Prevalence of gestational diabetes mellitus in urban and rural Tanzania

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ABSTRACT

Aim: To estimate prevalence of gestational diabetes mellitus (GDM) and associated determinants in urban and rural Tanzania.

Methods: A cross-sectional study was conducted from 2011 through 2012 in selected urban and rural communities. Pregnant women (609 urban, 301 rural), who were not previously known to have diabetes, participated during usual ante-natal clinic visits. Capillary blood samples were collected at fasting and 2 h after 75 g glucose load and were measured using HemoCue. Diagnosis of GDM was made using 1999 World Health Organization (WHO) criteria.

Results: Women in rural areas were younger (26.6 years) than in urban areas (27.5 years). Mean gestational age, height, and mid-upper arm circumference (MUAC) were similar for the two areas. Overall prevalence of GDM averaged 5.9%, with 8.4% in urban area and 1.0% in rural area. Prevalence of GDM was higher for women who had a previous stillbirth (OR 2.8, 95% CI 1.5–5.4), family history of type 2 diabetes (OR 2.1, 95% CI 1.1–4.2), and MUAC above 28 cm (OR 1.9, 95% CI 1.1–3.3), and lower for women with normal hemoglobin compared with anemia (OR 0.45, 95% CI 0.22–0.93).

Conclusions: Prevalence of GDM is higher than expected in urban areas in Tanzania, indicating an increasing population who are at risk for delivery complications and type 2 diabetes in Sub-Saharan Africa.

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1. Introduction

The 1999 WHO diagnostic criteria define GDM as carbohydrate intolerance resulting in hyperglycemia of variable severity with onset or first recognition during pregnancy [1]. The definition applies irrespective of whether or not insulin is used for treatment or the condition persists after pregnancy. Hyperglycemia usually disappears after the baby is born, but may be associated with long term health risks to the mother and the child, such as predisposition to obesity, metabolic syndrome and diabetes later in life [2,3]. Studies have shown that women with GDM had a 17–63% risk of developing postpartum diabetes within 16 years, and the risk is higher in women who required insulin and those with high body mass index (BMI) [4–6].

Prevalence of GDM ranges from 1% to 20% of pregnancies depending on the population studied [7–11]. A review by

Ferrara showed that GDM prevalence has increased by 10–100% in several racial groups during the past 20 years [12]. Higher prevalence was observed among US women from Asian and Philippino origin even at a lower BMI [13]. Community based studies have shown that the prevalence of GDM varies across urban, peri-urban and rural areas [9,14]. Factors contributing to GDM include family history of diabetes, age above 25 years and BMI above 25 [15,16]. Other factors include sedentary life style, pregnancy weight gain, maternal height, dietary factors and cigarette smoking [17,18]

Studies on GDM in Sub-Saharan Africa are generally few. In a South African rural community a prevalence of 8.8% was reported and in rural Ethiopia the prevalence was 3.7% [7,19]. In Tanzania, data on the prevalence of GDM in rural and urban areas are scarce. About two decades ago, GDM was not detected in either rural or urban areas [20,21]. Ten years later, however, an increased prevalence of overweight and obesity was reported [22–24]. This implies that the prevalence of GDM may have increased as well, with accompanying increases in delivery complications and risk for type 2 diabetes later in life for the mother and the child.

This cross-sectional study was done to estimate and compare prevalence of GDM in urban and rural communities. It is envisaged that the results of this study will provide essential information regarding the need to treat and prevent GDM in a country where there is also a challenge of combatting communicable infections and other forms of malnutrion as well as changing dietary and lifestyle practices which are risk factors for GDM.

2.   Materials and methods

A cross-sectional study was conducted in Dar es Salaam city and Morogoro region from August 2011 through March 2012. The study subjects were pregnant women aged 20 years or more and 20 gestational weeks or more, attending antenatal clinic (ANC) at selected six health facilities in Dar es Salaam city (urban) and two centers in Kilombero district in Morogoro region (rural).

Six health facilities in the urban area and two health facilities in the rural area where chosen based on their high number of pregnant women attending ANC. All women aged above 20 years and with gestational age of 20 weeks or more, attending ANC during the survey period, were eligible to participate. Women with previously diagnosed diabetes and women from ethnic groups other than African, were excluded. Other exclusion criteria included having chronic disease(s), such as sickle-cell anemia or cancer, and having conditions that limit activities or normal dietary intake, such as bed-rest since conception. In two health facilities, on some days more women were attending ANC than researchers could handle and on these days the first 15 women attending that day were included.

During their normal ANC visit, the aim of the study, the procedure and the possible effects of oral glucose tolerance test (OGTT) were explained to the women, emphasizing that participation was voluntary. The study was approved by Tanzanian National Medical Research Institute (NIMRI). Informed consent was sought from the study subjects before commencing of the study.

With the assistance from the reproductive and child health clinical officer and the nurse in charge, eligible mothers were selected and invited to participate. In the urban area, 715 mothers were invited, 637 qualified for the examination and 599 completed the OGTT. In the rural area, 400 eligible mothers were invited, 315 qualified for the examination and 301 completed an OGTT. Overall response rates were 89% and 79% in the urban and rural area, respectively.

2.1.   Laboratory assessment

Blood samples were taken using finger prick with a sterile lancet after cleaning the site with antiseptic alcohol swaps. Blood glucose was measured in capillary whole blood using HemoCue Glucose B-201 (Ängelholm AB, Sweden). On the first visit, mothers were asked to remain fasting overnight and return to the center for fasting blood glucose measurement, after a period of three days with ususal eating habits and unrestricted activities. When a women's fasting blood glucose exceeded the WHO limit for diabetes ($n = 12$), they were asked to return a second time for a second fasting glucose measurement. When the fasting level was in the non-diabetic range, an OGTT was carried out. Anhydrous glucose (75 g) in 300 ml of water was given and blood glucose was assessed after two hours. Categorization of the women into GDM and normal was made using WHO diagnosis criteria for GDM (fasting and 2-h capillary whole blood). All those who met criteria for diabetes mellitus and impaired glucose tolerance (fasting 6.1 or 2-h 7.8 mmol/l) were classified as having GDM [1]. Women diagnosed with GDM were referred to the physician for further investigation, treatment and counseling.

After taking the capillary blood sample for glucose measurement, another drop was taken for testing hemoglobin (Hb) levels. Hb concentrations were measured using HemoCue Hb 201+ Hemoglobin photometer (HemoCue AB, Ängelholm, Sweden) and recorded to the nearest 0.1 g/dl. Women were classified as anemic (<11 g/dl) or normal (≥11 g/dl) using Hb cut-off points suggested by WHO [25]. Further classification was in severe (<7 g/dl), moderate (7–8.9 g/dl), mild (9–10.9 g/dl) and normal (≥11 g/dl).

Women were asked to collect urine on the spot in a provided disposable plastic container. Urine samples were tested within one hour for glucose, ketones, leucocytes and protein using multistix made with a color sensitive pads (urine strip 10 C, Dialeb GmbH, Austria).

2.2.   Anthropometric assessment

Systolic and diastolic blood pressure (BP) was measured from mid-upper-arm of the left side while the respondent was sitting and relaxed for 10 min before the actual measurement, using a digital BP device (Microfile BPA100, Widnau, Switzerland). Two readings were taken with an interval of 5 min, and the average systolic and diastolic BP was recorded in mmHg. Mothers with high blood pressure (defined as systolic ≥140 mmHg and diastolic ≥90 mmHg) were referred to see the doctor for further investigations and treatment.

Height was measured without shoes and recorded to the nearest 0.1 cm, using height measuring board (Shorr Productions, MD, USA). Weight was measured to the nearest