The impact of potential new diagnostic criteria on the prevalence of gestational diabetes mellitus in Australia

Robert G Moses, Gary J Morris, Peter Petocz, Fernando San Gil and Dinesh Garg

ABSTRACT

Objective: The International Association of Diabetes and Pregnancy Study Groups (IADPSG) has proposed new criteria for the diagnosis of gestational diabetes mellitus (GDM). The aim of this study was to compare the prevalence of GDM when IADPSG criteria were used with the prevalence when the current Australasian Diabetes in Pregnancy Society (ADIPS) criteria were used.

Design, setting and participants: This was a prospective study over a 6-month period, examining the results of all glucose tolerance tests (GTTs) conducted for the diagnosis of GDM in Wollongong, a city using the public and private sectors.

Main outcome measures: The prevalence of GDM using the existing (ADIPS) and the proposed (IADPSG) criteria.

Results: There were 1275 evaluable GTTs (571 public and 704 private). Using the current ADIPS diagnostic criteria, the prevalence of GDM was 8.6% (public), 10.5% (private) and 9.6% (overall). Using the proposed IADPSG criteria, the prevalence of GDM was 9.1% (public), 16.2% (private) and 13.0% (overall).

Conclusions: The proposed IADPSG criteria would increase the prevalence of GDM from 9.6% to 13.0% ($P < 0.001$). In our study in the Wollongong area, which has a population with a predominantly white background, this increase came mainly from older women attending a private pathology provider. Data from both the public and private sectors need to be included in any discussion on the change in prevalence of GDM.

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Gestational diabetes mellitus (GDM) is associated with a strong probability of the mother developing type 2 diabetes in the future and with adverse perinatal outcomes, especially the risk of "intrauterine programming" of the fetal pancreas for development of obesity and diabetes later in the baby's life.[1]

GDM is generally acknowledged as glucose intolerance of variable severity, with onset or first recognition during the current pregnancy.[2] Worldwide, there are several diagnostic criteria. The original criteria of 1964 (derivations of which are still widely used) were based on the prediction of the development of maternal diabetes.[3] The Australasian Diabetes in Pregnancy Society (ADIPS) developed consensus criteria for the diagnosis of GDM in 1991.[4] These criteria have been restated[5] and have been widely used for about 20 years.

The Hyperglycemia and Adverse Pregnancy Outcome (HAPO) study, published in 2008, was a large, blinded, multinational, multicentre study that examined pregnancy outcomes for women with intermediate degrees of glucose intolerance.[6] A consensus panel of the International Association of Diabetes and Pregnancy Study Groups (IADPSG) was formed to consider the results of the HAPO study. The consensus panel was also able to take into consideration two recent large randomised trials demonstrating the advantages of treating women with "mild" degrees of glucose intolerance.[7,8] As a result, the IADPSG have suggested new diagnostic criteria for glucose tolerance testing in pregnancy that are indicative of adverse perinatal outcomes.[9]

The new IADPSG criteria are likely to diagnose more women with GDM than the ADIPS criteria. This prospective study was established to determine the prevalence of GDM, comparing use of the IADPSG criteria with the ADIPS criteria.

METHODS

This study was carried out in the New South Wales city of Wollongong, which has a population of about 280 000 people. The vast majority of obstetric services for this population are conducted within the area. There are between 3000 and 3300 births each year in the public and private sectors. About one-third of births occur in a private hospital and two-thirds in public hospitals. A previous study has demonstrated more than 90% compliance with universal testing for GDM.[10] Thus, in a 6-month period, it could be anticipated that between 1450 and 1500 women would be tested for GDM.

The ADIPS criteria for GDM are based on the results of either the fasting or the 2-hour plasma glucose level after a 75 g glucose tolerance test (GTT). A diagnosis of GDM is established if the fasting plasma glucose level is ≥ 5.5 mmol/L or the 2-hour level is ≥ 8.0 mmol/L. Unless a GTT is indicated earlier, all pregnant women in Wollongong are offered a GTT at the beginning of their third trimester. No preliminary challenge test is used. Using the ADIPS criteria, only fasting and 2-hour plasma glucose samples have been used.

The IADPSG criteria have proposed a diagnosis of GDM if any of the following plasma glucose levels are established: fasting plasma glucose level, ≥ 5.1 mmol/L; plasma glucose level 1 hour after glucose load, ≥ 10.0 mmol/L; or 2 hours after glucose load, ≥ 8.5 mmol/L. To prepare for the possible new criteria and to compare the current prevalence of GDM using the ADIPS and IADPSG criteria, all pregnant women having a GTT had fasting, 1- and 2-hour blood samples taken. This was done for a 6-month period from the beginning of January 2010 until the end of June 2010, and is continuing.

The overwhelming majority of GTTs carried out during pregnancies in the Wollongong area are conducted by the public hospital or a dominant private pathology provider (Southern IML Pathology), which has 18 collection centres across the area and one central laboratory. For the network of public hospitals, testing was done at Wollongong Hospital for women attending the antenatal clinics. Other women were tested at the private pathology provider. About half the women attending the private pathology provider were patients of obstetricians in private practice, and half were in a shared-care arrangement with a general practitioner and would eventually be managed at the antenatal clinic of a public hospital.

All GTTs were conducted according to a standard procedure. The women were asked

Comparison of number of women diagnosed with GDM by the ADIPS and IADPSG criteria

	ADIPS		IADPSG	
Pathology test centre	Number	Proportion (95% CI)	Number	Proportion (95% CI)
Wollongong Hospital (n = 571)	49	8.6% (6.4%–11.2%)	52	9.1% (6.9%–11.8%)*
Private centre (n = 704)	74	10.5% (8.3%–13.0%)	114	16.2% (13.5%–19.1%)†
Total (n = 1275)	123	9.6% (8.1%–11.4%)	166	13.0% (11.2%–15.0%)†

GDM = gestational diabetes mellitus. ADIPS = Australasian Diabetes in Pregnancy Society. IADPSG = International Association of Diabetes and Pregnancy Study Groups. * Not significant. † $P < 0.001$. ◆

to undertake 3 days of carbohydrate loading, and to present in the morning after an overnight fast of 12 hours. After a preliminary fingerprick sample to check that their plasma glucose levels were not significantly elevated (this occurred at Wollongong Hospital only), a fasting blood sample was taken and a 75 g glucose load was administered. Samples were then taken at 1 and 2 hours after glucose loading. Women were asked to refrain from smoking and to rest during the course of the GTT.

Samples were collected by a trained phlebotomist into commercial tubes containing sodium fluoride and EDTA (anticoagulants) and centrifuged. Laboratory estimations of plasma glucose were done using a hexokinase method according to the manufacturer's recommendations. In Wollongong Hospital, the Roche Cobas 6000 analyser was used, and at Southern IML, the Roche Cobas 8000 analyser was used (Roche Diagnostics, Mannheim, Germany).

Tests of statistical significance were performed using the McNemar test.

RESULTS

There were 1422 GTTs conducted, of which 1275 (571 public and 704 private) (90%) were able to be evaluated. The major reasons for the reduction in evaluable GTTs were transition problems, resulting in an absence of some 1-hour blood samples.

The number of women diagnosed with GDM by the ADIPS or the IADPSG criteria are shown in the Box. Significantly more women attending the private pathology provider, and in total, were diagnosed by the IADPSG criteria. The women attending the public hospital had a mean age of 28.5 years, and women attending the private pathology provider had a mean age of 31.3 years.

With any change in diagnostic criteria, there will be some overlap. Of women diagnosed with GDM according to the ADIPS criteria, 22/123 (18%) would not have had an abnormal result with the IADPSG criteria. Of the women diagnosed with GDM according to the IADPSG criteria, 65/166 (39%) would not have had an abnormal result with the ADIPS criteria.

The proposed IADPSG criteria will shift the emphasis from the post-glucose load test result to the fasting blood glucose test result. In our series, only 22% of women would be diagnosed with GDM on their fasting glucose level using the ADIPS criteria, but using the IADPSG criteria, 57% would be diagnosed on their fasting glucose level.

In the IADPSG recommendations,[9] the proportion of women diagnosed using the fasting, 1- and 2-hour test results were 51%, 36% and 13% respectively. Our figures for the Wollongong area were similar for the fasting, 1- and 2-hour results: 57%, 28% and 16% respectively.

In 2009, 87.4% of the women who gave birth to babies in Wollongong Hospital and 93.4% of the women who gave birth to babies in the private hospital were born in Australia or were from countries with a predominantly white background. Given that two-thirds of deliveries are in the public system, this would give an overall estimated rate of women with a white background of 89.4%.

DISCUSSION

One of the strengths of the HAPO study and the subsequent IADPSG deliberations was that the results appeared to be applicable to different ethnic groups and in different countries. This raised the possibility of worldwide, evidence-based consensus criteria for the diagnosis of GDM. The IADPSG criteria would have diagnosed 17.8% of the women in the HAPO study with abnormal glucose tolerance. It is probable that the proposed new criteria will diagnose a greater proportion of women than the current ADIPS criteria, and it is this potential increase in the number of women being diagnosed that will need to be considered.

The prevalence of GDM in the Wollongong area has been consistent for over 10 years, having been reported as 7.2% in 1993[10] and 6.6% in 2003[11] using data from the public and private sectors. These data were collected independently from the government statistics, which have been shown to be unreliable, and underestimate the prevalence of GDM.[12]

In our study, we ascertained GDM at the point of testing, and used data from the public and private sectors. The current prevalence of GDM in Wollongong using ADIPS criteria is 9.6% for the total population, ranging from 8.6% in women attending the public hospital to 10.5% in women attending a private pathology provider. A previous report[11] has also demonstrated differences in the prevalence of GDM between the public and private sectors. Using the proposed new IADPSG criteria, the prevalence of diagnosed GDM will increase to 13.0%, with differences between the public (9.1%) and the private sectors (16.2%).

The overall prevalence of 13.0% is similar to that at other Australian sites. Application of the IADPSG criteria to the two Australian cities participating in the HAPO study indicated a GDM prevalence in Brisbane of 12.1% and in Newcastle of 13.6%.[13]

Recording ethnicity data at the time of the GTT was not practical, given that there were 18 different collection centres operated by the private pathology provider. The prevalence of GDM varies greatly, depending on the rate of type 2 diabetes in the population being tested and on maternal age. Centres with a high proportion of mothers from ethnic backgrounds particularly at risk (Middle Eastern, Pacific Islander, Asian and Indian women) will have a higher prevalence and an earlier onset of type 2 diabetes, and hence a higher prevalence of GDM.

In Australia in 2007 (the most recent data available),[14] 83.5% of women giving birth were born in Australia or were from countries with a predominantly Caucasian background. In the Wollongong area in 2009, 89.4% of pregnant women were born in Australia or came from countries with a predominantly Caucasian background. This rate is slightly higher than, but not dissimilar to, the Australian rate,[14] so we feel confident that the incidence of GDM reported here will be reasonably representative and can be used as a source for national estimates.

Previously, the ADIPS criteria diagnosed the majority of women with GDM on the basis of the 2-hour post-glucose load test

result. The proposed adoption of the IADPSG diagnostic criteria will mean a paradigm shift, with far greater emphasis being placed on the fasting plasma glucose level. The figure of 57% of women being diagnosed on the result of the fasting test in the Wollongong area is similar to the 51% reported from the IADPSG analysis of the HAPO study results.

This study has strengths and weaknesses. The strengths are that it is prospective, of reasonable size and has an ethnic distribution not dissimilar to the national data. It also includes, by gathering data from the public and private sectors, almost all of the tests done in a city over a 6-month period. Given the differences in the prevalence of GDM between the two sectors, we feel that any future meaningful discussion about the prevalence of GDM must not be confined to public hospitals but must include the wider private sector.

The major weakness was that we were unable to record the women's country of birth at the time of collection; however, given their predominantly Caucasian backgrounds, these data would be unlikely to significantly influence the overall result.

Adoption of the IADPSG criteria for the diagnosis of GDM will increase the prevalence of diagnosed GDM in the Wollongong area from 9.6% to 13.0%. The potential disadvantages of the new criteria relate to resource allocation, the absence of cost–benefit analyses and the potential for causing harm due to increased obstetric and neonatal interventions. Concerns about increased workload, particularly in areas with a high proportion of women from an ethnic background at higher risk of GDM, have recently been outlined.[15] However, the advantage is the IADPSG criteria have a strong evidence base for outcomes and may well become the international standard.

COMPETING INTERESTS

None identified.

AUTHOR DETAILS

Robert G Moses, MD, Endocrinologist[1]
Gary J Morris, BAppSc, Scientific Officer, Department of Biochemistry[2]
Peter Petocz, PhD, Associate Professor of Statistics[3]
Fernando San Gil, PhD, Principal Scientist, Department of Biochemistry[1]
Dinesh Garg, MD, Endocrine Registrar[1]
1 Wollongong Hospital, Wollongong, NSW.
2 Southern IML Pathology, Wollongong, NSW.
3 Macquarie University, Sydney, NSW.
Correspondence:
robert.moses@sesiahs.health.nsw.gov.au

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