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Editorial Commentary

Exploiting the antidiabetic effect of folkloric remedies in Africa: limitations and prospects

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SUMMARY: The use of traditional folkloric remedies for the management of diabetes mellitus is gaining increasing attention among biomedical researchers in developing countries. This may be linked to the growing incidence of diabetes in these countries. To fully appreciate the potential usefulness of these herbal remedies and further develop their clinical applications, a more holistic approach is required in the generation and interpretation of research data, and the dissemination of new findings to the biomedical community. This article examines the current limitations and offers suggestions on how to advance the exploitation of plant products in the management of diabetes.

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A large proportion of the biomedical research that originates from Africa revolves round the use of folkloric remedies for the treatment of different ailments. Many African researchers have dedicated their careers to establishing the efficacy of local remedies especially those of plant origin. While some researchers have concentrated in the more “traditional” African/Tropical diseases such as malaria, tuberculosis and other infectious diseases; others have veered into metabolic diseases such as diabetes, hypertension, heart disease, which are still erroneously considered as Western diseases.

The incidence of diabetes mellitus (especially type 2) in sub-Saharan Africa is on a fast ascent. In 2010, it was estimated that 12 million people suffered from diabetes in sub-Saharan Africa. In fact by 2030, sub-Saharan Africa is predicted to have the highest growth in the number of people with diabetes of any region in the world. Factors such as ageing, rapid urbanization, obesity, sedentary life styles etc., have been reported as causes for this increase. This is substantiated by reports from epidemiological studies showing that the

incidence of diabetes in rural Africa is far less than that in urban areas.

Literature from Nigerian researchers on the antidiabetic effects of local medicinal plants abound. While most of these reports stop at ascertaining just the efficacy of the plants, others delve into ascertaining short and long term safety/toxicity of these remedies. Still other researchers go as far as establishing the multiple therapeutic approaches of plant remedies which contain a wide array of phytochemicals that may play multiple roles in disease management.

The aetiology of diabetes mellitus presents a multifactorial disease whose primary lesion is the absolute or relative lack of insulin. Although hyperglycaemia is the hallmark of diabetes mellitus, due to the key role of insulin in metabolism, multiple metabolic pathways, such as carbohydrate, protein and lipid metabolism are affected by its deficiency. Hyperglycaemia has also been shown to promote the generation of reactive oxygen species, a situation that is believed to cause and/or exacerbate diabetic

complications. Dyslipidaemia resulting from diabetes mellitus is also recognized as a key factor in the development of coronary heart disease in diabetes sufferers. The orthodox treatments of diabetes focus more on lowering of fasting blood sugar concentrations by the use of either exogenous insulin or other hypoglycaemic agents. While these treatments solve the short term problem of hyperglycaemia and minimize the chronic complications arising from small blood vessel diseases (microangiopathy); large blood vessel diseases (macroangiopathy) are unaffected by tight blood glucose control. It therefore behooves on researchers to find better/alternative therapeutic approaches to holistically treat diabetes mellitus, so that the multifactorial aspects of the disease can be targeted at the same time.

Due to the wide array of phytochemicals in medicinal plant preparations, it is not unusual to observe several biological activities from a single preparation. There are several antidiabetic plants that have been reported to lower fasting blood sugar (FBS) by different mechanisms such as:

- Reducing the digestion and absorption of carbohydrates—these include plant components such as saponins, tannins and flavonoids, that possess α -amylase and α -glucosidase inhibitory effects and also regulate intestinal brush border transport of glucose. Plant polysaccharides and soluble fibres reduce the rate of absorption by reducing the gastric emptying rate. These effects, singly or collectively, reduce post-prandial hyperglycaemia and modulate hyperglycaemia
- Possessing insulinomimetic or insulin secretagogue activities.
- The regeneration of pancreatic beta cells: Some phytochemicals, such as saponins and flavonoids, are reported to cause β -cell regeneration.

While some medicinal plant preparations exhibit one of these effects, others show multiple mechanisms of lowering FBS. Interestingly, many antidiabetic medicinal plant preparations also have significant antihyperlipidaemic and antioxidant effects. These properties would be very useful in the management of chronic diabetic complications, especially macroangiopathy.

The isolation of plant phytochemicals and their assessment for antidiabetic effects, is now common

place. While this is undoubtedly sound scientific research, as it may throw more light on the mechanism of action of the plant extract; isolation of a specific class of phytochemicals may reduce the holistic effect of medicinal plant preparations on the treatment of diseases. As a way out for this, scientist may first ascertain the properties of whole extract preparations before determining the effects of its phytochemical fractions. The use of standardized extracts e.g. HPLC standardized fractions, may also be very instructive.

Once a superior therapeutic effect has been established for a particular plant preparation, other studies should be undertaken to establish safety and translate laboratory work to new drug discovery that can be used to solve concrete health problems.

Some of the limitations of research in the antidiabetic effects of local remedies as well as research in diabetes mellitus as a whole include:

- Misconceptions: Erroneously, diabetes and other chronic diseases are still considered as Western diseases. It is only now becoming clear that this is also an African problem.
- Funding: The heavy burden of infectious diseases in Africa has for a long time elicited generous funding from international organizations. This focus by the international community has saved millions of lives. However, this fixation on infectious diseases has masked the growing need for urgent intervention in the rising incidence of chronic diseases such as diabetes. This double disease burden of sub-Sahara Africa must be equally tackled to achieve viable public health.

Increasing public awareness of the growing incidence of diabetes and the need to urgently address it can minimize these limitations. There is also an urgent need for epidemiological studies on the prevalence of diabetes in all regions of Nigeria and indeed sub-Sahara Africa. This will help establish the actual prevalence of the disease and also determine the causes of increased incidence in different regions. This information will be vital in designing intervention strategies for reducing the disease burden.

Funding from local and international bodies (including the private sector) to support research in diabetes and other chronic diseases will play a key role in reducing the diabetes problem in sub-Sahara Africa. This funding must include all forms of research in diabetes

and other chronic diseases. It must not be limited to epidemiological studies, but also laboratory based studies that can translate into viable solutions to this pressing health problem. Funding to control chronic diseases in sub-Sahara Africa must not be limited to just the provision of drugs and other materials for chronic disease management. To be effective it must also extend to supporting research that promotes drug discovery especially from local remedies. The standardization of these time tested remedies may even provide superior therapeutic effects than orthodox treatments. They are also likely to be cheaper and more readily available.

Scientists, medical personnel and public health specialists must collaborate to establish diabetes and other chronic diseases as a public health problem. In addition, there is need to develop a sustainable framework for the funding of research that will provide practical solutions to the growing diabetes burden in Nigeria and by extension to the rest of Africa

While there is no scarcity of published literature on the antidiabetic efficacy of several medicinal plants, there is however a paucity of information on the exact mechanism of action of these local remedies as well as the standardization of preparations. Awareness, better funding, and collaborations will play a major role in bridging this gap. Without these, the progression of laboratory research to clinical trials and eventually the development of new, perhaps, better drugs for the treatment of chronic diseases including diabetes, will be severely undermined.

SOURCES

Colhoun HM, Betteridge DJ, Durrington PN, Hitman GA, Neil HA, Livingstone SJ, Thomason MJ, Mackness MI, Charlton-Menys V and Fuller JH (2004) Primary prevention of cardiovascular disease with atorvastatin in type 2 diabetes in the collaborative atorvastatin diabetes study (CARDS): multicentre randomised placebo-controlled trial *Lancet*. 364: 685–696.

Levitt NS (2008) Diabetes in Africa: epidemiology, management and healthcare challenges. *Heart* 94: 1376–1382.

Mbanya JC, Motala AA, Sobngwi E, Assah FK, and Enoru ST (2010) Diabetes in sub-Saharan Africa. *Lancet*. 375: 2254–2266.

Motala A and Ramaiya K (eds) (2010) Diabetes: the hidden pandemic and its impact on sub-Saharan Africa. *Diabetes Leadership Forum, Africa 2010*.

Omonkhua AA and Onoagbe IO (2010) Preliminary proximate and phytochemical analyses of some medicinal plants used to treat diabetes mellitus in Nigeria. *Inventi Impact: Ethnopharmacology* 1: 68–70.

Omonkhua AA and Onoagbe IO (2012) Long-term effects of three hypoglycaemic plants (*Irvingia gabonensis*, *Urena lobata* and *Carica papaya*) on the oxidative status of normal rabbits. *Biokemistri*. 24: 82–89.

Omonkhua AA, Onoagbe IO, Ajileye AF, Aladegboye LO and Adetoboye AR (2013) Long term anti-diabetic, anti-hyperlipidaemic and anti-atherogenic effects of *Carica papaya* leaves in streptozotocin diabetic rats. *European Journal of Medicinal Plants* 3: 508–519.

Patel DK, Prasad SK, Kumar R and Hemalatha S (2012) An overview on antidiabetic medicinal plants having insulin mimetic property. *Asian Pacific Journal of Tropical Biomedicine* 2: 320–330.

Petit PR, Sauvaire Y, Ponsin G, Manteghetti M, Fave A and Ribes G (1993) Effects of a fenugreek seed extract on feeding behavior in the rat: metabolic endocrine correlates. *Pharmacology Biochemistry and Behavior* 45: 369–374.

Tiwari AK and Rao M. (2002) Diabetes mellitus and multiple therapeutic approaches of phytochemicals: present status and future prospects. *Current Science* 83: 30–38.