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Original article

Prevalence and determinants of diabetes and impaired fasting glucose among urban community-dwelling adults in Guangzhou, China

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Abstract

Aim. – This study aimed to estimate the prevalence of diabetes and impaired fasting glucose (IFG) in the adult population aged ≥ 20 years in Guangzhou and to evaluate the associated risk factors.

Method. – A total of 6197 randomly selected adults, aged ≥ 20 years and living for at least 5 years in Guangzhou, participated in questionnaire-based interviews between 2006 and 2007, and had their clinical characteristics and standard blood chemistries measured. A 75 g OGTT was conducted for those subjects with fasting glucose levels ≥ 5.6 mmol/L. Diabetes and IFG were defined according to WHO 1999 criteria.

Results. – Based on Chinese census data, the age- and gender-standardized prevalences of diabetes and IFG were 5.5% and 3.3%, respectively. Among the identified diabetic individuals in the present investigation, 42.3% were newly diagnosed. The prevalence of diabetes and IFG increased with age. The results of multivariate logistic-regression analyses showed that diabetes and IFG were significantly associated with age, a family history of diabetes, obesity, hypertension and hyperlipidaemia.

Conclusion. – The prevalences of diabetes and IFG have increased dramatically over the past decade. Yet, a large proportion of cases go undiagnosed. These results suggest an urgent need to establish regular population-based diabetes screening in Guangzhou.

Keywords: Diabetes mellitus; Impaired fasting glucose; Urban; Adult; Associated factors; Epidemiology; Screening; China

Résumé

Prévalence et déterminants du diabète et de l'hyperglycémie modérée à jeun dans une population adulte en milieu urbain.

Objectifs. – Estimer la prévalence du diabète et de l'hyperglycémie modérée à jeun (HMJ) dans une population urbaine adulte âgée de 20 ans et plus à Guangzhou et évaluer les facteurs de risque associés.

Méthodes. – Un total de 6197 adultes choisis au hasard vivant depuis cinq ans au moins à Guangzhou a répondu à une enquête fondée sur un questionnaire entre 2006 et 2007. Des mesures anthropométriques et des analyses sanguines ont été réalisées. Une hyperglycémie provoquée orale avec 75 g de glucose a été réalisée chez les sujets dont la glycémie à jeun était supérieure ou égale à 5,6 mmol/L. Le diabète et l'hyperglycémie modérée à jeun ont été définis selon les critères de l'OMS (1999).

Résultats. – Fondées sur des données de recensement chinoises, la prévalence standardisée selon l'âge et le sexe du diabète et celle de l'hyperglycémie modérée à jeun, étaient respectivement de 5,5 % et de 3,3 %. Parmi les individus identifiés diabétiques dans la présente enquête, 42,3 % des cas ont été diagnostiqués grâce à cette enquête. La prévalence du diabète et celle de l'hyperglycémie modérée à jeun augmentent avec l'âge. L'analyse en régression logistique montre que le diabète et l'HMJ étaient significativement associés à l'âge, aux antécédents familiaux du diabète, à l'obésité, à l'hypertension et à l'hyperlipidémie.

Mots clés : Diabète sucré ; Hyperglycémie modérée à jeun ; Dépistage ; Épidémiologie ; Urbain ; Adulte ; Facteurs associés ; Chine

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Conclusion. – La prévalence du diabète et celle de l'hyperglycémie modérée à jeun ont augmenté considérablement pendant la dernière décennie. Une grande proportion de cas n'était pas diagnostiquée. Ces résultats suggèrent qu'il y a besoin urgent à établir un dépistage du diabète dans l'ensemble de la population à Guangzhou.

1. Introduction

Diabetes mellitus is one of the most serious public health problems across the globe. In keeping with the worldwide trend, China has experienced a rapid increase in the prevalence of type 2 diabetes over the past 20 years, with three national surveys of adult populations indicating that the prevalence of type 2 diabetes has grown nearly fourfold—from 0.6% in 1979 to 2.5% in 1994 and 2.6% in 2002 [1–3]. As one of China's most modernized cities, Guangzhou has experienced rapid economic development, and its residents have experienced huge lifestyle changes over the past two decades. These changes include overnutrition or dietary imbalances, long-term sedentary work and lack of physical activity during leisure time, all of which are regarded as major risk factors for type 2 diabetes. In 1997 and 2002, two studies of diabetes in people aged 20–74 years in Guangdong Province showed that the prevalence of diabetes in Guangzhou in those 2 years was 2.0% and 4.4%, respectively [4,5].

However, neither of the studies included large enough sample populations to allow for more precise estimations of the prevalence of diabetes in that city. To address this gap in knowledge, we conducted a study in a representative sample of over 6000 urban residents of Guangzhou aged ≥ 20 years. Our objectives included:

- to determine the prevalence of diabetes and impaired fasting glucose (IFG) in the adult population of Guangzhou;
- to estimate the percentage of existing diabetes cases that were undiagnosed;
- to evaluate the associated risk factors for diabetes and IFG, including age, family history of diabetes, obesity, hypertension and hyperlipidaemia.

The results of this study should prove useful to the local health professionals charged with controlling and managing diabetes in Guangzhou.

2. Methods

2.1. Subjects and sampling

A four-stage sampling method was used to select a representative sample of the urban adult population in Guangzhou. In stage one, six administrative regions were randomly selected from the whole urban area. In the second stage, one street district was randomly selected from each of the six sampled administrative regions. In stage three, two communities were randomly sampled from each selected street district. In the fourth and final stage, all residents aged ≥ 20 years who had lived in Guangzhou for at least 5 years were invited to participate in the survey. Informed consent was obtained from each participant before starting the study. A total of 9047 eligible citizens were contacted, and 6197 of them participated in the survey. Ultimately, 6033 individuals successfully completed the study, representing a response rate of 66.7%. The ethics committee of Sun Yat-Sen University approved the study protocol.

2.2. Data collection

Data collection included questionnaire interviews, clinical measurements and venous blood collection, all of which took place at local community health care centres. For those participants unable to get to health care centres, data collection was conducted in their homes. All of the investigators underwent strict training in the methodology and principles of the study programme as well as in the necessary skills for the study prior to the start of the study.

2.2.1. Questionnaire interviews

A structured questionnaire for demographic characteristics—age, gender, educational level, occupation and income, individual history of hypertension and diabetes, and family history of diabetes—was administered to each participant by the investigators. Women were asked whether or not they had ever been diagnosed with diabetes of pregnancy as well as whether or not they had ever been diagnosed with diabetes while not pregnant.

2.2.2. Clinical measurements

Height was measured to the nearest centimeter using a tape measure attached to the wall and with the subject standing as erect as possible. Body weight was measured to the nearest 0.1 kg, using a digital bathroom scale, with the subjects barefoot and wearing lightweight clothing. Body mass index (BMI) was calculated as weight (kg) divided by the square of height (m). Participants with a BMI ≥ 25 kg/m^2 and < 28 kg/m^2 were classified as overweight, and those with a BMI ≥ 28 kg/m^2 were classified as obese (World Health Organization [WHO] 1997 standards). Waist circumference (at the level of the navel) and hip circumference were measured in duplicate with the subjects standing and at the end of expiration while breathing normally, and the average of the two values used in the study analyses. The waist-to-hip ratio (WHR) was calculated by dividing the waist circumference by the hip circumference.

Systolic blood pressure (SBP) and diastolic blood pressure (DBP) were measured three times in each subject, using a mercury sphygmobolometer in the sitting position after a 15 min rest, and the values then averaged. Hypertension was defined (according to WHO 1999 guidelines) as SBP ≥ 140 mmHg or DBP ≥ 90 mmHg, or as diagnosed hypertension requiring antihypertensive drugs for more than 2 weeks.