Impaired glucose regulation in adults in Jamaica: who should have the oral glucose tolerance test?

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ABSTRACT

Objective. *To compare the 1999 World Health Organization (WHO) fasting plasma glucose (FPG) criteria and the WHO 2-hour post-challenge glucose (2hPG) criteria during an oral glucose tolerance test (OGTT) in identifying adults in Jamaica with hyperglycemia. As the OGTT is not commonly used in clinical practice, factors associated with the failure of the FPG criteria to detect persons with impaired 2hPG were investigated.*

Methods. *A random sample of 2 096 adults, 25–74 years old, living in the town of Spanish Town, Jamaica, was evaluated for diabetes. After excluding 215 individuals for reasons such as missing data, the remaining 1 881 persons were composed of 187 who were previously known to have diabetes and 1 694 who were screened for diabetes with both FPG and 2hPG.*

Results. *The FPG criteria detected 83 cases of diabetes, compared to 72 by the 2hPG criteria. The kappa statistic comparing the two criteria was 0.31 (95% confidence interval: 0.28–0.34), indicating fair agreement. There were 261 cases of impaired glucose tolerance (IGT) and 92 cases of impaired fasting glucose (IFG). In those 92 with IFG, an OGTT would identify 34 cases of IGT and 14 cases of diabetes. Of those classified as normoglycemic by FPG criteria, 14% of them had IGT or diabetes by 2hPG criteria. The factors predicting the likelihood of non-detection of impaired glucose tolerance or diabetes by FPG were age, body mass index, central obesity, systolic blood pressure, and female sex. By receiver operating characteristic curve analysis, an FPG of 5.1 mmol/L would predict a 2hPG ≥ 7.8 mmol/L.*

Conclusions. *A few individuals classified as normal on FPG will have IGT or diabetes, and an OGTT will be needed to identify them. The yield of IGT detected by screening in Jamaica can be improved by lowering the threshold for IFG or by using clinical information to identify high-risk individuals.*

Key words Diabetes mellitus, blood glucose, glucose intolerance, glucose tolerance test, mass screening, Jamaica.

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People with impaired glucose regulation (impaired fasting glucose (IFG) and/or impaired glucose tolerance (IGT)) are at risk of developing type 2 diabetes (1–3). This risk can be amelio-

rated by lifestyle interventions as well as drug therapy, according to recent trials (4–6). As such, these individuals form a high-risk or prediabetic group who could benefit from proven interventions to prevent diabetes if these persons were identified. Screening for prediabetic states may be particularly indicated where the burden of diabetes is high.

In Jamaica the prevalence of diabetes is high. Among survey participants 25 to 74 years old in the town of Spanish Town the prevalence was estimated at 13.4% (7). A third of these participants had diabetes that had not been detected previously. These estimates were somewhat lower than those from an earlier population survey in Jamaica, where overall prevalence was 17.9%, with a 48% frequency of undiagnosed diabetes (8). The prevalence of IGT in Spanish Town was 13.7% (7).

The World Health Organization (WHO) in 1999 proposed both fasting plasma glucose (FPG) criteria and 2-hour post-challenge glucose (2hPG) criteria on an oral glucose tolerance test (OGTT) for diagnosing disorders of impaired glucose regulation (1). However, the WHO noted that IFG and IGT were not interchangeable categories. The OGTT is costly, time-consuming, and inconvenient, and alternative screening strategies have been proposed to limit its use (9).

There were three main aims for this study:

1. To compare the performance of the FPG and 2hPG criteria in identifying individuals with undiagnosed diabetes and lesser degrees of glucose impairment.
2. To investigate the implications of relying solely on the fasting criteria for diagnosis, and the factors associated with increased risk of missing individuals with impaired glucose tolerance and diabetes (especially given the relative inconvenience and uncommon use of the OGTT in clinical practice).
3. To examine two strategies for identifying people with IGT or diabetes whose FPG was normal (< 6.1 mmol/L).

METHODS

Subjects and measurements

Participants were recruited to an on-going survey of hypertension, diabetes, and chronic disease in Spanish Town, Jamaica. A probability proportionate to size cluster sampling technique was used to randomly select participants in five 10-year age strata (25–34, 35–44, 45–54, 55–64, 65–74), with equal proportions of men and women in each age stratum (7). The clusters were enumeration districts derived from the 1991 census, which was the most recent one at the time of our research study. Individuals residing in selected clusters were contacted and recruited by research nurses doing house-to-house visitations. Individuals were invited to participate if they were 25–74 years old. A participation rate of 60% was achieved. Approximately 90% of Jamaicans identify their race as black, and some 7% as mixed (i.e., black mixed with Chinese, Indian, or Caucasian). The protocol was reviewed and approved by the Ethics Committee of the University of the West Indies, Mona.

Participants attended a centrally located clinic at the Spanish Town Hospital, after an overnight fast of 12–14 hours. They completed an interviewer-administered questionnaire covering their health and lifestyle practices and personal and family history of disease. The question "Have you ever been told by a doctor or health professional that you had diabetes or sugar?" was used to identify participants with a history of diabetes.

Blood pressure (BP), height, weight, waist circumference, and hip circumference were measured using a standardized protocol (10, 11). BP was measured to the nearest 2 mmHg as the first and the fifth Korotkoff phases, using a standard mercury sphygmomanometer. Three measurements were taken at one-minute intervals in the sitting position after the participant had been sitting for five minutes. Body mass index (BMI) was calculated as weight in kilograms divided by height in meters squared (kg/m^2). The waist-to-hip ratio

(WHR) was calculated as waist circumference divided by hip circumference, both measured with a retractable steel tape to the nearest 0.1 cm.

Individuals without known diabetes were screened for diabetes by both FPG and by OGTT. Fasting venous samples were collected in heparinized and fluoridated tubes for plasma glucose concentration. Participants then had an OGTT, where they consumed a 75-g glucose solution over a period of two to three minutes. A blood sample was drawn 120 minutes after ingesting the glucose (i.e., 2hPG).

Samples were frozen and transported to a single laboratory, where plasma glucose concentration was estimated using the glucose oxidase test within 24 hours. Cholesterol (total lipoprotein and high-density lipoprotein (HDL)) and triglycerides were measured by enzymatic techniques using an Abbott VP Biochromatic Analyzer (Abbott, Irving, Texas, United States of America). Low-density lipoprotein (LDL) cholesterol was calculated by the Friedewald formula (12).

In total, 2 096 subjects were recruited between September 1993 and March 1999 and evaluated for diabetes. Of the 2 096, 22 subjects were excluded: 2 who were unsure of a personal history of diabetes, 7 women who had a history of gestational diabetes, and 13 who did not answer the question on their diabetes status. A further 193 (106 men and 87 women) did not have samples for both fasting and 2-hour glucose concentration (for reasons such as subject refusal, broken blood tubes, etc.) and were excluded from further analysis. Men without these blood results were significantly younger (mean age, 41.0 years; standard deviation (SD), 12.4 years) than those with glucose values (mean, 47.1 years; SD, 14.6 years) ($P < 0.0001$). Mean BMI was not statistically different ($P = 0.98$). Women without these blood results did not differ by age ($P = 0.55$) or BMI ($P = 0.19$) from those with results. With these exclusions, there were 1 881 persons eligible for analysis, of which 187 had known diabetes and 1 694 were screened for diabetes with both FPG and 2hPG.

Definitions

Known diabetes was defined as a diagnosis made by a doctor or other health professional based on the participants' questionnaire information. The majority (61%) of individuals with known diabetes reported their diabetes management was principally by drug treatment, and a further 30% reported using only a diabetic diet. In those without a known history of diabetes, the FPG and/or 2hPG were used to classify glycemic status. Diabetes was defined as an FPG concentration ≥ 7.0 mmol/L, and IFG as 6.1 to 6.9 mmol/L (1). Individuals with fasting glucose ≤ 6.0 mmol/L were classified as normoglycemic by the FPG criteria. Diabetes by the 2hPG criteria was a 2hPG concentration ≥ 11.1 mmol/L, and IGT was 7.8 to 11.0 mmol/L. Normoglycemia was defined as a 2hPG concentration < 7.8 mmol/L (1). Hypertension was defined as systolic BP ≥ 140 mmHg and/or diastolic BP ≥ 90 mmHg and/or current use of antihypertensive medication.

Statistical analyses

Data were analyzed using Intercooled Stata 6.0 software (StataCorp LP, College Station, Texas, United States). The *t* test was used to compare differences between means, and the chi-square test was used to compare differences in proportions. A *P* value of less than 0.05 was considered statistically significant. Both FPG and 2hPG criteria were applied to individuals without known diabetes, with the assumption that each criterion was independent of the other.

The number of screen-detected cases identified by each set of criteria was added to the number of known diabetic cases to calculate the total prevalence, with the associated 95% confidence interval (95% CI). The kappa statistic was used to assess the concordance of the two criteria in categorizing participants with respect to glycemic status. (A kappa value of 0 indicates the agreement is due to chance, while a value of 1 indicates perfect agreement.)

Logistic regression analysis was done to find factors that predicted failure of the FPG criteria to identify individuals with undiagnosed IGT or diabetes by 2hPG criteria. These analyses were restricted to individuals classified as normoglycemic by FPG criteria. The variables examined were age, sex, history of hypertension, family history of diabetes (parents, siblings, or grandparents), BMI, waist circumference, WHR, systolic BP, diastolic BP, total cholesterol, HDL cholesterol, LDL cholesterol, and fasting triglycerides. These variables were examined in univariate models and retained if they were significant to *P* < 0.20. The retained variables were subjected to stepwise forward logistic regression to identify the best predictors on multivariate adjustment. Waist circumference was collinear with BMI and WHR, and it was examined in similar models without the inclusion of these variables.

Retained variables that were continuous were dichotomized in order to calculate a "score" for participants. We assigned a value of 1 to each of the following four characteristics: (1) age ≥ 45 years; (2) female sex; (3) BMI ≥ 30 kg/m², waist ≥ 80 cm for women or ≥ 94 cm for men, or WHR ≥ 0.80 for women or ≥ 0.95 for men; and (4) systolic BP ≥ 140mmHg. Otherwise, a value of 0 was assigned. These values were summed to give the "score," which could be a maximum of 4.

An age of 45 years was used because of the American Diabetes Association's (ADA) recommendation to start screening in high-risk groups at this age (13). A BMI of 30 kg/m² or higher represents obesity. Cutoff points for waist circumference and for WHR were based on the respective proposals by Lean et al. (14) and by the United States Department of Agriculture (15).

We examined more complex scores based on the beta coefficients of the multivariate logistic regression models, but they did not perform better than the simple score.

Receiver operating characteristic (ROC) curves were used to examine the performance of scores that included age, sex, one or more obesity measures, and systolic BP in identifying people with normal FPG but with abnormal 2hPG. An ROC curve was also used to determine the "optimal" cutoff of FPG for detection of IGT or diabetes by 2hPG criteria. This cutoff point was chosen to maximize the sensitivity and specificity of FPG in predicting a 2hPG of 7.8 mmol/L.

RESULTS

Overall, 187 of 1 881 participants reported having diabetes, giving an overall prevalence of 9.9% (95% CI: 8.6%–11.4%). The prevalence of self-reported diabetes among the 738 men included in the analyses was 7.7% (95% CI: 5.9%–9.9%), and among the 1 143 women it was 11.4% (95% CI: 9.6%–13.4%). Among both the men and women, persons known to have diabetes were older and had higher BMI, waist circumference, WHR, and blood pressure values in comparison to those who were screened. Persons with known diabetes also had a higher prevalence of self-reported hypertension. These differences were independent of age (Table 1).

Table 2 shows the proportions cross-classified by the FPG and 2hPG criteria in individuals without physician-diagnosed diabetes. Fifty-five percent of those classified as having diabetes by the FPG criteria were similarly classified by the 2hPG. A higher proportion of those classified diabetic by the 2hPG criteria (64%) were also diabetic by the FPG criteria. Few who were classified as normoglycemic on either set of criteria were found to be diabetic by the other criteria. Misclassification was greatest in the intermediate glycemic categories. Only 13% of people with IGT had IFG, while 37% of those classified as having IFG also had IGT. The overall kappa statistic was 0.31 (95% CI: 0.28–0.34), indicating fair agreement.

Slightly more people were found to have diabetes by using the FPG criteria than by using the 2hPG criteria (Table 3). The absolute difference in prevalence of screen-detected diabetes by these two criteria was small: 1.2%

TABLE 1. General characteristics of participants in study of impaired glucose regulation in adults in Jamaica, 1993–1999[a]

	Men				Women			
	Known diabetes (n = 57)		Screened participants (n = 681)		Known diabetes (n = 130)		Screened participants (n = 1 013)	
Age (years)	55.7	(11.9)	46.3	(14.6)	57.5	(10.9)	44.6	(13.0)
Body mass index (kg/m^2)	25.7	(4.6)	23.7	(4.2)	29.0	(6.6)	27.9	(6.4)
Waist (cm)	88.7	(11.7)	80.3	(11.5)	87.7	(12.0)	82.9	(13.0)
Waist-to-hip ratio	0.90	(0.06)	0.84	(0.07)	0.84	(0.08)	0.79	(0.06)
Systolic blood pressure (mmHg)	130.4	(19.5)	120.3	(20.3)	131.5	(25.5)	119.2	(20.8)
Diastolic blood pressure (mmHg)	75.6	(13.9)	69.0	(14.3)	70.9	(13.4)	68.7	(13.9)
Prevalence of known hypertension (%)[b]	49.1	(28/57)	18.4	(123/669)	62.3	(81/130)	29.4	(294/1 001)

[a] Unless otherwise stated, the results are mean and standard deviation.
[b] The denominator in each fraction is the number of individuals who confirmed their hypertension status.

TABLE 2. Frequency of glucose status categories by 1999 World Health Organization fasting plasma glucose (FPG) and 2-hour post-challenge glucose (2hPG) criteria in individuals without a physician diagnosis of diabetes in study of impaired glucose regulation in adults in Jamaica, 1993–1999

	2hPG criteria			
FPG criteria	Normoglycemia (< 7.8 mmol/L)	Impaired glucose tolerance (7.8–11.0 mmol/L)	Diabetes (≥ 11.1 mmol/L)	Total/Overall
Normoglycemia (< 6.1 mmol/L)	1 301	206	12	1 519
Row %	85.7	13.6	0.8	100.0
Column %	95.6	78.9	16.7	89.7
Impaired fasting glucose (6.1–6.9 mmol/L)	44	34	14	92
Row %	47.8	37.0	15.2	100.0
Column %	3.2	13.0	19.4	5.4
Diabetes (≥ 7.0 mmol/L)	16	21	46	83
Row %	19.2	25.3	55.4	100.0
Column %	1.2	8.1	63.9	4.9
Total/Overall	1 361	261	72	1 694
Row %	80.3	15.4	4.3	100.0
Column %	100.0	100.0	100.0	100.0

in men, 0.2% in women, and 0.6% overall. The proportion of undetected diabetes was 34% overall by the FPG criteria and 31% by 2hPG.

The FPG criteria classified as normoglycemic 218 individuals with either IGT (206 persons) or diabetes (12 persons) by 2hPG criteria. The 149 women in this group were significantly more obese than were the men; the women had a mean BMI of 29.0 (SD = 6.0) vs. 24.5 (SD = 4.9) for the men (P < 0.0001). This difference re-

mained significant after adjustment for WHR. Table 4 shows factors that were predictive of missing this at-risk group when using only the FPG criteria. Women were at greater risk compared to men for being missed. Higher values for age, BMI, WHR, waist circumference, and systolic BP were also predictors. A history of hypertension, a family history of diabetes, and diastolic blood pressure were not significant predictors of being missed. None of the lipid measures was retained

since they either were not significant in univariate models or were not independent of obesity variables.

We examined two approaches to screen for IGT and diabetes in people with FPG < 6.1 mmol/L. Figure 1 shows the ROC curve for detection of 2hPG ≥ 7.8 mmol/L using FPG. The "optimal" cutoff of FPG was 5.1 mmol/L. This cutoff had a sensitivity of 73.0% and a specificity of 70.6%. There were 468 people with FPG between 5.1 and 6.1 mmol/L; of these

TABLE 3. Total prevalence (with 95% confidence interval (CI)) of diabetes using 1999 World Health Organization fasting plasma glucose (FPG) and 2-hour post-challenge glucose (2hPG) criteria in study of impaired glucose regulation in adults in Jamaica, 1993–1999

	FPG criteria		2hPG criteria	
	Prevalence	95% CI	Prevalence	95% CI
Men	11.4	9.2–13.9	10.2	8.1–12.6
Women	16.3	14.2–18.5	16.1	14.0–18.4
25–44 years	5.9	4.5–7.6	5.2	3.9–6.9
45–74 years	22.8	20.1–25.6	22.2	19.6–25.0
Overall	14.4	12.8–16.0	13.8	12.2–15.4

TABLE 4. Risk (odds ratio (OR) and 95% confidence interval (CI)) of nondetection of impaired glucose tolerance or diabetes by 1999 WHO 2hPG criteria using fasting plasma glucose criteria only, study of impaired glucose regulation in adults in Jamaica, 1993–1999[a]

Variable	OR	95% CI	*P* value
Age (per 10-year increase)	1.46	1.28–1.66	< 0.001
Sex (male = 0, female = 1)	1.86	1.27–2.75	0.002
Body mass index (per 5-kg/m^2 increase)	1.22	1.06–1.41	0.005
Waist-to-hip ratio (per 0.05 increase)	1.15	1.01–1.31	0.031
Systolic blood pressure (per 10-mmHg increase)	1.09	1.01–1.17	0.025
Waist circumference (per 10-cm increase)[b]	1.28	1.14–1.45	< 0.001

[a] Multivariate models were used and variables have been selected and given in the order of entry into the model. Odds ratios for model with age, sex, body mass index (BMI), waist-to-hip ratio (WHR), and systolic blood pressure are shown. Odds ratios for other covariates in the model with waist circumference substituted for BMI and WHR were similar to those reported.
[b] Separate model with age, sex, and systolic BP as other covariates.

FIGURE 1. Receiver operating characteristic (ROC) curve for the prediction of post-challenge glucose levels ≥ 7.8 mmol/L by fasting plasma glucose (FPG) in adults in Jamaica, 1993–1999
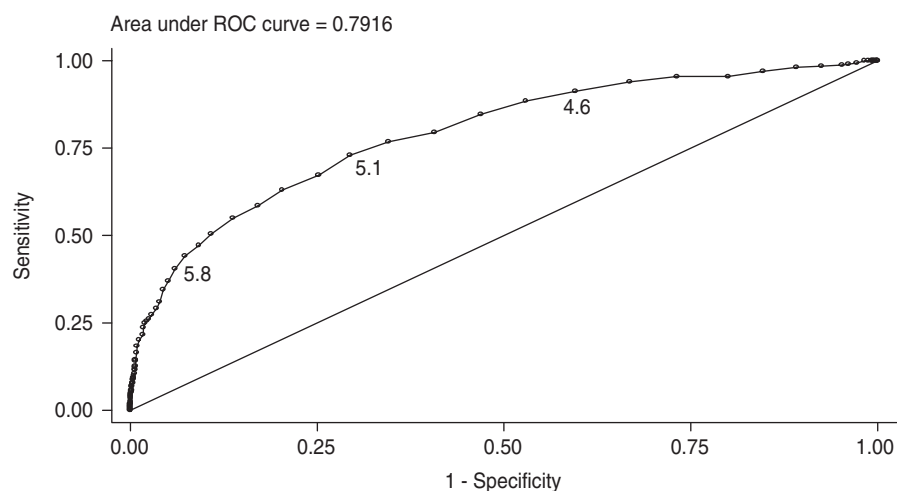
The numbers on the curving line are the FPG threshold values in mmol/L. A perfect test would have 100% specificity, and would be indicated by a point in the upper left-hand corner. The optimal cutoff point was 5.1 mmol/L. The curve for a test with no discriminatory power would appear as the diagonal line from the lower left corner to the upper right corner.

468, 117 of them had IGT and 11 had diabetes by the 2hPG criteria. Hence, lowering the threshold for IFG to 5.1 mmol/L would identify 59% of those with IGT or diabetes by 2hPG criteria who would be missed at the current threshold of 6.1 mmol/L.

Among the 92 participants with IFG as currently defined, an OGTT would identify 34 cases of IGT (37%) and 14 cases of diabetes (15%). Based on the results shown in Table 4, an approach to detecting abnormal OGTT results in those with normal FPG is proposed in Figure 2. We investigated several scores that included age, sex, systolic BP, and either one or more of BMI, WHR, and waist circumference. All scores had similar areas under the ROC curve, ranging from 0.66 to 0.68. The scores identified between 140 and 167 of the missed individuals, and in all the sensitivity and specificity was maximized (i.e., around 76% and 70%, respectively) at a score of 2 (i.e., presence of two or more risk factors).
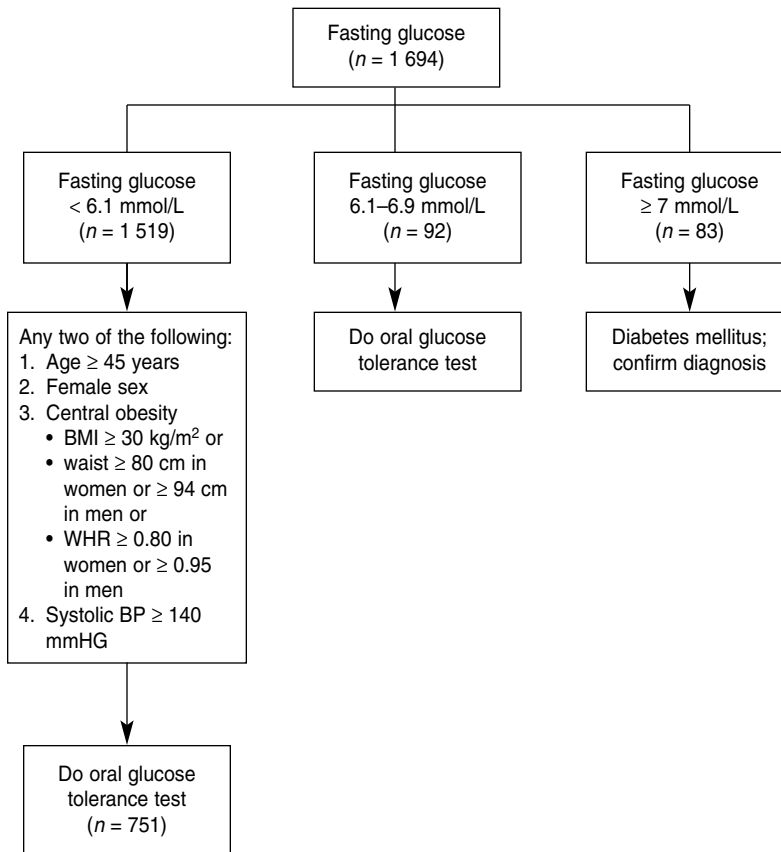
This approach would require performing an OGTT in 751 individuals with FPG < 6.1 mmol/L, and it would identify in this group 153 with IGT and 9 with diabetes by 2hPG criteria, or 74% of the 218 that would be missed if no OGTT were done (Figure 2).

DISCUSSION

The WHO has retained the OGTT as a diagnostic test for diabetes because of the variability in the concordance between the ADA criteria (13) and the 1985 WHO criteria worldwide (1, 16). Using the fasting glucose as the sole diagnostic test is much simpler and reflects more closely what happens in clinical practice. However, IGT is a well-established risk factor for type 2 diabetes and cardiovascular disease (17, 18). In addition, there are proven interventions that reduce risk in people with IGT (4–6, 19).

Our findings suggest that the FPG criteria resulted in a similar proportion of screen-detected diabetes compared to the 2hPG criteria. However, there was discordance in the intermediate glycemic categories, where IGT

FIGURE 2. Algorithm for use of the oral glucose tolerance test in screening in adults in Jamaica, 1993–1999

to be a more convenient and cost-effective strategy in identifying persons with diabetes. However, from a clinical perspective, 14% of individuals at clear risk for diabetes and diabetic complications would be classified as normal if only fasting glucose were used.

In addition, just over half of those identified as having IFG also have diabetes or IGT. People with IFG and IGT together have much greater risk for incident diabetes than do those with either isolated IFG or isolated IGT (3). Performing OGTT in people with IFG would help to better characterize their risk, and it is recommended by the WHO (1). The concern, however, is with those who would be deemed normal by current FPG criteria.

We explore two approaches to addressing this problem. The first would be to lower the threshold for IFG to 5.1 mmol/L. This approach is suggested by the American Diabetes Association, at least for the diagnosis of diabetes; the ADA recently lowered the threshold of the IFG to 5.6 mmol/L (26). Lowering the threshold to 5.1 mmol/L would mean doing an additional 468 OGTTs over the currently recommended approach and would identify 59% of those misclassified with respect to 2hPG criteria. The second approach would be to keep the FPG criteria as currently defined and use clinical information to identify people with normal FPG for screening with the OGTT. We propose that persons should be given an OGTT if they have a fasting glucose of < 6.1 mmol/L and have two or more of the following four characteristics: (1) age ≥ 45 years; (2) female sex; (3) central obesity as seen by BMI ≥ 30 kg/m², or waist ≥ 80 cm in women or ≥ 94 cm in men, or WHR ≥ 0.80 for women or ≥ 0.95 for men; or (4) systolic BP ≥ 140 mmHg. These risk categories were chosen to facilitate practical application of our results. This approach would require doing more OGTTs, but it would also have a higher yield in diagnosing diabetes than would merely lowering the FPG threshold.

One strength of the study is that the sample is sufficiently large to allow for

and IFG were found not to be equivalent categories. This is in keeping with other studies (20–22). The likelihood and consequences of missing individuals with impairment of glucose metabolism by using only the FPG criteria are potentially greater than would occur if only the OGTT were performed. The factors predicting the likelihood of missing these individuals by the FPG criteria were increased for female sex and for higher values for age, BMI, central obesity, and systolic blood pressure.

This result is important because higher age, BMI, and central obesity are associated with progression of IGT to diabetes (23, 24). Increased systolic blood pressure, as a component of the insulin resistance syndrome (25), also indicates increased risk for future cardiovascular disease in these individuals. The prevalence of diabetes is higher in women, who are also more likely to remain undiagnosed if FPG criteria are used alone.

From the public health point of view, both criteria produce acceptable results in terms of detecting undiagnosed diabetes. Jamaica does not have a national screening policy for diabetes, but opportunistic screening is commonly practiced. Those who seek medical attention, particularly for chronic diseases such as hypertension, are more likely to be screened for diabetes than are other persons. Hypertension is more common among women and the elderly in Jamaica. It is noteworthy that the largest differences in undetected diabetes between the criteria were found among men and those under the age of 45 years. Population screening using fasting glucose only is likely

stable estimates of prevalence of impaired glucose regulation. However, there is likely to be some selection bias with an overall participation rate of 60%. Our results were similar to those of surveys done in sub-Saharan Africa, suggesting than any selection bias is unlikely to invalidate our findings (22, 27).

The study is also population based, and the sample was selected by cluster sampling methodology to increase representativeness. The Spanish Town community is thought to be representative of the urban demographic profile of Jamaica and was chosen on the advice of the Statistical Institute of Jamaica because of this. Our findings are therefore likely to be generalizable to the adult population of Jamaica, but they should also apply to other Caribbean countries and developing countries in general that share similar socioeconomic and epidemiologic features (7).

One potential limitation of the study, however, is the fact that the OGTT has poor reproducibility. In one study, the intra-individual coefficient of variation was 16.7% when a second OGTT was performed two to six weeks later (28). Some of the variability may be due to differences in the conditions surrounding the performance of the test such as inadequate carbohydrate loading for the three days prior to the test, duration of fasting, and level of physical activity preceding the test. The poor reproducibility may also reflect the inherent variability of glucose homeostasis. It is not clear how our results might have changed on repeat testing.

However, if this variability is random, the overall reclassification of individuals within groups would probably result in an unchanged prevalence of IGT and diabetes. Also, prior epidemiologic data on incidence, prevalence, and sequelae of diabetes mellitus utilized a single OGTT performed on each individual (1, 13, 29, 30). Nevertheless, in clinical practice the diagnosis of diabetes should not be based on a single measure of blood glucose in asymptomatic individuals (1, 13). Individuals with screen-detected diabetes need confirmation by repeat testing.

While the overall prevalence of diabetes is similar with both criteria, the kappa statistic suggests that different people are being classified as cases. Since neither the FPG nor the OGTT can be considered the "gold standard" for diagnosing diabetes, the kappa statistic cannot test the relative or absolute accuracy or comparability of the two methods. Diabetes-specific outcomes, such as retinopathy, would be needed for this comparison. Repeat testing of individuals will result in reclassification of case status. For example, some individuals with IGT will be found to have diabetes on a repeat OGTT, and vice versa. Since there is variability in both the FPG and the OGTT, it is not possible to precisely quantify the true number of clinical cases of impaired glucose regulation using single glucose measures. Therefore, the actual yield of cases meeting the clinical definition of IFG, IGT, or diabetes requires repeat testing. Consequently, there must be caution in applying the results of this survey to the clinical setting.

In summary, the FPG criteria perform well in the Jamaican population with respect to identifying undetected diabetes but may misclassify a subgroup with IGT. These individuals, classified as normal on fasting glucose, will have features of insulin resistance, and an OGTT may be needed to identify them. They are at increased risk for diabetes and its complications, and effective interventions are available to reduce this risk. The yield of screen-detected IGT can be improved by lowering the threshold for IFG or by using clinical information to identify high-risk individuals. The latter approach may be a pragmatic one while the debate on the definition of IFG and IGT continues (31).

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RESUMEN

Alteraciones del control de la glucemia: ¿a quiénes se les debe hacer la prueba de tolerancia a una dosis oral de glucosa?

Objetivo. Comparar los criterios publicados por la Organización Mundial de la Salud (OMS) en 1999 acerca del uso de la prueba de glucemia en ayunas (PGA) y de la prueba de tolerancia a una dosis oral de glucosa con valoración a las dos horas (PTG2h) para identificar a adultos hiperglucémicos en Jamaica. Como la PTG2h no se administra normalmente en un contexto clínico, se investigaron los factores asociados con la inutilidad de la PGA para detectar a personas con hiperglucemia según la PTG2h.

Métodos. Se examinó una muestra aleatoria de 2 096 adultos de 25 a 47 años de edad que vivían en la ciudad de Spanish Town, Jamaica, para determinar la presencia de diabetes. Una vez que se eliminó a 215 personas por diversos motivos, entre ellos la ausencia de datos, quedaron 1 881 personas entre las cuales se encontraban 187 que se sabía de antemano que tenían diabetes y otras 1 694 que fueron sometidas tanto a la PGA como a la PTG2h.

Resultados. La PGA permitió detectar 83 casos de diabetes, mientras que la PTG2h permitió detectar 72. El estadístico kappa de comparación entre los dos criterios de valoración fue de 0,31 (intervalo de confianza de 95%: 0,28–0,34), valor que revela una concordancia moderada. Se observaron 261 casos de intolerancia a la glucosa tras la PTG2h y 92 casos de hiperglucemia en ayunas. En estas últimas 92 personas, la PTG2h sirvió para identificar 34 casos de intolerancia a la glucosa y 14 casos de diabetes. De las personas que se mostraron normoglucémicas según la PGA, 14% tenían intolerancia a la glucosa o diabetes, según la PTG2h. Algunos factores tuvieron valor pronóstico en relación con la falta de detección de la intolerancia a la glucosa o la diabetes. Estos fueron la edad, el índice de masa corporal, la concentración de la obesidad en el tronco y el abdomen, la tensión sistólica y el sexo femenino. De acuerdo con la curva de eficacia diagnóstica, una glucemia en ayunas de 5,1 mmol/L tendría valor pronóstico con respecto a la presencia de una glucemia de 7,8 mmol/L según la PTG2h.

Conclusiones. Algunas personas cuya glucemia en ayunas está dentro de lo normal tienen intolerancia a la glucosa o diabetes; por lo tanto, para identificarlas es necesario hacer la PTG2h. Se puede mejorar la detección de casos de intolerancia a la glucosa en Jamaica si se reduce el umbral de normalidad para la PGA o si se toman en cuenta los datos clínicos para identificar a las personas en alto riesgo.