

ORIGINAL ARTICLES**Estimating prevalence of diabetes in a Congolese town was feasible**

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Abstract

Objectives: To study prevalence, determinants, and complications at diagnosis of diabetes and intermediate hyperglycemia (IH) in Kisantu, a semirural town in Bas-Congo province, Democratic Republic of Congo.

Study Design and Setting: A large-scale analytical cross-sectional population-based survey was performed in 2007 in Kisantu. After extensive sensitization, the study sample was collected using a modified World Health Organization (WHO) STEPwise strategy, taking subsequently a random sample of streets, households within streets, and inhabitants aged 20 years and older within households. After informed consent, subjects were invited to fixed sites for interview, anthropometry, clinical examination (blood pressure, monofilament, and ophthalmology), and biochemical tests (fasting capillary glucose, serum creatinine, and albuminuria). Fasting glycemia was repeated or 2-hour postload glycemia was measured the next day in subjects with an initial glycemia of 126–199 mg/dL (7.0–11.1 mmol/L) or 100–125 mg/dL (5.6–6.9 mmol/L), respectively. Hence, prevalence of diabetes, impaired fasting glucose, and impaired glucose tolerance according to both 2006 WHO/International Diabetes Federation and 2003 American Diabetes Association criteria could be evaluated. Bivariate and multivariate analyses were used for statistical analyses.

Results: Response rate was 93.7% (1,898 of 2,025). Complete data were available in 1,866 (92.1%) subjects.

Conclusion: Estimating the prevalence of diabetes and IH in a small Congolese town was proven to be feasible. © 2011 Elsevier Inc. All rights reserved.

Keywords: Diabetes mellitus; Epidemiology; Prevalence; Population-based survey; Africa; Congo

1. Introduction

Although communicable diseases will remain the predominant health problem for sub-Saharan Africa for the next decade, the prevalence of certain noncommunicable diseases including type 2 diabetes seems to be rising [1,2]. Patients with these diseases, especially those with complications, make significant demands on the health care services [2]. A number of organizations therefore recently called for a recent agenda on diabetes in sub-Saharan Africa [2–4]. The first

step of such agenda is the inventarisation of the disease burden in these countries, including the prevalence of both diabetes and its precursor, impaired glucose tolerance (IGT), risk factors, and complication rates [1,2,4].

Estimating the prevalence of a disease requires the availability of a study population from which cases are derived [5]. Yet population data in developing countries are often not readily available. This is the case in Democratic Republic of Congo (DRC) where the last census was carried out in 1984 [6]. Population projections are, therefore, unreliable in DRC [7,8]. On the other hand, assessing the prevalence of noncommunicable diseases such as diabetes mellitus implies recording self-reported sociodemographic information and performing anthropometric measurements as well as biochemical tests. WHO recognizes in underresourced

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What is new?

1. Performing a population-based survey to estimate prevalence of diabetes and intermediate hyperglycemia in a small Congolese town was proven to be feasible using a modified World Health Organization (WHO) STEPwise strategy.
2. Participation rate and adherence to the study protocol were improved through sensibility to local habits and various interventions: for example, gaining support of local authorities, an extensive information and sensitization program, (repeat) visits to selected subjects at their homes, and careful consideration of people's privacy...
3. In accordance with WHO/International Diabetes Federation and American Diabetes Association recommendations, repeat fasting and/or 2-hour postload blood glucose measurements were made when needed to maximize detection of cases of diabetes and to differentiate between impaired fasting glucose and impaired glucose tolerance.
4. Prevalence data on microvascular complications at diagnosis will contribute to the current debate on diagnostic criteria for diabetes mellitus and intermediate hyperglycemia.

settings the difficulty of carrying out biochemical tests, unless low-cost technology is used [9].

Despite the scarcity of data, there are indications that the incidences of diabetes and obesity in DRC are increasing rapidly [10,11]. A regional diabetes prevalence of 7% was observed in a 2003 pilot study in Kisantu, Bas-Congo province, DRC [12]. We do this because the number of prevalence studies in sub-Saharan Africa is low and the methods that are used differ considerably. Designing and performing a prevalence study have to deal with a lot of challenges: absence of trained field workers; dispersion of the population over a vast area; absence of detailed cartography; reaching and motivating the population; and the search for low cost, robust, and simple technology for performing biochemical tests. As resources are limited, a complete survey of the population is impossible and alternatives to simple random sampling have to be developed. In designing our study, we had to address each of these problems and construct solutions for them.

As a result of all these problems, the number of studies on prevalence of diabetes in sub-Saharan Africa is scarce. We performed a systematic literature review, which resulted in 23 studies of which only seven complied with a predefined set of quality criteria (1).

The main objective of the present large-scale study was therefore to determine the prevalence of diabetes mellitus

and intermediate hyperglycemia (IH), their determinants, and their microvascular complications at diagnosis. This article presents the design and methodology used to construct the sampling frame and conduct the survey.

The underlying idea of our study was to show that it is feasible to organize diabetes prevalence studies in developing countries under difficult conditions while rigorously complying with methodological requirements.

2. Methods

2.1. Location

Kisantu is a town in the western Bas-Congo province of DRC, 120 km south west of the capital Kinshasa. According to a local census, which was performed in 2005 by the rural health zone of Kisantu [8], the population of Kisantu was estimated to be 130,805 inhabitants. Most people do subsistence farming or exercise menial jobs.

2.2. Study design

The study design was an analytical cross-sectional household survey.

2.3. Selection criteria

We excluded children from this study for pragmatic reasons. It is a separate and special group (only type 1 diabetics), ethical considerations would differ, and the number of diabetic patients in this group is far lower than in older age groups. All Congolese men and women aged 20 years and older were eligible. Mental invalids and pregnant women were excluded.

2.3.1. Sample size

A sample size of 1,824 participants was calculated according to the formula $n = Z^2 PQ/d^2$ assuming an expected proportion (p) of diabetes in Kisantu of 5% [10,12], a confidence coefficient (z) of 1.96 for a confidence interval (CI) of 95%, and a degree of precision (d) of 1% ($Q = 1$; $P = .05$). Anticipating a 10% nonresponse rate, the sample size was increased to 2,025. Taking into account the possibility of (limited) within-cluster correlation (compounds clustered within streets) with an intraclass correlation coefficient of 0.01 and an average number of six compounds per street, we calculated an inflation factor of 1.05, resulting in a sample size of 1,915 participants. For a correlation factor of 0.05, this results in 2,280 participants.

2.3.2. Sampling design

The Kisantu health care zone comprises 13 areas, among which four make up the city of Kisantu whereas nine others represent its rural component. The study was carried out in the four catchment areas of the city center: Nkandu (subdivided into two sites: Nkandu-Etat and Nkandu-Gare), Kintanu 1, Kintanu 2, and Kikonka. The sampling process was implemented in two steps; the constitution of the sampling frame preceded the actual sampling of subjects.

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