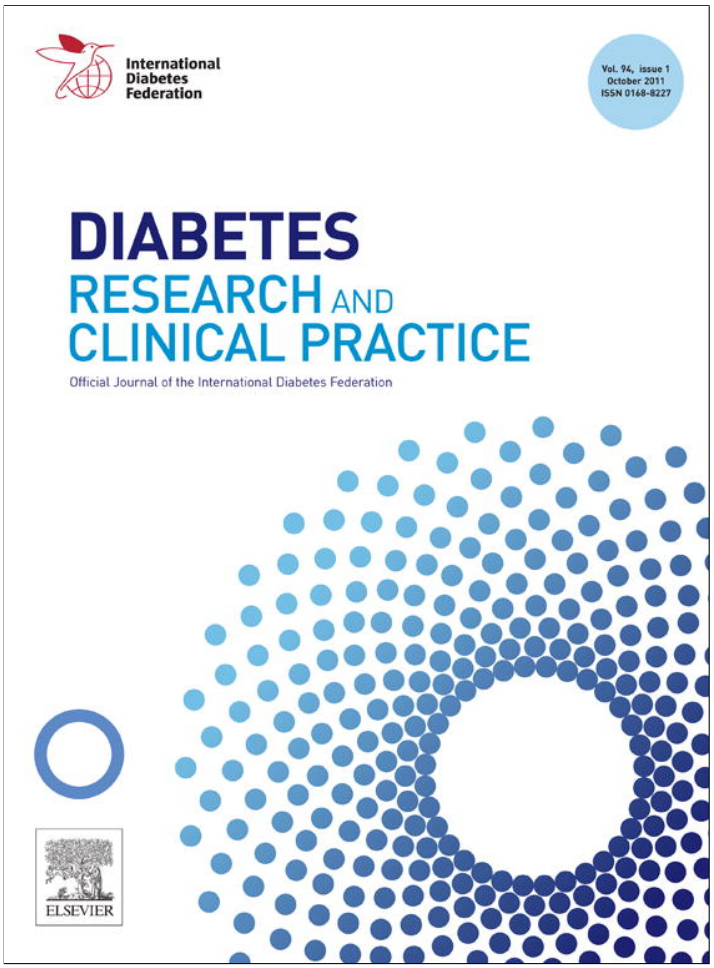

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Brief report

Inadequacy of fasting plasma glucose to diagnose gestational diabetes mellitus in Asian Indian women

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ABSTRACT

The prevalence of Gestational Diabetes Mellitus (GDM) diagnosed by WHO criterion (2-hPG ≥ 7.8 mmol/L) was 13.4%. By International Association of Diabetes and Pregnancy Study Groups criteria of FPG ≥ 5.1 mmol/L, prevalence of GDM was 3.2%. FPG may not be suitable for diagnosis of GDM in Asian Indians due to high insulin resistance in addition to pregnancy hormonal effect.

1. Introduction

Gestational Diabetes Mellitus (GDM) is defined as carbohydrate intolerance of varying severity with onset or first recognition during pregnancy [1]. GDM is associated with a significant incidence of diabetes in later life of the mother, an increase in fetal and neonatal morbidity and future development of obesity and diabetes in the offspring. The extent of this risk depends on the diagnostic criteria used to identify GDM [2]. In India, the diagnostic criterion of World Health Organization (WHO), 2-h PG ≥ 7.8 mmol/L after an 75 g oral glucose load [3], is in vogue to diagnose GDM. Now based on the Hyperglycemia and Adverse Pregnancy Outcome (HAPO) study, the International Association of Diabetes and Pregnancy Study Groups (IADPSG) consensus panel suggests that GDM can be diagnosed if fasting plasma glucose (FPG) ≥ 5.1 mmol/L but ≤ 7.0 mmol/L in the first prenatal visit, presumably during the first trimester [4]. IADPSG also recommends diagnosis of GDM if any one of the following plasma glucose values are met: ≥5.1 mmol/L, 1-h: ≥10.0 mmol/L, 2-h: ≥8.5 mmol/L with 75 g OGTT between 24 and 28 weeks of gestation. Using the IADPSG diagnostic criteria, 51% of GDM was diagnosed by an FPG > 5.1 mmol/L in the HAPO study. This prospective study was undertaken to ascertain the ability of FPG to diagnose glucose intolerance during pregnancy in our population.

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Table 1 – Performance of fasting plasma glucose test for the predictor of gestational diabetes and macrosomia.

FPG (mmol/L)	Test positive	2-h PG value		Macrosomia	
		Sensitivity (95% CI)	Specificity (95% CI)	Sensitivity (95% CI)	Specificity (95% CI)
5.0	3.9	29.1 (22.9–36.1)	89.4 (87.6–91.0)	21.2 (12.5–33.3)	87.2 (85.0–89.2)
5.1	3.2	24.0 (18.3–30.7)	93.0 (91.4–94.3)	15.2 (7.9–26.6)	90.2 (88.2–91.9)
5.5	1.8	13.8 (9.4–19.6)	97.4 (96.3–98.2)	6.1 (2.0–15.6)	95.6 (94.1–96.7)
6.1	0.9	7.1 (4.1–11.9)	99.2 (98.5–99.6)	1.5 (0.1–9.3)	98.2 (97.1–98.9)
6.6	0.6	4.6 (2.3–8.8)	99.8 (99.4–100.0)	0.0 (0.0–6.9)	99.3 (98.6–99.7)
2-h PG 7.8	13.4			13.6 (6.8–24.8)	86.3 (84.0–88.3)

2. Materials and methods

This study was started after obtaining Institutional Ethics Committee approval. After determining the desired sample size based on the overall prevalence of GDM in our population (13.9%) [6], a total of 1463 consecutive pregnant women who visited the antenatal clinic for the first time in the second and third trimester of pregnancy were recruited, as women in our population usually visit the antenatal clinic during this period of pregnancy. Details on maternal age, gestational weeks, parity and family history of diabetes were collected. Women with a previous history of GDM or diabetes were excluded. After a thorough clinical examination, body mass index (BMI) and blood pressure were recorded. Informed consent was obtained before collecting the blood samples. After drawing the venous blood in the fasting state, they were given 75 g oral glucose load and 2-h venous blood was drawn. The plasma glucose was estimated in the central laboratory by GOD-POD method. Pregnant women were diagnosed with GDM by the WHO criteria of 2-h PG $\geq$ 7.8 mmol/L (140 mg/dL) and the rest were classified as normal glucose tolerant (NGT) women.

2.1. *Statistical analysis*

Mean and standard deviations were computed for continuous data and proportion was calculated for discrete data. The diagnostic test procedure was employed to estimate test positive, sensitivity and specificity and its 95% confidence interval for different cut-off levels of plasma glucose value. Analysis was two tailed and p-value < 0.05 was considered statistically significant. Statistical analysis was performed by using SPSS version 10 package.

3. Results

The mean maternal age of the 1463 pregnant women was 23.6 ± 3.3 years and BMI was 21.5 ± 4.1 kg/m^2. The mean gestational weeks were 27.9 ± 5.6, with 52% (760) and 48% (702) in the second and third trimester, respectively. The mean FPG was 4.4 ± 0.6 mmol/L. Using the WHO criterion of 2-h PG $\geq$ 7.8 mmol/L, 196 women (13.4%) were diagnosed with GDM. Family history of diabetes was present in 18.3% of the pregnant women.

We examined the performance of FPG alongside the diagnosis of GDM by 2-h PG $\geq$ 7.8 mmol/L at various cut-off points starting from 5.0 mmol/L. From the cut-off point of 5.0 mmol/L onwards the sensitivity was less than 29.1%, although specificity was greater than 89.4% (Table 1).

We also assessed the FPG cut-off point 5.1 mmol/L recommended by IADPSG in relation to the diagnostic criterion of WHO. This cut-off point had a specificity of 92% and sensitivity of 24%. Thus, the ability of FPG to detect WHO defined GDM was 3.2% and the missing proportion of cases was 76% (Table 1).

4. Discussion

A number of changes and suggestions have been made for years to diagnose GDM. The new IADPSG recommendations suggest that GDM can be diagnosed on the basis of an FPG $\geq$ 5.1 mmol/L but $\leq$7.0 mmol/L at the first prenatal visit or by a 75 g OGTT between 24 and 28 weeks of gestation if any of the following values are found – FPG $\geq$ 5.1 mmol/L, 1-h PG: $\geq$10.0 mmol/L and 2-h PG: $\geq$8.5 mmol/L [4]. Based on the HAPO study the FPG $\geq$ 5.1 mmol/L criterion proposed by IADPSG would identify 51% of women who had GDM. [5].

In our population, by applying this criterion of FPG $\geq$ 5.1 mmol/L only 24% (3.2% of the total population) of those diagnosed as GDM using WHO criterion 2-h PG $\geq$ 7.8 mmol/L would have been classified as GDM. FPG $\geq$ 5.1 mmol/L failed to diagnose the majority of women with GDM compared with a 2-h PG $\geq$ 7.8 mmol/L. This is likely related to the well documented high insulin resistance (IR) in Asian Indians and as a consequence, higher postprandial plasma glucose compared with Caucasians [7,8]. Asian and South Asian ethnicity are both independently associated with increased IR in late pregnancy [9]. Das et al. documented an increased IR during pregnancy in Asian Indian women which increases further in GDM [10].

These studies provide evidence that FPG may not be an appropriate option to diagnose GDM in Asian Indian women and South Asian populations. Administering a 75 g oral glucose load and measuring 2-h PG serves as a one-step definitive procedure to diagnose GDM. Perucchini et al. also suggest a one-step diagnostic procedure although their observation was based on a different ethnic population [11]. The soundness of diagnosing GDM by the WHO criterion has been established by both short-term [11] and long-term [12] outcome studies in the off-springs of the mothers who had GDM [12,13].

5. Conclusion

FPG identifies the minority of GDM pregnancies in an Asian Indian population. This study strengthens our procedure of

diagnosing GDM with 2-h PG $\geq$ 7.8 mmol/L with 75 g oral glucose load. This cost-effective, evidence based and population specific procedure meets our responsibility of offering ''a single-step definitive glucose test'' [14].

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Conflict of interest

The authors declare that they have no conflict of interest.

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