living with diabetes. This was to evaluate the quality of care of Nigerian diabetics with a view to planning improved diabetes care (Chinenye et al. Profile of Nigerians with diabetes mellitus – Diabcare Nigeria Study: Results of a multicentre study 2012).

A total of 531 out-patients enrolled, 209 (39.4) males and 322 (60.6%) females. The mean age of the patients was 57.1 ± 12.3 years with the mean duration of diabetes of 8.8 ± 6.6 years. Majority (95.4%) had type 2 diabetes mellitus compared to type 1 (4.6%), with $p < 0.001$.

The mean FPG, 2HrPPG glucose and HbA1c were 8.1 ± 3.9 mmol/L, 10.6 ± 4.6 mmol/L and $8.3 \pm 2.2\%$ respectively.

Only 170 (32.4%) and 100 (20.4%) patients achieved the ADA and IDF blood sugar targets respectively.

Most patients (72.8%) did not practise self-monitoring of blood glucose. High blood pressure (hypertension) was found in 322 (60.9%) of the subjects.

Diabetic complications found were peripheral neuropathy (59.2%), retinopathy (35.5%), cataracts (25.2%), stroke (4.7%), diabetic foot ulcers (16.0%) and nephropathy (3.2%).

This landmark study concluded that Nigerian diabetics have suboptimal blood sugar control, are hypertensive and have chronic complications. The study group recommended that improved quality of care and treatment to target should be implemented to reduce diabetes-related morbidity and mortality.

Diabcare Nigeria Multi-Centre Study:

Table 6: HbA1c Levels Stratified by Different Guidelines

Guideline	Definition	Range (%)	N	Proportion of patients achieving target, n (%)
ADA	Recommendation for adults with diabetes	<7%	525	170 (32.4)
IDF (Type 2)	Target	<6.5	489	100 (20.4)

N: number of valid patient data used in the analysis

n (%): number of patients (percent)

(C) The Diabetic Foot

During the Nigeria DiabCare Study, many patients with Diabetic Foot were recruited from UPTH. Diabetic Foot refers to the variety of pathological conditions that may affect the foot of persons with diabetes (Eker AU, Chinenye S et al. The Diabetic Foot- A Review 2003), ranging from superficial skin ulcers (sores) to outright foot gangrene leading to amputation. Currently, Diabetic Foot is the commonest reason for amputation in most Nigerian hospitals including UPTH.

The burden of Diabetic Foot syndrome is enormous on the patient and society in general. It consumes a significant proportion of the health budgets which results in significant loss in economic productivity and social status.

Pictorial Chart of Diabetic Foot Ulcer in UPTH
Viewer discretion advised!

These plethora of Diabetic Foot consisted of individuals from various social classes in Nigeria attending UPTH:







Figure 14: Photos of Diabetic foot ulcers in UPTH medical wards

Our studies revealed high prevalence of peripheral neuropathy among our diabetics (Unachukwu CN, Babatunde S, Chinenye S. Peripheral Neuropathy and Macroangiopathy in Diabetics with Foot Ulcers in Port Harcourt 2004) with consequent “loss of foot protective sensations”.

Once loss of protective sensation occur, mechanical injury to the foot can occur without the patient perceiving it as disturbingly painful. It is in fact this lack of pain that causes the patient to either ignore the wound or becomes fetish about its origin.

- Patients with diabetes are 25 times more likely to have their leg amputated than people without diabetes.
- The amputations unfortunately often do not only result in the loss of the limb, but sometimes result in the loss of life of the patient.
- The treatment for Diabetic Foot is about the most expensive, even as it does not guarantee the salvation of the leg or life of the patient.
- Commonest reason for prolonged hospitalization in UPTH and elsewhere (15-270 days).

The problem of diabetic foot arises due to the combination of the sensory neuropathy that damages nerves and makes it difficult for the diabetic patient to feel; the blood vessel disease that reduce the supply of blood to the foot, and the reduced immunity caused by diabetes that makes it difficult for the patient to fight infection.

These factors make it easier for the diabetic patient to sustain skin ulcers on the foot, and for the ulcers to become infected, and in serious

cases, for the infected ulcer to progress and become gangrenous, and then wither the foot. The patient at this stage often requires the amputation of the affected foot to save his/her life.

- Diabetic foot often follows a train of events that starts with the loss of sensation, as a result of the sensory neuropathy caused by the disease. The loss of sensation cause the deformation of the foot (**Charcot's joint**), as the patient continues to walk on an injured foot, to the point that it causes the dislocation of the joints.
- This dislocation causes the shoes to fit poorly, causing ulcer to develop. The ulcer easily becomes infected, when the blood sugar level is not properly controlled, because the high sugar content of the blood provides very good nourishment for germs to grow and multiply.
- The normal response of the body to the presence of germs is often not present, because diabetes depresses the body's immune response to the presence of the germs. This is not helped by the fact that the blood vessel disease that often complicate diabetes reduce blood supply to the foot, thereby placing a road block to the mobilization of the body's immune soldiers to fight the infection.
- The holdup created by blood vessel disease often eventually completely cuts off blood supply to the infected limb, resulting in the death of the tissues around the ulcer. This area of dead tissue often grows in size, such that the limb often requires to be amputated as a life-saving measure.



Fig. 15: Diabetic Foot

- For early detection and preventive measures, diabetic foot examination consists of:
 - A visual examination of the foot
 - A lookout for foot deformity
 - A clinical test for sensory loss
 - A clinical test for peripheral blood vessel disease.
 - The examination of the foot wear

Diabetes Foot Care: Dos and Don'ts

- **Do** wear well-fitting shoes. Shoes should be supportive, have low heels (less than 5 cm high) and should not rub or pinch. Shop at a reputable store with knowledgeable staff who can professionally fit your shoes.
- **Do** elevate your feet when you are sitting. This would help blood to circulate in the feet, and reduce some of the effects of blood vessel disease
- **Do** wiggle your toes and move your ankles around, for a few minutes several times a day, to improve blood flow in your feet and legs.
- **Do** exercise regularly and as much as possible. It would help improve circulation, and reduce the incidence of crampy pains in the legs.

- **Do** inspect your feet daily and in particular, feel for skin temperature differences between your feet.
- **Don't** wear high heels, pointed-toe shoes, sandals (open-toe or open-heel) or worn-out shoes.
- **Don't** wear anything tight around your legs, such as tight socks or knee-highs.
- **Don't** ever go barefoot, even indoors. Consider buying a pair of well-fitting shoes that are just for indoors.
- **Don't** put hot water bottles or heating pads on your feet.
- **Don't** cross your legs for long periods of time.
- **Don't** smoke. Smoking decreases circulation and healing, and significantly increases the risks of amputation.
- **Don't** have pedicures by non-health care professionals.

We recommend early screening for loss of foot sensation (peripheral neuropathy), in addition to meticulous foot care and improved blood sugar control, to reduce the occurrence of foot ulceration (sores) and gangrene with the attendant human suffering and loss of economic resources.

(D) Diabetes in the Elderly - Niger Delta experience

This was a cross-sectional study carried out in elderly patients developing diabetes for the first time (Chinenye et al. Diabetes mellitus in the elderly 2012). The aim of the study was to assess their common pattern of presentation and their clinical and biochemical characteristics.

Methods:

All newly-diagnosed elderly (≥ 65 years) patients with type2 diabetes presenting at UPTH, Port Harcourt over a period of 3-6 months were assessed with interviewer-administered questionnaires. Their BP, BMI and biochemical parameters including FPG, lipid profile and creatinine were measured. Kidney, nerve and eye complications were assessed during the study.

Results:

There were 19 males and 33 females with a mean age of 70.5 ± 4.9 years. Their presenting symptoms ranged from no symptoms i.e. diagnosed while being investigated for other illness (46.2%), symptoms of DM (27%), eye symptoms (9.6%) and symptoms of complications such as nerve damage, leg swelling and stroke (17.2%). Only 15.4% of the patients carried out regular exercise at least two times a week. History of DM in a first degree relative was present in 57.7%. The average BMI was $26.7 \pm 3.8 \text{ kg/m}^2$, with 42.3% overweight and 21.2% obese.

Hypertension was present in 51.9% of the patients. The average FPG was $8.3 \pm 3.9 \text{ mmol/L}$. Good glycaemic control ($\text{FPG} < 7.2 \text{ mmol/L}$) was present in 42.3%. The average total cholesterol was $190 \pm 34.9 \text{ mg/dl}$. A total cholesterol level greater than 200mg/dl was present in 38.5% of the patients. The average triglyceride was $106.8 \pm 35.6 \text{ mg/dl}$ and 14.9% had levels $\geq 150 \text{ mg/dl}$, while the average bad cholesterol (LDL) was $128.1 \pm 34.5 \text{ mg/dl}$ with 55.8% having $\text{LDL} \geq 115 \text{ mg/dl}$. Only 29.8% had good cholesterol (HDL) $\geq 45 \text{ mg/dl}$. Complications were present in 30.8% of the patients. 17.3% had nerve damage (neuropathy) at first diagnosis, 5.8% had eye complications and abnormal kidney function (GFR) was present in 59.6%.

The study concluded that diabetes in the elderly is associated with a high degree of heart-related risk factors, complications and is frequently detected in the course of other illnesses.

Table 7: Presenting symptoms at detection of diabetes in males and females

Variables	Male (%)	Female (%)	Total (%)
Classical symptoms	3(5.8)	11(21.2)	14(26.9)
No symptoms	11(21.1)	13(26.9)	24(46.2)
Eye symptoms	1(1.9)	4(7.7)	5(9.6)
Complications	4(7.6)	5(9.6)	9(17.2)
Total	19(36.4)	33(65.4)	52(100)

Table 8: Complications of diabetes in the elderly patients

Complication	Number	Percentage (%)
Neuropathy (nerve damage)	6	11.5
Nephropathy (kidney damage)	28	53.8
Eye complications	2	3.8
Nerve/kidney damage	2	3.8
Eye complications + kidney	1	1.9

(E) Diabetes in Pregnancy: The Nigerian Perspectives

This study was aimed at determining the prevalence of diabetes in pregnancy (GDM) and associated factors among antenatal women in Port Harcourt using the new World Health criteria (Chinenye S, Ogu R, Akhidue K 2015).

Methods

In this study, antenatal women were tested using 75g glucose load and obtaining fasting (5.1 – 6.9mmol/L), 1hr (≥ 10.0 mmol/L) and 2hr (8.5 – 11.0mmol/L) glucose values; one value being sufficient for diagnosis; and associated anthropometric and clinical factors including primary and secondary outcomes.

Results

Results reveal that 26.5% of the subjects had a family history of Diabetes while 12.9 %, 7.6% and 11.4% were diabetic using the FPG, 1hr-PPG and 2hr-PPG respectively of the new WHO CRITERIA.

The overall prevalence of GDM in the study population was 15.2%. The outcomes of birth weight, mode of delivery, neonatal hypoglycaemia, need for Neonatal Intensive Care (NIC) and preeclampsia were documented.

Conclusion

Diabetes Association of Nigeria has adopted these new World Health criteria and is translating the recommendations into local practice with Port Harcourt setting the pace in Nigeria.

(F) Sociocultural factors: Evidence from review studies in Nigeria underscore the following Sociocultural and economic factors militating against diabetes care (Chinenye et al. Sociocultural aspects of diabetes in Nigeria 2013):

1. Low level of health literacy among Nigerian diabetics
2. Erroneous religious beliefs, myths and misconception about diabetes.
3. Poor adherence to medications
4. Socioeconomic circumstances (poverty etc.)
5. Poor physician-client relationship
6. Low level of family support
7. Westernization with increasing sedentary living, overweight and obesity
8. Inadequate and declining support to diabetic patients
9. Frustration and helplessness among the less privileged persons and families of diabetics
10. Increasing complications and deaths associated with diabetes resulting from poverty, fake drugs and poor health services in Nigeria
11. Increasing misinformation about diabetes and the practice of inappropriate care across Nigeria especially from alternative healthcare providers.
12. Very weak financial status of diabetes advocacy groups e.g. DAN, at all levels, thereby decreasing performance and output

THE CONCEPT OF LIVING WELL WITH A CHRONIC DISEASE OR ILLNESS (DIABETES)

A chronic disease or illness, in general terms, is a condition that is slow in progression, long in duration, and devoid of spontaneous resolution and if not well treated, often limits the function, productivity and quality of life of any individual who lives with it [Institute of Medicine, 2012].

Diabetes mellitus is a chronic illness and is also marked by the experience of long-term bodily or health disturbance such as fatigue, confusion or social stigma and how people live and cope with disruption to their daily lives.

Chronic diseases or conditions have emerged in recent decades as the major cluster of health concerns for the Nigerian people e.g. Diabetes mellitus, Hypertension, Cancer, Asthma etc.

A chronic illness like Diabetes Mellitus imposes an enormous and growing burden on individuals, families, communities and the nation as a whole.

For Nigerians who are living with diabetes, access to suitable disease treatment programs is uneven, disparities among sections of the country persist and shortcomings in the quality of care are all too common.

Living and coping with chronic illness is not Nigeria's challenge alone. On September 19 – 20, 2011, for the 1st time, the United Nations took up the topic of chronic non-communicable diseases as a principal agenda at a plenary High level summit. The rising burden of chronic disease affects countries at every position on the economic spectrum.

Each has much to learn from others, recognising that differences in culture, conditions and circumstances will demand distinctive solutions.

Diabetes Mellitus: The Bio-psychosocial Perspectives

Hygienic and sanitary advances have greatly prevented many previously common infectious diseases. Immunizations, clinical and community interventions have substantially controlled many past causes of chronic infectious illnesses such as tuberculosis, polio etc though not completely eliminated.

However, these advances have been compromised by parallel increases in physical inactivity, unhealthy eating, overweight, obesity, tobacco and alcohol use, and other chronic disease risk factors including exposure to environmental pollutants as seen in the Niger Delta region.

Today, virtually every Nigerian family has recorded a case of diabetes in a 1st, 2nd or 3rd degree family member. Diabetes Association of Nigeria (DAN) estimates that there are about five million Nigerians living with Diabetes Mellitus (Chinenye et al. Diabetes Advocacy and Care in Nigeria 2014) and World Health statistics indicate that Nigeria has the highest number of people with diabetes in sub-Saharan Africa (IDF Diabetes Atlas 6thed 2013).

Diabetes and other chronic diseases have now emerged as a major public health problem and it threatens not only population health but also social and economic welfare.

Diabetes not only impact the social and economic lives of millions of Nigerians and their families but also is a major contributor to healthcare costs.

Diabetes is thus a common public health as well as a clinical problem in Nigeria. Therefore, a biopsychosocial perspective for understanding diabetes, developing policies, strategies and interventions to combat it is critical. A biopsychosocial perspective considers how individuals’ genes, biology and behaviours interact with the social, cultural, psychological and physical environment around them to influence health outcome for the entire diabetic population.

Determinants of Diabetes Health

Spectrum of Diabetes Health

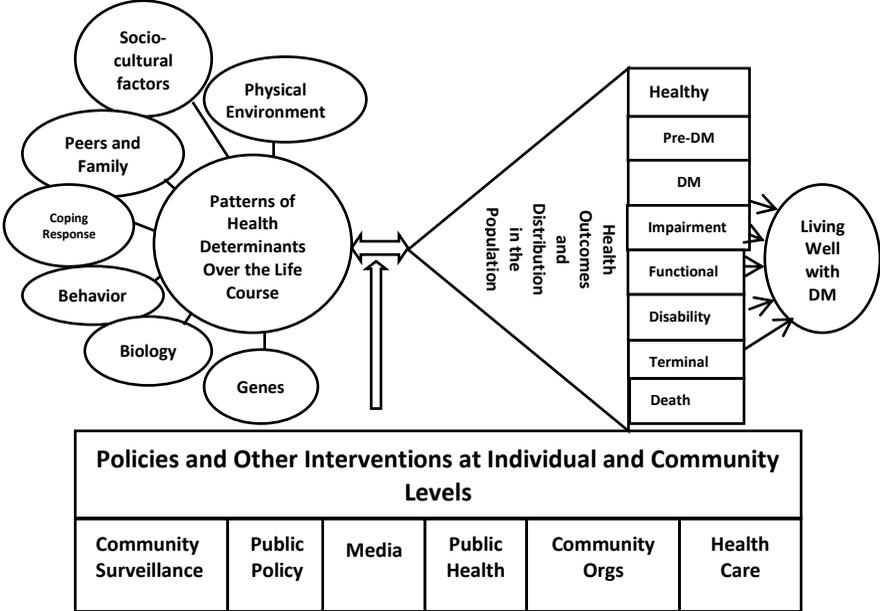


Fig. 16: Integrated Bio-psycho-social Model

Note:

Pre-DM: Pre-diabetes, DM: Diabetes Mellitus

Surveillance for diabetes and its outcomes is critical to identifying needs, setting priorities for action and assessing programmatic progress.

The principal aim of any diabetes health intervention is to eliminate mortality or reduce morbidity i.e. managing each affected person and the population as a whole to “live well” regardless of diabetes or an individual’s current state of disability. Thus, the concept of living well with diabetes reflects the best achievable state of health that encompasses all dimensions of physical, mental and social well-being.

Living well with diabetes is determined by the physical, social, psychological and cultural surroundings and by the effects of diabetes – not only on the affected individual, but also on family members, friends and care-givers.

In this way, progress towards living well with diabetes can be achieved through the combined efforts of both individuals and society to reduce disability and improve functioning and quality of life regardless of each unique individual’s current health status or the stage of diabetes.

DIABETES CARE AND TARGETS OF CONTROL

The goals in caring for people with diabetes are:

- To eliminate symptoms
- To prevent or at least slow the development of complications.
- To improve health and longevity

Diabetes is a multi-faceted disorder and the demands of control parameters are progressive (Chinenye et al. Current Concepts in the Management of Diabetes 2006).

Table 9: Essential Components of Diabetes Care

<p>1. Treatment of High Blood Sugar (Hyperglycaemia; the root of “all evils” in diabetes)</p> <ul style="list-style-type: none">(a) Non-Pharmacological measures<ul style="list-style-type: none">(i) Monitoring(ii) Education [DSME](iii) Diet(iv) Physical Activities (exercise)(b) Drug treatment<ul style="list-style-type: none">(i) Oral glucose lowering agents(ii) Insulin [injectable form](c) Combination therapies<ul style="list-style-type: none">• oral glucose lowering agents plus insulin
<p>2. Treatment of High Blood Pressure (Hypertension) and High cholesterol</p> <ul style="list-style-type: none">(a) Non-pharmacological<ul style="list-style-type: none">(i) Monitoring(ii) Education(iii) Diet(iv) Exercise (physical activity)(b) Drug treatment
<p>3. Prevention and treatment of acute complications</p>
<p>4. Prevention and treatment of chronic complications</p>

Team-Based Care

Diabetes Care through a team approach is more effective than that from a single provider, and efforts to raise the quality of care by team improvements are more effective on blood glucose and other control parameters.

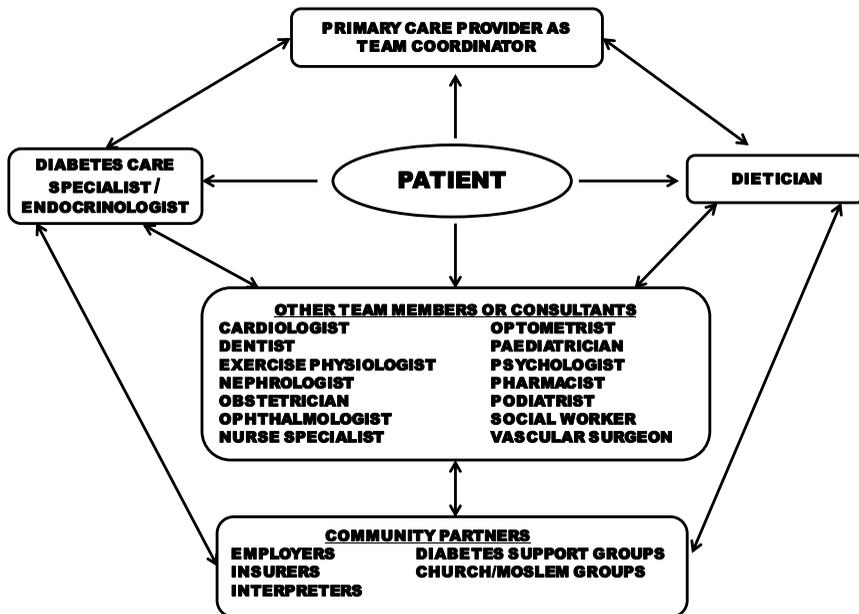


Fig 17: Diabetes Care Team

Concurrent treatment of secondary factors such as hypertension, obesity and high cholesterol including smoking cessation are usually required because these factors drive the development of complications.

Eye, kidney and nerve complication reduction is accomplished through control of blood sugar and pressure; heart, brain and blood vessel complications are reduced through control of blood sugar, cholesterol, blood pressure, smoking cessation and prevention of clots formation.

Diabetes care requires appropriate goals setting, dietary, exercise and medications adherence, (very important), appropriate self-monitoring of blood glucose (SMBG), regular screening for complications, and recommended laboratory assessment. Others include maintenance of ideal body weight and optimal blood pressure.

The Use of Insulin in treating Diabetes

The safe use of insulin in the treatment of diabetes would involve knowledge of:

- How insulin works
- Indications for insulin use
- The available insulin preparations (we have progressed from Animal → Human Insulin → Insulin analogues)
- The common insulin prescription plan
- The implementation of the insulin prescription plan
- The different types of insulin delivery devices (we have progressed from syringes and needles → reusable pens → disposable pens with micro fine needles).
- How to recognise and deal with the side-effects of insulin use (hypoglycaemia and weight gain)

Patient-centred, family-centred & community-oriented Care

The components of lifestyle interventions include medical nutrition counselling, exercise recommendations and comprehensive diabetes education with the purpose of changing the paradigm of care in diabetes from provider-focused to patient-centred as depicted below (Chinenye et al. Patient-centred care in diabetology: sub-Saharan African Perspectives. AJDM 2014).

PATIENT-CENTRED, FAMILY-CENTRED & COMMUNITY-ORIENTED CARE

(Chinenye et al. 2014. Patient-centred Care in Diabetology: sub-Saharan African perspective)

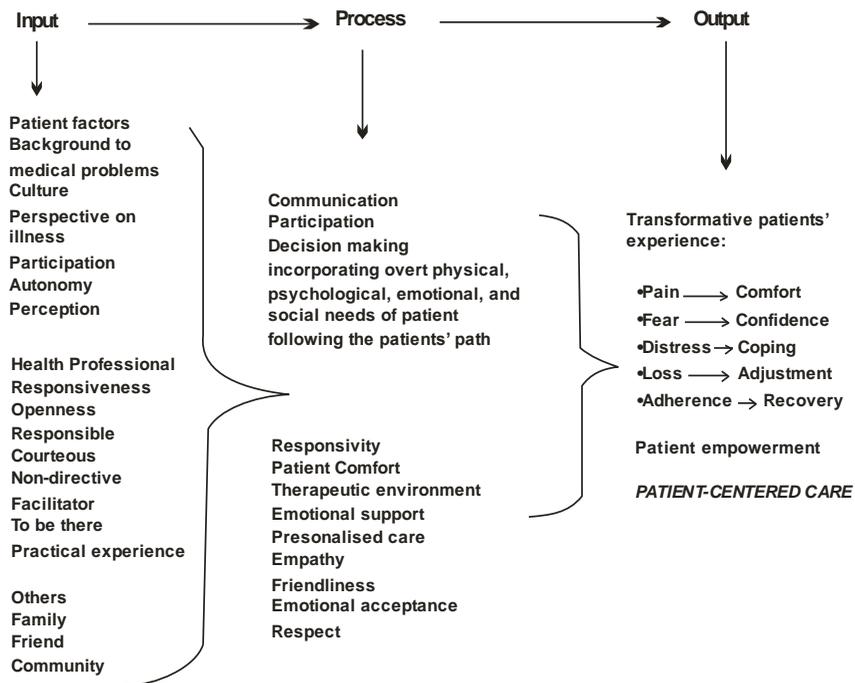


Fig. 18: Patient-centred Care in Diabetes

- It is the quality of the relationship between the health professional and the patient that is central to the therapeutic process.
- The diabetic patient should no longer be taken as a complex bio-medical machine.
- Rather as an integrated Bio-psychosocial Being at a given stage of his or her life-cycle.
- In the current socio-economic environment, the average Nigerian with diabetes enjoys better literacy, education, communication and awareness than before.

- Family-centred and community-oriented treatment must be practised, keeping the family and community as interventional units in diabetes care.

Physician/Patient Partnership

- Educate continually
- Include the family
- Provide information about diabetes
- Provide training on self-management skills
- Emphasize partnership among healthcare providers, the patient and the patient's family e.g. join the Diabetes Association.

Targets for Diabetes Care

Targets are evidence-based benchmarks in treatment of diabetes with respect to blood sugar, blood pressure, cholesterol levels etc. Without some form of targeted control of diabetes, it becomes difficult to promote care at all.

Achieving and maintaining good blood sugar control by treating-to-target, is the goal of using guidelines (Chinenye et al. Clinical Practice Guidelines for Diabetes Management in Nigeria 2013, 2nd edition)

How do we treat-to-target?

- Taking control and achieving control.
- Taking control – Empowering the diabetic patient to manage his/her condition in partnership with care givers and loved ones (through Diabetes Self-management education, DSME)
- Achieving control – Reducing the impact of diabetes so that patients can live a normal life (through monitoring, prescribed appropriate and adequate medications, diet and exercise).

Table 10: IDF optimal targets for glycaemic, lipid, blood pressure and weight control

Biochemical Index:	Optimal	
Capillary blood glucose values (finger-prick)	mmol/L	mg/dl
Fasting	≤6.0	110
2-hour post-prandial (post-meal)	≤9.0	160
Blood Pressure (mmHg):		
Systolic	<130	
Diastolic	<80	
If persistent, dipstick for proteinuria		
Systolic	<125	
Diastolic	<75	
Lipids		
	mol/L	mg/dl
Total cholesterol	<5.2	<200
LDL cholesterol	≤2.6	≤95
HDL cholesterol	>1.1	>40
Men		>40
Women		>50
Triglycerides	<1.7	<150

Diabetes Association of Nigeria is a key member of International Diabetes Federation (IDF)

IDF is the global umbrella of all diabetes associations and plays the role of a specialized agency of World Health.

STANDARDS OF CARE

Standard Care

Involves:

- ☉ Maintaining HbA1c below 6.5% which should minimize risk of developing complications.
- ☉ Providing lifestyle and education support, and titrate therapies, to enable people with diabetes achieve HbA1c below 6.5 % (where feasible and desired), or lower if easily attained.

- ⊙ Advising those in whom target HbA1c levels cannot be reached that any improvement is beneficial.
- ⊙ Raising targets for people on insulin or some tablets whose attainment of tighter targets may increase the risk of hypoglycaemic episodes, which may present particular problems for people with other physical or mental impairment.
- ⊙ Equivalent target levels for capillary plasma glucose levels are <6.0 mmol/L (<110 mg/dl) before meals, and <9.0 mmol/L (<160 mg/dl) 1-2 h after meals.

Comprehensive Care

- ⊙ The target levels here are as for *Standard care*, but it may be possible to devote more resources to achieving lower target levels without adverse impact on health.

Minimal Care

- ⊙ The target levels here are as for *Standard care*, but may need to be based on measurement of plasma glucose levels ALONE, especially in rural settings where facilities for HbA1c are not available.

The Relevance of Monitoring in Diabetes Care

(a) Haemoglobin A1c (HbA1c) Test as Monitoring Standard:

HbA1c test is very accurate because the method(s) of measurement is now well standardized. This test is for long term glucose control (2-3months) and measures sugar molecules attached to haemoglobin and the result should be less than 6.5% when diabetes control is optimal. This is the gold standard for assessing Diabetes Control.

(b) Home Self-monitoring of Blood Glucose (SMBG): This underscores the following:

- Day-to-day blood sugar variations.
- Core component of effective DM self-management.
- Day-to-day treatment options and adjustments.
- Titrate treatment to prevent ‘hypo’ episodes.

Diabetes Self-Management Education

Definition: Diabetes Self-Management Education (DSME) is the on-going process of facilitating the knowledge, skill and ability necessary for diabetes self-care (Funnell et al. Diabetes Care 2010).

This process incorporates the needs, goals and life-experience of the person with diabetes and is evidence-based.

Objectives

- (i) Support informed decision-making
- (ii) Support self-care behaviours
- (iii) Support problem-solving and active collaboration with the health team
- (iv) To improve clinical outcomes, health status and quality of life

Diabetes Self Care

The World Health in 2009 defined self-care as “Activities that individuals, families and communities undertake with the intention of enhancing health, preventing disease, limiting illness and restoring health.” These activities are derived from knowledge and skills from the pool of both professional and lay experience. They are undertaken by sick people on their own behalf, either separately or in participative collaboration with professionals.

The components of self-care strategies in Diabetes include:

- Dietary planning
- Physical activities (exercise)
- Medication adherence (including self-administration of insulin)
- Self-monitoring of blood glucose (SMBG)
- Problem solving skills (management of hypo & hyper glycaemia)
- Reducing risks (smoking cessation, eye, foot and dental care)
- Healthy coping (stress management, psycho-sociocultural issues, family and social support)

Self-care interventions do not only contribute to prevention of organ damage in diabetes, they are also of proven effectiveness in other chronic conditions e.g. hypertension etc.

Guiding Principles

1. Diabetes education is effective for improving clinical outcomes and quality of life
2. DMSE has evolved from primarily didactic presentations to empowerment models
3. DSME programs incorporating behavioural and psychosocial strategies demonstrate improved outcomes e.g. DAWN Study.
4. Culturally and age-appropriate programs improve outcomes and group education is effective.
5. On-going support is critical to sustain progress made by participants during DSME program (Norris SL et al. 2002).
6. Behavioural goal-setting is an effective strategy to support self-management behaviours (Funnel MM, Brown TL. 2010).

Take Home Message

Unlike other diseases, people with diabetes are responsible for 95% of their own care. Yet, many are faced with managing this disease – including making complex daily health decisions – without proper education regarding their diabetes.

Diabetes Educator

Diabetes Educators are healthcare professionals who focus on helping people with and at risk for Diabetes and related conditions achieve behaviour change goals which in turn lead to better clinical outcomes and improved health status.

Certified Diabetes Educator

Qualified healthcare professionals including, but not limited to:

- Physicians, especially endocrinologists
- Registered Nurses
- Registered Dietitians
- Pharmacists
- Mental health professionals
- Podiatrists
- Optometrists
- Physiotherapists

They help clients learn how to manage their diabetes.

Table 11: Roles and Functions of the Diabetes Educator

ROLE	OBJECTIVE(S)	OUTCOME
Help PLWD develop effective coping strategies for the variety of health-related situations that arise because of Diabetes	Problem Solving	<ul style="list-style-type: none"> ▪ Effective coping strategies ▪ Identify psychological and social barriers that affect your health
Teaching the importance of Self-care Behaviour	Reducing Risks	<ul style="list-style-type: none"> ▪ Quitting smoking ▪ Having regular eye and foot examinations ▪ Monitoring blood sugar, blood pressure & cholesterol ▪ Keeping personal care records
Adherence Counsellor	Taking medicines	<ul style="list-style-type: none"> ▪ How your medicines work ▪ Potential side-effects of your medicines ▪ Timing and frequency of administration ▪ What happens if you don't adhere to medications ▪ Self-administration of insulin
Relevance of Monitoring	Understand information about blood sugar, blood pressure and other diabetes monitoring equipment.	<ul style="list-style-type: none"> ▪ Proper use of the monitoring equipment ▪ How often and when you should test ▪ What appropriate target ranges are ▪ How to interpret test results
Healthy Eating Education	Healthy Eating	<ul style="list-style-type: none"> ▪ The effects of food on blood sugar ▪ Sources of carbohydrate, fat and proteins ▪ Effective meal planning ▪ Resources that you can use to make wise food choices
Physical Activity Education	Being Active	<ul style="list-style-type: none"> ▪ Develop a physical activity plan ▪ Discuss about ways to overcome common barriers to increased physical activity

Education should be provided at a level appropriate to the patient understanding and targeting erroneous beliefs and attitudes about diabetes.

“I do not run like a man running aimlessly; I do not fight like a man beating the air. No, I beat my body and make it my slave (to achieve my aim, for a long and healthy life!!!) 1 Corinthians 9:26-27

LIVING TO A GRAND OLD AGE WITH DIABETES – A STEP-BY-STEP GUIDE

The Holy Land, Jerusalem, operates on the principle that “Medical Healing and Divine Healing are complimentary!”

– *The Holy Land Injunction*

This is summarized as follows:

Step One: Take time off, to tell your God and yourself why you must live well, in spite of the Disease (diabetes).

Step Two: Learn as much as possible about diabetes

“My people perish for lack of knowledge...” (Hosea 4:6).

“...the excellence of knowledge is that it giveth life to them that have it”. Ecclesiastes 7:12

Step Three: Have a Health Plan with Life-style Modification

Joel Ostein wrote a book titled “Become a better you”

“It is not the strongest of the species that survives, nor the most intelligent, but the one most responsive to change”- Charles Darwin

Step Four: Build a Support Team e.g. Join the Diabetes Association of Nigeria

Step Five: Commence your Health Plan immediately

Step Six: Religiously follow the Health Plan

Step Seven: Regularly look out for Complications

Step Eight: Go for regular Health Checks e.g. always keep your hospital appointments.

“Knowing is not enough; we must apply. Willing is not enough; we must do.” - Johann von Goette [German writer & statesman]

The Dietary Management of Diabetes

No matter the type, stage or severity of diabetes, dietary management otherwise called Medical Nutrition Therapy, is a very crucial aspect of the overall management of diabetes which may involve Diet alone, Diet with oral glucose-lowering agents or Diet with insulin.

The type and amount of food consumed is a fundamental determinant of diabetes health.

In the Nigerian setting, there is no scientific reason why our diabetic patients should be restricted to a diet of unripe plantain and beans. This is unacceptable and is hereby condemned!!!

Diet used for controlling blood sugar should meet the following criteria (Umeadi M, Chinenye S. Dietary Management of Diabetes in Nigeria 2014):

- (a) Should provide a balanced diet. A diet is said to be balanced if it is able to supply all the essential nutrients, in the right quantities.
- (b) Should be prepared from the traditional varieties, using food items that can easily be found in the local environment. This is to ensure that the diet does not look or taste strange.
- (c) Should maintain the pleasure that comes from eating food, so that the person living with diabetes would enjoy it all the days of his/her life and not just for a brief period.

Diabetes Food Pyramid: The Diabetes Association of Nigeria, American Diabetes Association, International Diabetes Federation and other expert diabetes organizations specifically advise the following:

Diabetes Food Pyramid

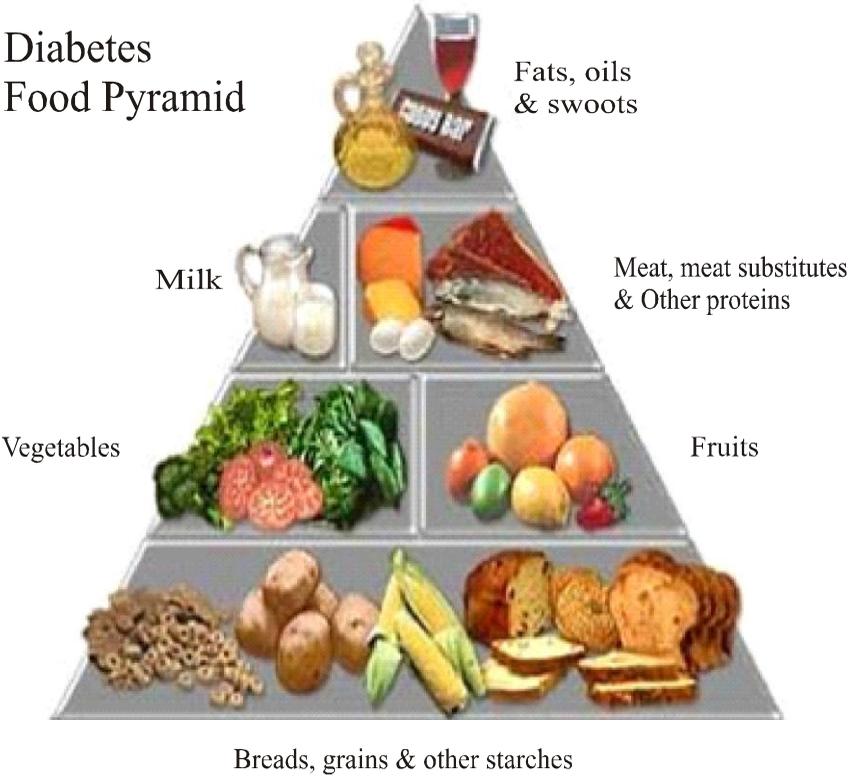


Fig. 19: Diabetes Food Pyramid

Carbohydrate: Carbohydrates should make up 45 - 55% of the total calories content of the meal.

Total fat: The fat content of the diet should not provide more than 30% of the total calories, preferably distributed into 5% saturated fatty acids, 15% monounsaturated fatty acids, and 10% polyunsaturated fatty acids.

Cholesterol: The total cholesterol in all the meals consumed in a single day should not be more than 300 mg.

Protein: Protein should provide not more than 15% of the total calories of the diet, and should preferably be derived from plant sources and/or lean sources of animal protein.

Sodium chloride (salt): The salt content of all the meals eaten in a single day should not be more than 100 mmol (approximately 5g of salt).

Calcium: The diet should be able to provide 1,000 to 1,500 mg of calcium in a day.

Fiber: The diet should contain a minimum total of 20 to 30g of fibre in the meals consumed per day.

Glycaemic Index (GI) and the Glycaemic Load (GL) of foods: The Glycaemic Index is a measure of the quality of carbohydrates contained in the food, while the Glycaemic Load is a measure of both the quality and the quantity of carbohydrates in the meal (*consult the book titled: Dietary Management of Diabetes 2014.*)

Diet is individualized and depending on your age, weight, occupation, food habits etc., your physician will prescribe your daily calorie requirement while the dietician prepares the meal plan.

Physical Activity for Better Diabetes Control

In diabetes, you must increase your physical activity to give yourself every chance to live a long and healthy life.

Increased physical activity is recommended for every diabetic patient and various studies have found it to be very effective (Chinenye et al. Diabetes Advocacy and Care in Nigeria 2014)

Physical activity is defined as any bodily movement produced by muscles that result in energy expenditure which can be measured, usually in kilocalories (Casperon et al 1985).

Physical activity in daily life is categorized into occupational, sports, conditioning, household or other activities.

Exercise is defined as a subset of physical activity that is planned, structured and repetitive and has a final or an intermediate health or

skill-related objective. Thus in exercise, the bodily movements are planned, structured, repetitive and with a health or skill-related objective.

However, physical activity and exercise are often used interchangeably. Physical Activities (Exercises) are generally grouped into three categories: -

- Aerobic exercises such as walking, cycling, jogging, running, hiking, playing tennis etc. These have beneficial Diabetes and cardiovascular effects.
- Anaerobic or Resistance exercise such as weight training. These increase short-term muscle strength.
- Flexibility exercises such as stretching. These improve range of motion of muscles and the joints.

Health Benefits of Physical Activity

1. It improves the sensitivity of the cells of the body to insulin
2. Physical activity improves the body's metabolism – it is medicinal
3. It works to improve the body's lipid profile/cholesterol
4. Physical activity improves cardio-respiratory health through its effects on the lungs and heart
5. Improves musculoskeletal health, through increased metabolism and greater use of the bones, muscles and joints of the body.

Physical Activity Prescription for the Control of Diabetes

A minimum of 150 minutes of moderate to vigorous intensity aerobic exercise each week, spread over at least 3 days of the week, with no more than 2 consecutive days without exercise!

Diabetes Physical Activity Poem

Physical Activity improves Diabetes Health

*Every little bit counts, but more is
even better – everyone can do it!*

Get active your own way...

Build physical activity into your daily life

...at home

...at school

...at work

...at play

...on the way

That's Active Living!!!

POLICY AND STRATEGIES TO ACHIEVE DIABETES CARE IN NIGERIA

Challenges to Diabetes Care in Nigeria

Most diabetes care in Nigeria is done by primary care providers. Less than 20% of Nigerians living with diabetes ever see an endocrinologist (core diabetes specialist) and there are not enough endocrinologists to handle the ever increasing number of people with diabetes in Nigeria.

The vast majority of diabetes management should still be, in the hands of Primary care physicians who must strive to update their knowledge and skill. One may ask, what is the current state of diabetes care and why should we worry about doing better?

The sad fact is that health care providers – government in particular and primary care providers – are not managing diabetes as well as it should be!!!

The Nigerian Diabcare Study (2008) put the average Haemoglobin A1c (HbA1c) of Nigerians living with diabetes at 8.3% which is clearly unacceptable! Diabetes remains an enormous contributor to heart-related disorders, as well as the most common cause of working-age blindness, end-stage-kidney disease and limb amputations.

It is especially alarming that the grim statistics remain despite incontrovertible evidence that overall diabetes management matters – not just blood glucose control alone.

It is imperative to think beyond the day-to-day treatment options and adjustments and consider our entire healthcare system and how best to deliver especially primary care to Nigerians living with Diabetes (*Chinenye et al. Diabetes Advocacy and Care in Nigeria 2014*).

The tools needed for good diabetes care are affordable as long as there is **political will** and adopting the right model for implementation is

worth the effort (*Chinenye et al. Diabetes and related diseases in Nigeria: Need for improved primary care in rural communities 2014*). The assessment tools available for diabetes care are accurate and easy to use even at the primary level.

In Nigeria, a functional National Health Insurance Scheme (NHIS) is essential to the proper delivery of primary care to people living with diabetes; thus the current dysfunctional NHIS with poor coverage needs serious overhauling.

High out-of-pocket expenses and lack of access to quality healthcare, drugs and facilities are critical barriers confronting diabetes and other Non-communicable Diseases (NCDs) care in Nigeria.

Current Facilities in Nigeria that provide Diabetes Care

1. Primary Health Centres (PHCs): At the Local Government Areas where there is virtually no diabetes care initiative. These PHCs mainly carry out immunizations, treat malaria etc. They lack capacity to manage diabetes; thus there is poor detection rate and ineffective referral.

There is a compelling need to integrate diabetes care into our existing PHCs because $\approx 60\%$ of our populace who live in rural areas patronize PHC services. (*Chinenye et al. Diabetes and related Diseases in Nigeria: Need for improved primary care in rural communities 2014*)

2. Secondary Health Care Facilities: These include General Hospitals and private medical centres. There is diabetes care in some of them, but capacity is inadequate; thus they mainly refer at a late stage.
3. Tertiary Health Care Facilities: These include Teaching Hospitals, Federal Medical Centres and Specialist Hospitals. Most of these centres run diabetes clinic which are usually overwhelmed by a large number of diabetic patients.

Objectives of Proposed Diabetes Primary Care Model

1. To enable effective opportunistic screening for diabetes (≥ 40 yrs, overweight/obese)
2. Diagnosis, treatment and follow-up for patients with Diabetes and related NCDs.
3. Prevent and/or identify complications early.
4. When to refer patients to a specialist/tertiary centre.
5. Referral back to the nearest PHC for follow-up care for non-complex cases.
6. Education of patients about lifestyle measures and specific treatment so that individuals can take responsibility for their own care in collaboration with health professionals.
7. Usage at the:
 - Primary Health Centre
 - Out-patient clinics of secondary health facilities
 - Private Clinics

Proposed Diabetes Care Model

This model has four parts as follows:

1. Consultation: This involves assessing and investigating the patient, treating or referring them where necessary and completing a register and treatment card.
2. Lifestyle Education: This involves diabetes specific education, support for medication adherence and setting up a treatment plan (on the 1st consultation).
3. Follow-up: This involves assessing the patient at a follow-up appointment, 1-3 month intervals and addressing their concerns and questions.
4. Counselling: This can be done by the doctor and then with a health educator/counsellor if available.
Counselling can occur less frequently after a few consultations.

Primary Diabetes Clinic Model

Most of the burden of diabetes fall close to people's homes at primary care level and appropriate health programmes for delivering care to people living with diabetes in this situation are required.

A few basic principles will guide this primary diabetes clinic model (Chinenye et al. Diabetes and related diseases in Nigeria: Need for improved primary care in rural communities 2014):

1. The primary care model should be appropriate to the local situation and resources.
2. Well supported decentralization of human and physical resources is a priority in order to improve access to healthcare and sustain uptake of long term treatment.
3. Clear guidelines and protocols for diagnosis, risk-factor assessment and management should be developed and adopted.
4. Diagnosis, treatment and education can be delivered to the patient either by professional health staff at a clinic or, once the condition is stable, continued via community or village health workers.
5. Diagnosis and initial stabilisation of the patient requires the input of trained staff especially medical officers and nurses.
6. A dedicated diabetes clinic improves the introduction and standardised use of protocols, increases the exposure of patients to appropriate health information, and aids routine drug ordering.
7. Protocols for diagnosis, management, assessment of complications and clear indications for referral should be developed.
8. This clinic will not function optimally in isolation from other healthcare services. Eventually it needs to be clearly and firmly placed within the national healthcare system and linked horizontally and vertically within the primary healthcare (PHC) programme.
9. Many Local Government Areas (LGAs) in Nigeria do not yet have a strong diabetes care initiative, but do manage PHC services, and it will be more feasible to focus on integrating the diabetes clinic within these PHC services.
10. Where medical officers are lacking, the primary diabetes clinic should be nurse-led with back-up as available from medical officers.
11. Health workers in PHC and their colleagues in referral institutions should be trained together in the clinic's functioning and protocol usage. This will enhance cooperation and standardisation of care for people with diabetes.

12. One area key to the good functioning of this clinic model is drug supply to the clinics and also to the village health personnel. Nothing discourages a patient faster from taking treatment than not finding it available!
13. The shorter the list of medications and the cheaper or more commonly available they are, the more likely ordering is to be timely and successful. This means staying within the Nigerian essential diabetes medicines' list and limiting the number of drugs in each protocol. Although this may not give the flexibility of management some clinicians would wish for, it will at least ensure an acceptable base-line of treatment options.

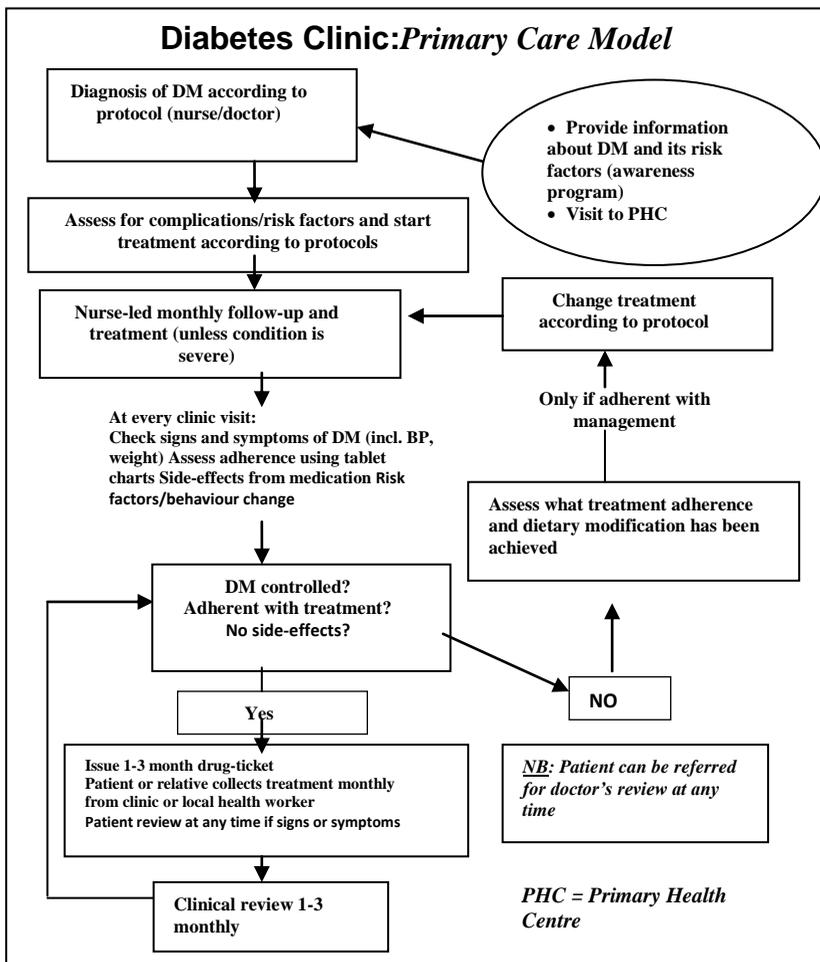


Fig. 20: Primary Care Diabetes Model

So what further can be done to help the primary care providers succeed in caring for patients with diabetes in Nigeria?

The Diabetes Association of Nigeria [DAN] is committed to being the most accessible and reliable source of information about diabetes in Nigeria.

First, there is www.diabetesnigeria.org, the DAN website, offering easy access to information and useful references for healthcare professionals.

Another extremely helpful source of information is the DAN's Clinical Practice Guidelines for Diabetes Management in Nigeria which is regularly updated.

The Association also offers many professional workshops for diabetes care providers.

Because good diabetes care depends on a good patient self-care, Nigerians living with diabetes must know a great deal about their own condition and its management in order to achieve the goals.

DAN offers a number of books, publications and other information resources for people with diabetes as well as information in culturally appropriate formats for some ethnic groups – Ibo, Hausa, Yoruba etc.

Diabetes Association of Nigeria (DAN) as a strong and credible member of International Diabetes Federation (IDF) that works closely with World Health has international goodwill. This goodwill can be harnessed by Nigerian government to expand and strengthen our healthcare as part of our march towards achieving Universal Health Coverage (UHC).

Country ownership and developing the capacity to create better and stronger health system should be our main focus.

WAYS TO SUPPORT NIGERIANS LIVING WITH DIABETES

You can do a lot to support your friend, relative or spouse as they manage their diabetes.

Encourage them. It is challenging to be afflicted with diabetes.

Treatment is life-long, thus support is essential.

1. You will need to learn the symptoms of low blood sugar (hypoglycaemia) and high blood sugar (hyperglycaemia) and what to do about them.

2. Experts agree that nearly all diabetic patients should be on cholesterol-lowering drugs in addition to their main anti-diabetic drugs (to prevent heart disease)
3. Remind them to check their blood sugar levels on time using glucose meters
4. Offer to keep a record of their symptoms or other concerns and agree to accompany them discuss about it with their doctor.
5. Together plan how to handle a diabetes-related emergency or complications.
6. Support them in making good food choices and prepare healthy food together.
7. Go with them to a diabetes support group meetings e.g. DAN.
8. Help manage medications:
 - People with diabetes need to take their medicines as prescribed
 - Sometimes, they may need a little help with that.
 - Make sure the person is able to self-administer the medications
 - Keep all their diabetes supplies in a convenient place.
9. Make Diabetes Health Services available, affordable and accessible

PREVENTION OF DIABETES

Preventive measures can be applied at any stage along the spectrum of diabetes health with the goal of preventing development or further progression of diabetes.

Primordial prevention: This consists of actions to minimize hazards to health, inhibit the establishment of factors (environmental, economic, social, behavioural, cultural) known to increase the risk of diabetes. It addresses broad health determinants rather than preventing personal exposure to risk factors. In other words, primordial prevention deals with prevention of development of risk factors.

Examples include:

- Establishing healthy communities.
- Promoting a healthy lifestyle in childhood.
- Prenatal nutrition programs.
- Subsidizing fitness programmes at the sports centre
- Increasing sports programmes in schools which may help reduce obesity in the subsequent generations.

Primary Prevention

This seeks to prevent the biologic onset of diabetes via risk reduction by altering behaviours or lifestyles that can lead to diabetes.

Examples include obesity reduction, increased physical activity, avoiding unhealthy diet, smoking cessation etc.

Essentially, primary prevention is concerned with interventions designed to modify adverse levels of risk factors once they are present with the goal of preventing an initial development of diabetes.

The ultimate goal is to increase the number of years that people can enjoy quality life and compress the time that people experience diabetes and disability.

Secondary Prevention

This includes procedures that detect and treat pre-clinical diabetes and thereby control disease progression. Screening procedures are often the first step, leading to early interventions that are more cost-effective than intervening once symptoms appear. Diabetes has a pre-clinical phase that is not benign.

Examples – routine blood sugar testing for people over 35 years to detect type 2 DM at the level of doctor-patient encounters or via public health screening programs.

Tertiary Prevention

This seeks to soften the impact of diabetes on the patient's function, longevity and quality of life.

Examples include: prosthetic rehabilitation after amputation, eye examinations to check for possible adverse outcomes of diabetes. Tertiary prevention assists the patient to accommodate his/her disability.

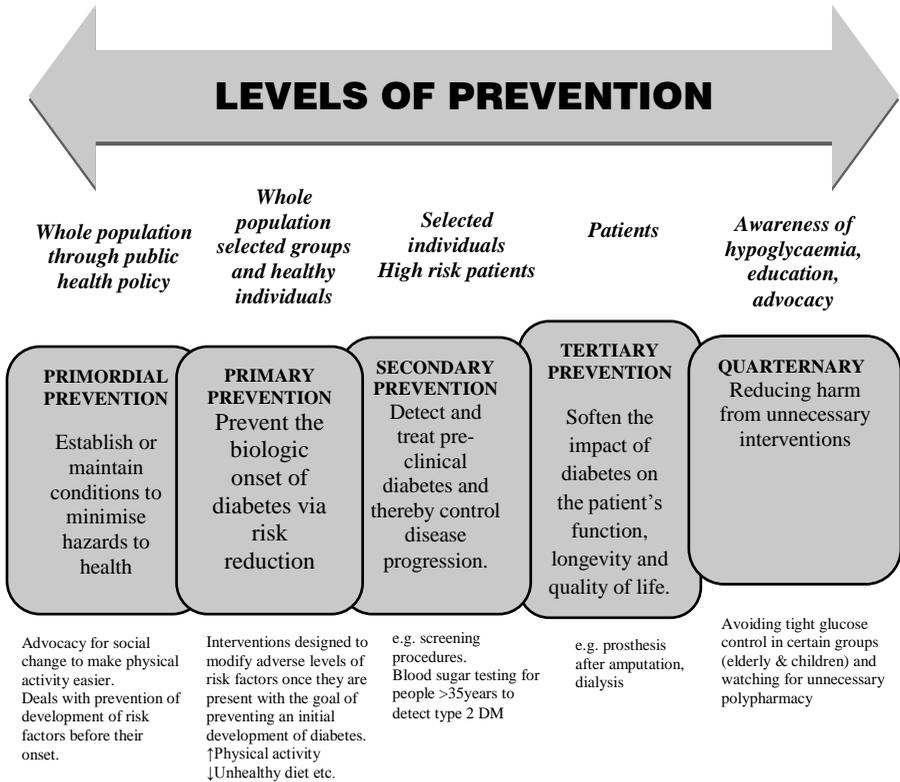


Fig. 21: Levels of Diabetes Prevention

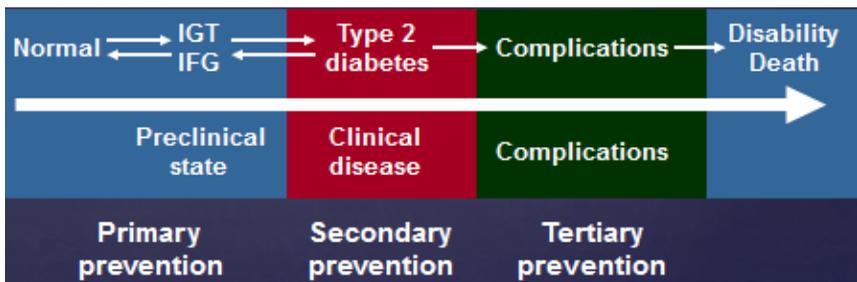


Fig. 22: Stages of Diabetes Prevention

Pre-diabetes

Definition: This is the “grey-area” in the march towards development of diabetes whereby the blood sugar is higher than the upper limit of normal but not high enough as to be classified as full blown diabetes.

Those with pre-diabetes are at increased risk of developing type 2 diabetes within a decade unless they adopt a healthier lifestyle that includes weight loss and increased physical activity.

Getting diagnosed with pre-diabetes is a serious wake-up call but it doesn't mean one will definitely develop diabetes.

There is still time to turn things around. It is an opportunity to initiate lifestyle changes or treatments and potentially retard progression to diabetes or even prevent it.

The following changes in one's daily habit are a good way to start preventing diabetes, namely:

1. Move more (life is movement)!!!

Becoming more active is one of the best things we can do to make diabetes less likely. Physical activity is an essential part of the treatment plan for pre-diabetes because it lowers blood glucose levels and decreases body fat.

Ideally, one should exercise at least 30 minutes a day, five days a week. Let your doctor know about your exercise plans and ask if you have any limitations.

2. Weight reduction.

Even 5-7% weight loss can make a significant difference.

3. See your doctor often for review

- Patients like some tangible evidence of success or failure

4. Eat healthy foods

- Load up on vegetables especially less starchy types

- Add more high-fibre foods into your daily menu

- Enjoy fruits in moderation: 1-3 servings per day

- Choose whole grain foods instead of processed grains e.g. brown rice instead of white rice

5. Make sleep a priority

- Not getting enough sleep regularly makes weight loss harder

- A sleep short-fall makes it harder for the body to use insulin effectively, thereby enhancing probability of developing diabetes
 - Set good sleep habit
 - Avoid caffeine after lunch if you have difficulty sleeping
 - Don't watch TV or use your PC or smartphone when you are trying to fall asleep
6. Get support
- Join gym clubs
 - Join Diabetes Association
7. Choose and Commit
- Having the right mind-set can help
 - Accept that you won't do things perfectly everyday but pledge to do your best most of the time
 - Make a conscious choice to be consistent with everyday activities that are in the best interest of your health.
 - Make small changes overtime

MILESTONES IN DIABETES RESEARCH AND POTENTIAL FOR CURE

“Taking time to look back is a foundation on course to build a stable future” – Unarine Ramaru (South African writer).

- 1. Discovery and characterization of Islet cells** by Paul Langerhans in 1869 in Germany.
- 2. Discovery of insulin** in 1921 by Fredrick Banting, James Macleod, Charles Best and James Collip in University of Toronto, Canada.
- 3. April 2007: New type 2 diabetes genes identified.**
This discovery dramatically boosted scientists' understanding of risk factors for diabetes. Since then, researchers have spotted more than 70 gene variants that raise diabetes risk by up to 30% (WebMD 2015: www.m.webmed.com). Most of these affect the release of insulin, the hormone that controls blood sugar levels.

4. Pancreas transplantation

- An organ donor's pancreas is transplanted into someone with diabetes.
- In some patients, a pancreas transplant cures diabetes.

5. Islet cell Transplantation

- Insulin-producing cells are harvested from an organ donor's pancreas and transplanted into someone with type 1 diabetes.
- This is still an experimental treatment but can potentially cure type 1 diabetes.

6. Herbal (Alternative) treatment

There are lots of herbal agents claimed to control and treat diabetic patients, but total cure from diabetes has not been reported or confirmed till date using Herbs.

In addition to side-effects (adverse effects), drug treatment have limitations in maintaining normal blood sugar and preventing late stage diabetic complications.

Several medicinal plants have been investigated for their beneficial effects in different types of diabetes e.g. *vernonia amygdalina* (Bitter leaf), *Galega officinalis* (Goat's rue or botanical root of metformin) etc. Over 800 plants have been reported to have anti diabetic properties but none has sustainable effects and currently are not useful in lowering the blood sugar to the optimal extent as insulin and other proven anti-diabetic drugs (Chinenye et al, Diabetes Advocacy and Care in Nigeria: Herbal medicine as potential source for anti-diabetic drugs 2014).

Chemical constituents of Anti-Diabetic Herbs

These are (Gupta et al 2012):

1. Sesquiterpene (Bitters)
2. Mormordicin
3. Lectin
4. Glycosides
5. Terpenoids
6. Cytotoxic momorcharin and momordin
7. Beta-carotene
8. Flavonoids (apigenin)
9. Taraxacin

10. Alkaloids e.g. lutein, luteoline, galegine.
11. Galegine study ultimately led to discovery of metformin (Glucophage) in the 1950s.
12. Anthocyanoside (myrtillin)

Plants have always been an important source for finding new medicines for human diseases. Among the hundreds of plants that have been tested for diabetes, only small fractions have been tested in animal studies and no phase 4 or 5 Human Studies.

Although an array of plants have been claimed to have blood sugar lowering effects, it is better to allow science guide us i.e until scientific evidence are available to support their anti-diabetic effects devoid of toxicity.

Proposed Recommendation before Diabetes Association of Nigeria:

“If there is proven clinical evidence for anti-diabetic effects of Nigerian Herbs, should physicians rely on these herbs, at least as complementary therapeutic agents, along with current orthodox anti-diabetic drugs to improve management of diabetic patients”? (Oputa RN, Chinenye S. Diabetes in Nigeria – a translational medicine approach 2015)

Isolation and identification of active constituents from Nigerian herbs, preparation of standardized dose and dosage regimen can play a significant role in improving Diabetes management (Chinenye S, Abo K, Suleiman M. Chike P, Siminialayi IM. Anti-diabetic Research Using African Medicinal Plants - work in progress)

7. Bariatric Surgery versus Cure for Diabetes

Despite what experts are calling remarkable results, they are not saying weight loss surgery is a cure.

Bariatric surgery is not for everyone with diabetes. The patients must be selected by the physicians.

Remission is said to occur when a person with type 2 diabetes achieves blood sugar levels no longer in the diabetes range without medications for at least 1 year.

Bariatric Surgery: Pros and Cons

- i. The surgery works if post-surgery clients still practise lifestyle changes such as healthier diet and exercise.
- ii. Even after substantial weight loss, diabetes does not remit if diabetes duration is more than 4 years.
 - a. Cells in the pancreas called the beta cells that make insulin die off over time and cannot be replaced.
 - b. If a large chunk of the beta cell population has been lost, benefit from bariatric surgery cannot be guaranteed.
- iii. The average cost of weight loss surgery ranges from \$11,500 - \$26,500 which makes it expensive.
- iv. Three procedures are common:
 - Bypass
 - Gastric sleeve
 - Gastric band
- v. Side-effects of bariatric surgery are weight regain, malnutrition, nausea, bloating, vomiting, gall stones and lack of certain vitamins e.g. B₁₂

Indications for Bariatric Surgery in Type 2 DM

- (a) BMI $\geq 35\text{kg/m}^2$
- (b) Failure to lose weight by traditional methods.
- (c) Had diabetes for less than 4 years
- (d) Failed medical treatment. Not recommended as 1st line treatment.

8. June 2014: First Artificial [Bionic] Pancreas developed: Scientists made a bionic pancreas that tracks blood sugar levels and automatically pumps the correct amount of insulin and glucagon into the blood. By mimicking the action of a real pancreas, the device can help people with type 1 diabetes avoid constant blood sugar monitoring and manual insulin injections.

Developed by a collaborative team from Boston University and Massachusetts General Hospital, working together to make automated blood glucose control a reality.

Bionic pancreas system uses continuous glucose monitoring along with subcutaneous delivery of both rapid-acting insulin (to lower blood glucose) and glucagon (to raise blood sugar) as directed by a computer algorithm.

The bionic pancreas automatically makes a new decision about insulin and glucagon dosing every five minutes – that is 288 decisions per day, 7 days per week and 365 days per year.



Fig. 23: Components of Artificial (Bionic) Pancreas (Source: www.bing.com/images)

9. Stem Cell Research and Cure for Diabetes

Harvard University Stem Cell researchers have produced massive quantities of Human-insulin-producing beta cells (Diabetes Voice, Dec 2014). These Stem Cells cured diabetes when transplanted in mice within two weeks. This is acclaimed to be 50% of the solution to the problem facing people living with Type 1 diabetes today.

The other remaining half of the solution involves developing an implantable device to install and protect the beta cells from rejection by the immune system of the recipient. Currently, the Harvard group and MIT department of Applied Biology are working to design an implantable device (William R. et al. Diabetes Voice 2014).

Should a cure be our primary target for diabetes?

Based on basic and clinical facts about diabetes, when “cure” comes (**and it surely will**), it is likely to be multiple:

- Different cures for type 1, type 2 etc.
- Perhaps different cures for diabetes at different stages.

The only thing of which we can be reasonably certain is that there will not be just one cure which will be effective for all. Diabetes is not a single disease but is a clinical syndrome that includes multiple diseases that have different aetiologies (causes), pathogeneses and rates of progression, thus may require different therapeutic approaches.

This is the inarguable state of affairs in Diabetes Research.

Acceptance of this fact will greatly save our patients and influence the prioritization of **life transformative treatments** that hold the potential to profoundly transform and improve life with diabetes.

Instead of an imaginary and unconfirmed claim from **alternative care providers**, it may be the case that something short of a “cure” is what patients need for now!!!

While the concept of a cure is motivating, I believe the claim of an ‘unproven cure’ by **alternative care providers including herbalists** derail and distract our patients from seeking scientific treatment advances that reduce the burden of diabetes, improve health outcomes and ultimately restore physiology.

The right question to ask may be:

- What does the person living with diabetes consider as Favourable or successful treatment?
- Is it a permanent restoration of normal physiology that a person with diabetes wants or is it a safe, easy and cost-effective way to eliminate the symptoms of diabetes and its complications?

The former will take many decades to achieve but the latter is achievable through a variety of treatment approaches that are already being accomplished.

As a general rule, any discoveries happening in academia should be thought of at least 10-20 years away from any opportunity for broad clinical application. (Brewer J et al. 2014)

While we continue to pursue the appealing concept of cure for diabetes, we should not lose touch with reality by committing to what is possible now!!!

Take Home Message

Until there is a scientifically confirmed cure, use the latest and the best proven therapy in diabetes care!!!

SUMMARY OF MY ACADEMIC/PROFESSIONAL CONTRIBUTIONS

(A) Research

My research interests have focused on areas of Endocrinology & Metabolism mainly (Diabetes Mellitus, Thyroid Diseases, Dyslipidaemia) and HIV/AIDS. Papers from these have been presented and published in local, national and international journals of repute including *Gut*, *Scandinavian Journal of Gastroenterology*, *Ethnicity & Disease*, *Vascular Health and Risk Management Journal*, *Archives of Diabetology and Cardiovascular Medicine*, *Pakistan Journal of Medical Sciences*, *Mera Diabetes International*, *Journal Sexual Medicine*, *Journal of the College of Physicians and Surgeons Pakistan*, *International Archives of Medicine*, *Nigerian Medical Practitioner*, *Indian Journal of Endocrinology & Metabolism*, *The Nigerian Health Journal*, *Port Harcourt Medical Journal*, *Journal of Social Health and Diabetes*, *Nigerian Journal of Orthopaedics & Trauma*, *BMC Endocrine Disorders*, *Nigerian Endocrine Practice* etc.

I have published over 40 Researched articles in peer-reviewed journals within and outside Nigeria.

Along with senior colleagues in the department, we have motivated the younger physicians to do research. Some of our efforts have culminated in the completion of training of these young physicians who are now lecturers either in UNIPORT or other tertiary institutions in Nigeria.

I am a principal author in 6 (Six) and a co-author in 3 (three) books namely;

1. National Clinical Practice Guidelines for Diabetes Management in Nigeria (principal author, *maiden edition*).
2. Living with Diabetes in Nigeria (co-author, *A Practical Manual of Diabetes Care*).
3. HIV&AIDS: The Niger-Delta Perspective (principal author).
4. Challenges Associated with the Effective Management of HIV infection in a Low income Setting in Sub-Saharan Africa: Case Study of Nigeria (co-author).

5. Lecture Notes & Essays in Internal Medicine with Multiple Choice Questions (principal author, Volume I).
6. Lecture Notes & Essays in Internal Medicine with Multiple Choice Questions (principal author, Volume II).
7. Clinical Practice Guidelines for Diabetes Management in Nigeria (principal author, 2nd edition)
8. Diabetes Advocacy and Care in Nigeria (principal editor).
9. Dietary Management of Diabetes in Nigeria (co-author).

(B) Medical Education:

From my early years as lecturer I up to the current professorial chair, I have actively participated in medical education, teaching both undergraduate students and postgraduate doctors. I have participated actively in organizing national medical conferences. My efforts in the Endocrinology unit along with those of my colleagues have been rewarded with the training of consultant Endocrinologists with a number of senior residents now undergoing subspecialty specialization in Endocrinology & Metabolism. In recognition of my outstanding contributions in the manpower training I have received several awards from Resident doctors and other professional societies.

(C) University/Professional/Community Activities:

I am a reviewer of a number of medical journals which include the *African Journal of Endocrinology & Metabolism*, *Archives of Diabetology & Cardiovascular Medicine*, *The Nigerian Health Journal*, *Nigerian Endocrine Practice* etc. I am an external examiner in medicine in some Nigerian Universities as well as the West African College of Physicians.

In 2006, I linked the University of Port Harcourt Advancement Centre (currently called Uniport Foundation) with Lund University in Sweden. Two (2) lecturers from our college benefited from that program. I had earlier received training and done a collaborative research with Lund University Hospital, Sweden.

- I led the medical team of the FGN pilgrims to the Holy Land (Jerusalem) in December 2003.

- An active member of the College Building Committee that submitted architectural blueprint and raising fund for a befitting college building.
- Contributed in developing the current MPH programme in community medicine.
- Was acting Head of Department (HOD), Internal Medicine, from 2009 – 2012 and created more specialty units in department of medicine.
- Elected National President of Diabetes Association of Nigeria in 2009 and under my leadership produced the 1st Edition of NATIONAL CLINICAL PRACTICE GUIDELINES FOR DIABETES MANAGEMENT IN NIGERIA. It was an award winning publication during the World Diabetes Congress in Dubai, UAE 2011, following assessment by an International Committee of International Diabetes Federation/World Health Organization (IDF/WHO)
- Currently initiated linkage between Uniport and Manchester University, UK for Research collaboration. The Manchester Group visited the University of Port Harcourt recently.
- Has designed, executed and published studies with colleagues in the college as well as colleagues at the national level to determine, evaluate and improve Diabetes Care in Nigeria.
- Coordinates the HIV/AIDS programme in UPTH and published a monograph on HIV/AIDS treatment with its peculiarities in the Niger Delta Region, which is currently used for training.
- Set up Non-communicable Diseases Research Group in the Department of Medicine, College of Health Sciences with academic colleagues.
- We are currently working on Grant Proposals.
- Currently Nigerian representative in International Diabetes Federation (IDF - based in Brussels) by virtue of being the President, Diabetes Association of Nigeria.

CONCLUDING REMARKS

Recommendations towards Diabetes Care & Support in Nigeria

(A) To Nigerians Living with Diabetes

- Be positive and live positively with diabetes.
- Get the right information about diabetes and its management
- Always adhere to the recommendations given by qualified and well trained healthcare providers.
- Take your drugs as prescribed
- Comply with appointments with your care givers
- Abide by the recommendations with regards to lifestyle:
 - Diet
 - Exercise
 - Cessation of smoking
 - Intake of alcohol
- Monitor relevant parameters like:
 - Glucose (HBA1c; Fasting and 2 Hrs post meal glucose)
 - Blood Pressure
 - Cholesterol
 - BMI, Waist Circumference, waist to hip ratio
- Perform regular checks on your:
 - Feet
 - Eyes
 - Kidneys
 - Etc.

(B) To the Care-givers:

- Be empathic to the patients not judgmental.
- Treat them holistically i.e.: treat not just blood sugar but also BP, Lipids, etc.
- Take into serious consideration their psychosocial needs and factor them in the overall care plan
- Above all make yourself available and accessible to the PLWD
 - Provide them with your contacts numbers so that you can be reached in case of emergency or need to clarify some issues.

- Do not see the PLWD as “pests” but as people you have been trained to provide care for.
- Update yourself with current trends in the management of diabetes so that the quality of care you give to PLWD will be appropriate & adequate.

(C) To the Government:

- Develop and implement a policy towards Diabetes Care in Nigeria
- The policy should be aimed at meeting the yearning needs of PLWD and ensure that they are adequately catered for by:
 - Ensuring that relevant diabetes care products especially drugs are free of charge or at least subsidized
 - Ensuring that insulin is given free of charge to ALL PLWD as done in many other countries.
 - Ensuring that the National Health Insurance provides sufficient cover for all round diabetes management.
- Government should provide diabetes centers of excellence across the country where PLWD could go to for world class care.

(D) To Non-Governmental Organizations

The NGOs should:

- Form a strong pressure group to push government towards developing and implementing a diabetes care policy for the country.
- Should be actively involved in the development of such policies and also ensure that the policies once developed are appropriately implemented.
- Should serve as a rallying point for all PLWD in Nigeria and they should at all-time defend their interest.
- Should discard the cloak of self-centeredness and replace it with the cloak of selflessness and service to humanity.

(E) To Corporate Organizations:

(e.g. pharmaceutical companies, Foundations etc.)

- They should devote a portion of their earnings towards helping the course of diabetes care in Nigeria. This could be a part of their Corporate Social Responsibility.
- They should set foundations with a bias towards diabetes care.

- They should actively be involved in sponsoring diabetes related activities like DAN conferences, Endocrine Society conferences and other diabetes related seminars in Nigeria.

DIABETES EPILOGUE

*Diabetes is not a death sentence
I still have the opportunity to live a long and healthy life
The life ahead may be Hard and Difficult
But I will face it with courage and dedication
To ensure that diabetes does not subtract even a month from my life
I will do all that is required
To live long and healthy, inspite of the disease
I will do it for myself & for my loved ones
I must fight to remain alive and healthy,
To achieve my life ambitions, and
To continue to be a blessing to All
So help me God!!!*

(Culled from the Book: 101 Ways to live a long and healthy life with Diabetes Mellitus)

References

- 1) Wilson JD. The Evolution of Endocrinology. Plenary Lecture at the 12th International Congress of Endocrinology, Lisbon, Portugal, 31st August 2004. *ClinEndocrinol.* 2005;62(4): 389-396.
- 2) Brown-Séquard CE. Du role physiologique et therapeutique d'un suc extrait de testicules d'animaux d'apres nombres de faits observe chez l'homme. *Archives de Physiologie Normale et Pathologiques* 1889; (*5^{ser}*) : **1739–1746**.
- 3) Starling EH. The chemical regulation of the secretory process (Croonian Lecture to the Royal Society). *Proceedings of the Royal Society* 1904; **73B: 310–322**.
- 4) Jameson JL (ed). Principles of Endocrinology. In: Harrison's Endocrinology (3rd edition). New York, McGraw Hill 2012.
- 5) IDF Diabetes Atlas. 6th Edition. International Diabetes Federation, 2013. Available at: <http://www.idf.org/diabetesatlas>
- 6) World Health Organization (WHO). Definition, Classification and Diagnosis of Diabetes. Geneva, WHO 1999 & 2006.
- 7) **Chinenye S**, Phillip-Ephraim EE, Young EE. Lecture Notes & Essays in Internal Medicine with Multiple Choice Questions & explanatory answers (Volume I: Endocrinology, Diabetology & Metabolism) Port Harcourt, Nigeria: University of Port Harcourt Press; 2013.
- 8) **Chinenye S.**, Onyemelukwe GC, Johnson TO et al. Diabetes Advocacy and Care in Nigeria. Port Harcourt, Nigeria: Diabetes Association of Nigeria; 2014.
- 9) **Chinenye S**, Ofoegbu EN, Onyemelukwe GC et al. Clinical Practice Guidelines for Diabetes Management in Nigeria (2nd edition). Port Harcourt, Nigeria: Diabetes Association of Nigeria 2013.
- 10) Ogbera AO, Fasanmade O, **Chinenye S**, Onyekwere C. Characterization of Newly Registered Patients with Diabetes Mellitus in an out Patient Facility in Nigeria. *Nigerian Endocrine Practice* 2007; **1** (3): 19-28.

- 11) **Chinenye S**, Ogu R, Akhidue K. Diabetes In Pregnancy: The Nigerian Perspectives using the new WHO criteria. *Indian J EndocrMetab* 2014 (in press).
- 12) Institute of Medicine. Living well with chronic illness: A call for Public Health Action. Washington DC20001.National Academy of Sciences 2012.
- 13) Ogbera AO, Fasanmade O, **Chinenye S**, Onyekwere C. Characterization of Newly Registered Patients with Diabetes Mellitus in an out Patient Facility in Nigeria. *Nigerian Endocrine Practice* 2007; 1 (3): 19-28.
- 14) Uloko AE, Gezawa ID, Muhammad FY, Habibu RA, Ramalan MA, Muhammed AA et al. Dysglycaemia among HIV patients on Highly active Anti-retroviral therapy in Kano, North-Western Nigeria. EMSON/2014/019 (BENIN 2014 Conference); 36:pg43.
- 15) Ogbera AO, Kapur A, **Chinenye S**, Fasanmade O, Uloko A, Odeyemi K. Undiagnosed diabetes mellitus in tuberculosis: A Lagos report. *Indian J EndocrMetab* 2014;18:475-9.
- 16) Ogbera AO, **Chinenye S**, Fasanmade AO, Akinlade A. Characterization of Lipid Parameters in Diabetes Mellitus – A Nigerian Report. *International Archives of Medicine* 2009; 2 (1) 2-19 (Doi-10.1186/1755-7682-2-19).
- 17) Ogbera AO, **Chinenye S**, Onyekwere A, Fasanmade O. Prognostic indices of Diabetes Mortality. *Ethnicity & Disease* 2007; 17: 721-725.
- 18) **Chinenye S**, Ogbera AO. Current Concepts in the Management of Diabetes Mellitus. *TNHJ* 2006; 6 (3/4): 383-390.
- 19) IDF Africa Region. Type 2 Diabetes Clinical Practice Guidelines for Sub-Saharan Africa. Tanzania. IDF Africa-WDF 2006.
- 20) **Chinenye S**, Ogbera AO, Kalra S. Patient-centered Care in Diabetology: sub-Saharan African perspective. *AJDM* 2014; 22(1):5-8.
- 21) Funnel MM, Brown TL. National Standards for Diabetes Self-management Education. *Diabetes Care* Jan 2010. doi:10.2337/dc10-S089. Vol 33 No.supplement1 S89-S96.

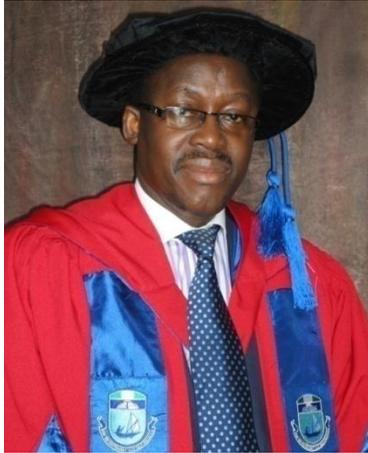
- 22) Norris SL, Lan J, Smith SJ, Schnid CH, Engelgan MM. Self-management education for adults with type 2 diabetes: a meta-analysis on the effect on glycaemic control. *Diabetes Care* 2002, 25:1159-1171.
- 23) World Health Organization (Regional Office for South-East Asia). Self-care in the Context of Primary Health Care. Report of the Regional Consultation Bangkok, Thailand, 7 – 9 January 2009.
- 24) Umeadi M, **Chinenye S**. Dietary Management of Diabetes in Nigeria. Port Harcourt, Nigeria: Diabetes Association of Nigeria; 2014.
- 25) Casperon CJ, Powell KE, Christenson GM. Physical activity, exercise and physical fitness: definitions and distinctions for Health-related Research. *Public Health Rep* 1985; 100:126-131.
- 26) **Chinenye S**. The Current Classification and Diagnostic Criteria for Diabetes Mellitus. *NJM* 2002; **11**(2): 84-86.
- 27) **Chinenye S**, Uchenna DI, Unachukwu CN, Ogbera AO, and Ojule AC. The Pattern of Diabetes Mellitus in Rivers State, Nigeria. *Nigerian Endocrine Practice* 2008; 2 (2) 87-93.
- 28) **Chinenye S**, Uloko AE, Ogbera AO et al. Profile of Nigerians with diabetes mellitus – Diabcare Nigeria study group (2008): Results of a multicenter study. *Indian J EnocrMetab*2012; 16:558-64.
- 29) Ekere AU, **Chinenye S**, Dodiya-Manuel A. The Diabetic Foot – A Review. *Nigeria Journal of Orthopaedics and Trauma*. 2003; 2(1): 4-10.
- 30) Unachukwu C, Babatunde S; **Chinenye S** Peripheral Neuropathy in Diabetics with Foot Ulcers in Port Harcourt, Nigeria. *Nigerian Journal of Orthopaedics and Trauma* 2004; 3(2):214-224.
- 31) **Chinenye S**, Young EE, Onwuchekwa AC. Diabetes Mellitus in the elderly-Niger Delta Experience. *Arch Diab& Cardio Med*; 2012 March issue: 7-11.
- 32) **Chinenye S**, Ogbera AO. Socio-cultural aspects of diabetes mellitus in Nigeria. *Journal of Social Health and Diabetes* 2013; 1(1): 15-20.

- 33) **Chinenye S**, Oputa RN, Oko-Jaja RI. Diabetes and related diseases in Nigeria: Need for improved primary care in rural communities. *Res. J. of Health Sci* 2014; 2(2):99-107.
- 34) Gupta PD, De A. Diabetes mellitus and its Herbal Treatment. *International Journal of Research in Pharmaceutical and Biomedical Science* 2012;3(2):706-721 (www.ijrpbsonline.com).
- 35) Oputa RN, **Chinenye S**. Diabetes in Nigeria – a translational medicine approach. *AJDM* 2015; 23(1):7-10.
- 36) WebMD 2015: www.m.webmed.com.
- 37) William R. Harvard Team gets one step closer to cure. *Diabetes Voice* 2014; 59(4):10.
- 38) Brewer J. Should a cure be our primary target for Type 1 diabetes? *Diabetes Voice* 2014;59(4):22-24.
- 39) **Chinenye S**, Unachukwu CN, Hart A. Diet and Diabetes: Theory and Practice for Care Providers. *Mera Diabetes international* May 2007; **15** (1): 9-11.
- 40) Ogbera AO, **Chinenye S**, Akinlade A. insulin injection Practices in People with Diabetes Mellitus. *African Journal of Endocrinology and Metabolism* 2008; **7** (1) 12-15.
- 41) Unadike BC, **Chinenye S** Knowledge, Awareness, and Impact of Diabetes among Adolescents in Uyo, Nigeria. *Mera Diabetes International* May 2009; 12-14.
- 42) Ogbera AO, **Chinenye S**, Akinlade A, Eregie A, Awobusuyi J. Frequency and Correlates of Sexual Dysfunction in Women with Diabetes Mellitus. *J Sex Med* 2009;6:3401-3406.
- 43) **Chinenye S**, Young E. Management of Diabetes Mellitus in Developing Countries: The Relevance of Postprandial Hyperglycaemia. *Pak J Med Sci* 2011;27(3):677-681
- 44) **Chinenye S**, Young E.- State of Diabetes Care in Nigeria – A Review. *The Nigerian Health Journal* 2011; 11(4):101 – 109

- 45) Ogbera AO, **Chinenye S**, Fasanmade O, Ajala W. Hypogonadism and Subnormal Total Testosterone Levels in Men with Type 2 Diabetes Mellitus. *Journal of the College of Physicians and Surgeons Pakistan* 2011; **21**(9): 517-521.
- 46) Young EE, **Chinenye S**, Unachukwu CN. Beta Cell Response to a mixed meal in Nigerian patients with type 2 diabetes. *BMC Endocrine Disorders* 2012; **12**(11): 1472-6823
- 47) **Chinenye S**, Ogbera AO, Young EE. Prevention and Control of non-communicable diseases in Nigeria: Challenges and strategic directions. *Arch Diab& Cardio Med*; 2012 March issue: 12-20
- 48) Oputa RN, **Chinenye S** Diabetes Mellitus: a global epidemic with potential solutions. *African Journal of Diabetes Medicine* 2012; **20**(2): 33-35
- 49) **Chinenye S**, Young EE. Isolated postprandial hyperglycemia in type 2 diabetic patients in a Nigerian Tertiary Health Center. *Indian J EndocrMetab* 2012; **16**(4): 604-608.
- 50) **Chinenye S**, Young EE. Diabetes Conversation Map in Nigeria: A New socioeducational tool in diabetes care. *Indian J EndocrMetab* 2013; **17**:1009-11.
- 51) **Chinenye S**, Anah CO & Ihekweaba AE. Thyrotoxicosis in the Niger Delta Region – Port Harcourt Experience. *Nigerian Medical Practitioner* 2006; **49**(3): 59-63.
- 52) Ordinioha B, Brisibe S. 101 Ways to Live a Long and Healthy Life with Diabetes Mellitus. Port Harcourt, Nigeria: Preventive and Public Health Consult, 2015.

CITATION

Of



PROFESSOR SUNDAY CHINENYE
MBBS (Ibadan), FWACP, FACE, FNSEM

Sunday Chinenye, a Professor of Medicine and Endocrinology, is a 1987 Bachelor of Medicine and Bachelor of Surgery (MBBS) graduate of the premier University of Ibadan, Ibadan.

He holds the post-graduate fellowship degree of the West African College of Physicians in Internal Medicine and Endocrinology. He is also a fellow of the American College of Endocrinology and Nigerian Society of Endocrinology.

His core research interests are Internal Medicine, Endocrinology, Advocacy and HIV Medicine.

He hails from Akwete-Ndoki, an ancient town of Ndoki Ethnic Nationality, the origin of the popular Akwete cloth, a border town between Rivers and Abia States, bisected by a major river emptying into the Atlantic Ocean and also running through Opobo and Andoni.

Through this major river, Akwete-Ndoki became a major colonial town and famous sea-route through which even the famous King Jaja of Opobo as a slave boy was routed to Igbani land. The relics are there till date. It is often said that the story of Igbani land is not complete without Ndoki and vice versa.

He attended Christ Church School, Akwete-Ndoki and had his secondary education at Ndoki Grammar School, Ndoki. He was nurtured and brought up by his devout Christian parents (all of blessed memory), grew up in his hometown where he was groomed with the ethics and traditions of his people. He embarked upon a highly distinguished medical career at the University of Ibadan in 1981 and finished at a record time in 6 years before proceeding for his post-graduate medical education.

He is an Honorary Consultant Physician/Endocrinologist /Diabetologist; the coordinator of Anti-Retroviral programme in University of Port Harcourt Teaching Hospital; the National President, Diabetes Association of Nigeria; a Royal High Chief of Umuihueze-Akwete ancient kingdom and Justice of Peace.

He was the acting Head, Department of Internal Medicine, University of Port Harcourt from December 2009 – Feb 2012. He has been an associate editor and now a reviewer for several local and international journals. An examiner at the West African Post Graduate Examinations, he has over 40 published articles in local and international journals to his credit in addition to 8 books and Chapter in a book. He has served in several committees and boards in the University.

Prof. Sunny Chinenye is an external examiner in Internal Medicine to various Nigerian Universities. Having practiced the noble medical profession for over 28 years now, Professor Chinenye rose through a series of professional ranks which has made him widely respected and valued for his contributions to academics and public life. He has made sustained and original contributions in several important fields that fundamentally impact upon the quality of life in the society, namely: Academics, Health and Social care, social justice, education and

training. One of those leading roles was and still as the National President of Diabetes Association of Nigeria. He has received acknowledgement from a number of the Nation's eminent public figures familiar with his works coupled with awards and laurels. His selfless determination have touched and immeasurably improved the lives of many people, particularly Nigerians living with diabetes, the vulnerable, the disabled and the disadvantaged.

In addition to giving valuable service to the society, Professor Chinenye has an inspirational vision and sustained expert knowledge. Professor Sunny Chinenye is happily married to a beautiful wife and he is a father of four lovely children. His first daughter just graduated with a 1st class (special Honours) in Computer Science and currently serving the NYSC programme.

Vice-Chancellor Sir, ladies and gentlemen, it is therefore with great pleasure that I present this erudite scholar, Professor Sunday Chinenye to deliver the 126th Inaugural Lecture of the University of Port Harcourt.

Thank you and God Bless!!

Professor IM Siminialayi
Dean, Faculty of Basic Medical Sciences