

# Clinical Decision Diagnosis Support System for Complementary and Alternative Medicine Practitioners in Lifestyle-related Diseases Management

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## Abstract

Chronic diseases accounted for 60% of all deaths – corresponding to a projected 36.65 million deaths worldwide in 2007. 2.8% of the world population suffers from diabetes mellitus and it may cross 5.4% by the year 2025. Hypertension is a major burden on health care. Prevalence of lifestyle-related diseases increases. Low accessibility to and non-affordability of orthodox medicine by rural dwellers and their need to keep healthy to be economically productive have led to their dependence on medicinal plants to remedy afflictions. Complementary and Alternative Medicine (CAM) attracts patronage due to patients' dissatisfaction with conventional health care, a desire for treatment and care that work, good relationship with practitioner, provision of information, a desire for greater control over one's health, and a desire for cultural and philosophical congruence with personal beliefs about health and illness. Medicinal plants' threatened sustainability makes adulteration and species' substitutions reduce their efficacy, quality and safety. It was found that CAM practitioners who participated in this study relied heavily upon knowledge that had 'stood the test of time' (traditional theory and practice) and 'that which worked' (experientially based knowledge) as the basis for clinical decision-making. The safe, effective and efficient delivery of client care is informed primarily by sound clinical decision making. Body mass index (BMI) plays a significant role in the process. Strategies that guide practitioners through the process of decision making may not only foster professional excellence in CAM practice, but also help to improve the quality of client care. Clinical decision-making is a complex process that is reliant on accurate and timely information. Clinicians are dependent (or should be dependent) on massive amounts of information and knowledge to make decisions that are in the best interest of the patient. CAM practitioners of modern time need currency and timeliness on computations of patients' body mass index, waist circumference and body shape combination;

product/therapy data on therapeutic efficacy; product quality and safety; adverse reactions and herb-drug interactions. This paper presents a clinical decision diagnosis system supporting CAM practitioners to effectively treat emerging lifestyle-related diseases with medicinal plants.

**Keywords:** body mass index, complementary and alternative medicine, lifestyle-related diseases, medicinal plants, clinical decision support system

## Introduction

At the heart of much scientific thinking in the medical world is a desire for prediction and to base treatment strategies and outcomes on a group statistic of probability. This is quite rightly explained as the desire to provide the optimum treatment and to eliminate false treatment that harms. Irrespective of gender, working long work hours increases the risk of developing hypertension, which then requires lifestyle modification of the established risk factors. Body mass index (BMI) is the standard measure of overweight and obesity status used in large-scale surveys of nutritional status in adults. The risk of developing health problems increases steadily from a BMI of 25-30 kg/m<sup>2</sup> and increases more rapidly at higher BMI's.

Decision making should be based on universally applicable quantitative standards and, wherever possible, local baselines (e.g., for mortality) in combination with context-specific qualitative information. Medical decision-making, therefore, requires the clinician to apply accumulated knowledge to a specific amount of patient information, particularly BMI, to produce a result that may be a diagnosis, prognosis, course of therapy, or the selection of further tests. The array of choices, the tradeoffs, and the other mitigating factors affecting clinical decisions are more complex and require more detailed knowledge than ever before.

## Statement of the Problem

There is a paucity of universally recognised, clearly constructed, systematic decision-making frameworks to guide the practice of system-based CAM. Lack of knowledge of and/or utilization of BMI by CAM practitioners in Nigeria in clinical decision making. Health disparities have been widely recognized as a problem throughout the world. The frequency of nonoptimal patient care, the wide variations in practice, and the inefficiencies, dangers, and inequalities have been reported in literature.

## Objective

To provide evidence-based decision support system for CAM practitioners in enabling them prevent potential adverse events and poor clinical outcomes thereby promoting adherence to effective best-practice medicine.

## Materials and Methods

The conditions (symptom, diet, genetics, age, exercise, and body mass index) for diagnosing obesity, diabetes, and hypertension arising from lifestyle were gathered from 65 orthodox medical practitioners. Ethnobotanical data on medicinal plants (**Figure 1**) were collected, recorded, and discussed randomly through personal contacts in the field, forestry-and-plant-science-based research institutions, local markets (*elewemo*), and at the homes of CAM practitioners (*babalawos*).



**Figure 1** Sample Medicinal Plants collected

100 CAM practitioners in Ota, Abeokuta, and Ijebu-Ode towns in Ogun State of Nigeria who know and use medicinal plants for treating various diseases were interviewed (**Figure 2(a)**).



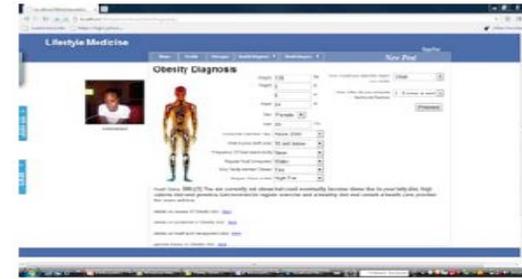
**Figure 2 (a)** A CAM Practitioner's Home in Ota, Nigeria & **(b)** Medicinal Plants in Nigeria (Internet-based)

Randomly administered semi-structured interview technique was employed. Additional data on clinically tested medicinal plants were also collected from published herbal medicine texts and databases, phytochemical databases, and reputedly cognate internet-based medicinal plants' sources (**Figure 2(b)**). Adverse reactions of each medicinal plant for the selected lifestyle diseases were documented. Building on a six interrelated process of Decision-making Framework for CAM, (DeFCAM), a knowledge-based lifestyle-related diseases clinical decision diagnosis support system, (ONILFCDSSCAM), emerged with the requisite conditions and cognate remedy medicinal plants for each disease using Multimedia-based Medicinal Plants Sustainability Management System (ONI\_MMPSMS) database, Microsoft SQL Server, C#.NET programming language, Visual Studio 2008, and Web server (Internet Information Services) tools.

## Results

600 medicinal plants with their flowers, fruits, bark, leaves, and roots were collected and photo/snap taken. 389 medicinal plants' species for treating diabetes; 160 for obesity; and 151 for hypertension were involved. The species differ only in the parts used. These details were used to populate the ONI\_MMPSMS database. From an analysis of 100 interview transcripts of CAM practitioners who participated in the study it was found that participants relied heavily upon knowledge that had 'stood the test of time' (traditional theory and practice) and 'that which worked' (experientially based knowledge) as the basis for clinical decision-making. Conversely, evidence arising from research was not generally used in the clinical decision-making of this practitioner cohort. Our diagnostic decision support system has been developed to provide a suggested list of potential diagnoses to the users. The CAM practitioners were trained by us to use scale to record patient's weight in kilograms, and a meter rule to take height data to be entered into the system for BMI computation. The system might start with the patient's signs and symptoms, entered either by the clinician directly or imported from the electronic medical record. The system generally does not generate only a single diagnosis, but usually generates a set of diagnoses based on the available information. Because the CAM practitioner often knows more about the patient than can be put into the computer, the CAM practitioner will be able to eliminate some of the choices.

Our system's features included: Obesity Diagnosis Page (**Figure 3**), Hypertension Diagnosis Page, and Diabetes Diagnosis Page. Each disease page displays a form to be filled by the CAM practitioner which the system uses to diagnose whether or not a patient is suffering from, is likely to suffer from or is not suffering from that disease based on the system's rule base. Diagnosed disease is used as a primary key to access ONI\_MMPSMS and all the principal medicinal plants, with their dosage administration, for each diagnosed disease are retrieved for the CAM practitioner to choose from.



**Figure 3** Obesity Diagnosis Page

Variation exists at all levels of the health care system. Variation can be appropriate and expected when it is due to the varying circumstances of providers or the different needs and characteristics of patient populations. As policies to reduce variation are implemented, outcomes must be tracked carefully to guard against unintended consequences.

## Conclusion

The increasing comorbid epidemics of diabetes mellitus and obesity conditions mandates a thorough examination of best therapies, adherence issues, access, and prevention strategies. The system here emphasizes recording of BMI as it contributes significantly in determining a lifestyle-related disease. For high-quality care to be achieved, health care systems must have safety, effectiveness, patient-centered emphasis, timeliness, efficiency, and equitability attributes. Medicinal plants' adverse reactions information made available enhances patients' safety using CAM and material reduction in practice variation throughout health care.