National diabetes screening programmes

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Introduction

The impact of diabetes mellitus as a global epidemic has recently been recognised by the United Nations. A UN resolution passed in 2007 has set aside the 14th of November every year as World Diabetes Day. The importance of good health policy implementation is well demonstrated by the fact that health issues dominate the eight Millennium Development Goals (MDG) set by the United Nations (UN) to be achieved by the year 2015.

In a period of 10 years (1985–1995) the global prevalence of diabetes increased by 550% (from 30 million to 135 million). The global diabetes epidemic is centered on type 2 diabetes which constitutes more than 90% of all cases. The prevention and control of diabetes should be focused on the control of modifiable risk factors such as obesity, lack of regular exercise, over-refined food products, sedentary lifestyle, and hypertension.

While launching the UN MDG African Steering Group with major development partners, the Secretary General, said, 'We will have time to reach the MDG world-wide and in most, or even all, individual countries – but only if we break with business as usual. We cannot win overnight. Success will require sustained action across the entire decade between now and the deadline. It takes time to train the teachers, nurses, and engineers; to build the roads, schools, and hospitals; to grow the small and large businesses able to create the jobs and income needed. So we must start now. We must more than double global development assistance over the few years. Nothing less will help to achieve the goals.'

It is the resolve of the UN that by the year 2015 the following goals called MDG will be achieved globally:

- eradicate extensive poverty and hunger;
- achieve universal primary education;
- promote gender equality and empower women;
- reduce child mortality;
- improve maternal health;
- combat HIV/AIDS, malaria, and other diseases;
- ensure environmental sustainability;
- develop a global partnership for development.

Although diabetes falls within 'other diseases' without specific mention in the 6th goal, it is important to know that up to 80% of the 200 million people with diabetes globally will die of cardiovascular diseases. This puts diabetes ahead of HIV/AIDS in morbidity and mortality – yet the problem is not as well recognised.[1,2]

The International Diabetes Federation (IDF) and the World Health Organization (WHO) have stressed the need for nations to formulate and implement prevention plans for diabetes.[3,4] This paper proposes an awareness and screening programme that may help fight the scourge of diabetes.

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Epidemiology

The world population figure for 2007 was approximately 6.6 billion. The following countries have as their population:

- China 1 324 112 000
- India 1 334 986 000
- USA 301 899 000
- Indonesia 235 497 000
- Brazil 190 551 000
- Nigeria 135 031 000

In 1985 only 30 million people globally had diabetes, and by 1995 it has risen to 135 million. Current estimates show that 200 million people are affected: 35 million each for China and India; 21 million for USA; and 2.5 million for Vietnam. The Nigerian national prevalence reported in 1997 by an expert committee set by the FMOH (Federal Ministry of Health) was 2.2%.[5] With a current 2.4% prevalence estimate, this means that 3.2 million Nigerians have diabetes. From the past national survey only 20% of these are aware of the presence of the disease. More than 90% of cases in Nigeria are type 2 and this is the predominant type of diabetes all over the world. The diabetes epidemic has been fueled by over-consumption of refined food items, sedentary lifestyle, lack of regular exercise, and excess body weight.

Therefore, the global diabetes epidemic is centered on type 2 diabetes, mostly in the 20–79 year age group. The prevalence world-wide in this age group is about 5.1%. The onset is estimated to begin 4 to 7 years before clinical diagnosis,[6] and because of this 50% go undiagnosed.[7] About 20–30% of type 2 patients present for the first time with complications and this impacts negatively on morbidity and mortality.[8-10] Therefore the need for prevention, early diagnosis, and treatment cannot be overemphasised. The IDF plan for the prevention of type 2 diabetes is based on controlling modifiable risk factors and this can be divided into two groups: people at high risk of developing type 2 diabetes; and the entire population. This means that proper lifestyle changes, targeting individuals at high risk and deploying suitable environmental changes may significantly improve the situation.

Diabetic Action Now

Diabetic Action Now is a joint initiative of WHO and IDF. It is focused on low- and middle-income communities particularly in developing countries. It aims to stimulate and support the adoption of effective measures for the surveillance, prevention, and control of diabetes and to achieve a substantial increase in global awareness about diabetes and its complications. The levels of care approach as developed in the guidelines recommends: standard care; minimal care; and comprehensive care.

The minimal care component could be adopted for local government health facilities, standard care for state health facilities, and comprehensive care for tertiary health facilities. At state level it may be possible to offer comprehensive care if resources are available and the need for such services arise. Nineteen healthcare domains are recognised for diabetic prevention and care. These are:

1. Screening and diagnosis.
2. Care delivery.
3. Education.
4. Psychological care.
5. Lifestyle management.
6. Glucose control level.
7. Clinical monitoring.
8. Self-monitoring.
9. Glucose control – oral therapy.
10. Glucose control – insulin therapy.
11. Blood pressure control.
12. Cardiovascular risk protection.
13. Eye screening.
14. Kidney damage.
15. Foot care.
16. Nerve damage.
17. Pregnancy.
18. Children.
19. In-patient care.

Criteria for diagnosis

If diabetes is to be prevented or detected early, clear criteria for diagnosis are needed. Although blood glucose levels increase with age after 40 years, they remain within normal range in non-diabetic subjects.[10] Using long-term epidemiological studies, glucose thresholds have been established at which the characteristic complications of diabetes mellitus occur.[11-13] The American Diabetic Association (ADA) Expert Committee used these studies to update diagnostic levels for diabetes in 1997,[14] and these are now widely accepted. Table 1 shows the normal plasma glucose values and values for impaired fasting glucose, impaired glucose tolerance, and gestational diabetes

Oral glucose tolerance test (OGTT).
The standard GTT uses 75 g of glucose dissolved in 300 ml of water after an overnight fast. A fasting level >7.0 mmol/L is diagnostic if confirmed on a subsequent day. The OGTT is time-consuming and costly, and is also subject to intra-individual ariability. It is, however, the 'gold' standard test for diagnosis of diabetes.

Impaired fasting glucose (IFG).
This is a fasting level between 6.1 and 6.9 mmol/L.

Impaired glucose tolerance (IGT)
This is 2 hours post-glucose load (75 g) plasma glucose value between 7.8 and 11.1 mmol/L.

Glycated haemoglobin (HbA_{1c}). This should be used for monitoring patients and in research. These tests are costly and give the blood glucose pattern in retrospect. HbA_{1c} is at present not a diagnostic test for diabetes.

Gestational diabetes (GDM)
In Britain GDM is usually established using a 75 g OGTT.[15–16] The ADA for 501 gm and 1001 gm OGTT are shown in Table 1.

Table 1 Diagnostic plasma glucose values (ADA, 1997)

Test	Plasma glucose (mmol/L)
Normal	<6.1
Diabetes a. Fasting glucose b. 2 h after 75 g OGTT, or random test with symptoms	 >7.0 >11.1
Gestational diabetes (GDM) a. Screening (1 h after 50 g glucose) b. Diagnostic (100 gm OGTT) i. Fasting ii. 1 h iii 2 h iv. 3 h	 >7.8 >6.0 >10.6 >9.2 >8.1
Impaired glucose tolerance (IGT) 75 gm OGTT 2 h level	 7.8–11.1
Impaired fasting glucose (IFG) a. Fasting	 6.1–6.9

Classification of diabetes

The classification of diabetes has been under a state of flux in the past four decades with regard to nomenclature, diagnostic plasma glucose values, and recommendations for screening. Clinical presentation and pathophysiology are dominant considerations in the classification. Only about 5% of diabetic patients have clearly defined genetic identity despite the strong genetic associations identified.[14, 17–19] In 1980, WHO adopted the 1979 classification proposed by the American National Diabetes Data Group (ANDDG).[20–21] The 1985 WHO classification gave a prominent categorization to Malnutrition Related Diabetes Mellitus (MRDM).[22] MRDM is now classified under secondary causes due to disease of the exocrine pancreas.[14] MRDM appears to be reducing in popularity as a diabetes sub-group, compared with previously.[9,23–29] A classification system for diabetes, based on WHO, is shown in Table 2.

Table 2 Classification of diabetes (WHO)

1. Type 1 diabetes	(a) Immune-mediated, including latent auto-immune diabetes in adults (LADA) (b) Idiopathic
2. Type 2 diabetes	
3. Maturity onset diabetes of the young (MODU)	Types 1 to 6, often autosomal dominantly inherited
4. Secondary diabetes	(a) Exocrine pancreas disease, including pancreatitis, cystic fibrosis, haemochromatosis, pancreatectomy, tropical fibrocalculous pancreatitis. (b) Endocrine disease, including Cushing's syndrome, thyrotoxicosis, acromegaly, phaeochromocytoma. (c) Drugs such as steroids, thiazides, diazoxide, protease inhibitors. (d) Infections such as mumps, Coxsackie, rubella, CMV. (e) Liver disease, e.g. cirrhosis. (f) Others, such as rare genetic syndromes (e.g. lipoatrophic diabetes).

Proposed screening criteria for Nigeria

A national diabetes screening programme could apply to the following groups:

1. All adults over 35 years, screened at least every 5 years, regardless of symptoms or risk factors. The ADA recommends 3-yearly screening for those over 45 years,[14] but a cut-off of 35 years is suggested for Nigeria because of its lower life expectancy.
2. In addition, there should be opportunistic screening of the following high-risk groups:
   - Overweight or obese (body mass index >25.0).
   - Family history of diabetes.
   - Previous baby weighing >4 kg.
   - Previous history of GDM.
   - Hypertension.
   - Dyslipidaemia.
   - IGT or IFG on previous testing,
   - All seriously ill or sick patients of unknown aetiology.
   - Chronic foot/hand ulcers.
   - Ants crowding around urine.
   - Erectile dysfunction.
   - Glycosuria.

The method of screening could depend on the situation. The OGTT is always ideal but there are clearly cost and logistic implications. Nevertheless, it may be needed in borderline glycaemic situations such as previously known IFG or IGT. Otherwise a fasting glucose level may be appropriate. There are clearly cost implications for any national screening programme and possible sources include government (FMOH), The MDG, The Global Fund, and possibly WHO.

Conclusions

As discussed earlier, the global burden of diabetes is high and rising. Though the proposals in this paper are particularly specific to Nigeria, they are applicable to other countries. The disease is important enough to justify the existence of national expert groups to advise government on issues of prevention, screening, and management.

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