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Original Research

Population-Level Outcomes with a 2-Step Approach for Gestational Diabetes Screening and Diagnosis

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ABSTRACT

Objectives: To examine outcomes associated with alternative glucose thresholds in a 2-step approach for screening and diagnosing gestational diabetes mellitus (GDM).
Methods: We studied 178,527 pregnancies between 2008 and 2012 in Alberta, Canada. They were categorized retrospectively as normal 50 g screen (n=144,191); normal 75 g oral glucose tolerance test (OGTT) (n=21,248); abnormal at glucose thresholds suggested by the International Association of Diabetes and Pregnancy Group (IADPSG) (HAPO 1.75, n=4308); abnormal at glucose thresholds associated with an odds ratio of 2.0 for adverse events in the Hyperglycemia and Adverse Pregnancy Outcomes (HAPO) study. This latter group, which would have been treated for GDM based on customary care, was further divided into those with 1 (HAPO 2-1 n=5528) or 2 or more abnormal glucose values (HAPO 2-2 n=3252). Main outcomes were large for gestational age (LGA), induced labour and Cesarean-section rates.
Results: LGA rates were 8.2%, 10.5%, 14.2%, 11.8% and 16.5% among normal 50 g, normal 75 g OGTT, HAPO 1.75, HAPO 2-1, and HAPO 2-2 groups, respectively. Labour induction and caesarean-section rates were 29.6% and 36.2% in the IADPSG, 38.2% and 36.8% in the HAPO 2-1 group, and 42.3% and 41.1% in the HAPO 2-2 groups, respectively. Excessive maternal weight (≥91 kg) was associated with a higher risk for all adverse outcomes.
Conclusions: The 2-step approach effectively identifies pregnancies at low risk for adverse outcomes. Labelling influences induction practice. Any glucose intolerance increases risk for adverse outcomes, and pregnancies with highest (2 or higher) abnormal glucose values remain at greatest risk. Further research is needed to determine whether glycemic thresholds for GDM diagnosis should incorporate information about maternal weight.

Mots clés :
diabète
diabète gestationnel
hypertrophie fœtale
grossesse
dépistage

RÉSUMÉ

Objectifs : Examiner les résultats associés à d'autres seuils glycémiques dans le cadre d'une approche en deux étapes pour le dépistage et le diagnostic du diabète gestationnel.
Méthodologie : Nous avons étudié 178 527 grossesses survenues entre 2008 et 2012 en Alberta, Canada. Les grossesses ont été classées par catégorie de manière rétrospective comme suit : valeur normale au dépistage du diabète gestationnel après une charge de 50 g de glucose (n=144 191); valeur normale après une charge de 75 g de glucose lors de l'épreuve d'hyperglycémie provoquée par voie orale (HGPO) (n=21 248); valeur anormale par rapport aux seuils glycémiques suggérés par l'*International Association of Diabetes and Pregnancy Study Group* (IADPSG) (étude HAPO 1.75 [*Hyperglycemia and Adverse Pregnancy Outcome*], n=4308); valeurs anormales par rapport aux seuils glycémiques associés à un rapport de cotes de 2,0 pour les effets indésirables d'après l'étude HAPO. Ce dernier groupe, qui aurait dû être traité pour un diabète gestationnel selon les soins habituels, a été divisé de nouveau en deux groupes, un présentant une valeur glycémique anormale (HAPO 2-1, n=5528) et l'autre présentant au moins deux valeurs glycémiques

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anormales (HAPO 2-2, n=3252). Les principaux paramètres d'évaluation étaient les taux d'hypertrophie fœtale, d'accouchement provoqué et de césarienne.
Résultats : Les taux d'hypertrophie fœtale étaient de 8,2 %, de 10,5 %, de 14,2 %, de 11,8 % et de 16,5 % dans le groupe ayant des valeurs glycémiques normales après une charge de 50 g de glucose, celui ayant des valeurs glycémiques normales après une épreuve HGPO 75 g et les groupes HAPO 1.75, HAPO 2-1 et HAPO 2-2, respectivement. Les taux d'accouchement provoqué et de césarienne étaient de 29,6 % et de 36,2 % dans le groupe IADPSG, de 38,2 % et de 36,8 % dans le groupe HAPO 2-1 et de 42,3 % et de 41,1 % dans le groupe HAPO 2-2, respectivement. Un poids maternel excessif (≥91 kg) était associé à un risque plus élevé d'issues défavorables, quelles qu'elles soient.
Conclusions : L'approche en deux étapes permet de détecter efficacement les grossesses à faible risque d'issues défavorables. L'étiquette « intolérance au glucose » influence la pratique relative au déclenchement artificiel du travail. Toute intolérance au glucose augmente le risque d'issues défavorables, et les grossesses présentant les valeurs glycémiques anormales (deux ou plus) les plus élevées sont associées au risque le plus important. Des recherches plus poussées sont nécessaires pour déterminer si les seuils glycémiques servant au diagnostic du diabète gestationnel devraient incorporer les renseignements sur le poids maternel.

Introduction

The diagnostic criteria for gestational diabetes (GDM) remain hotly debated and highly controversial. Much of this controversy stems from the fact that large observational studies, such as the Hyperglycemia and Adverse Pregnancy Outcome (HAPO) study (1–3), have demonstrated a continuous positive relationship between glucose and a variety of pregnancy outcomes (of varying clinical importance) with no clear threshold above which adverse pregnancy outcomes occur. The criteria put forth by the International Association of the Diabetes and Pregnancy Study Groups (IADPSG) (4) involve 2 major changes from past practice: 1) they abandon the 50 g screening test in favour of a single-step oral glucose tolerance test (OGTT); and 2) they suggest diagnostic glucose thresholds on the OGTT that correspond to a 1.75-fold increase in risk relative to that of the median glucose results for fasting and 1 and 2 hours following a 75 g glucose load for a large-for-gestational age (LGA) infant, elevated cord C-peptide and high neonatal body fat, based on data from the HAPO study. Equalling or exceeding 1 or more values on this test defines the presence of GDM. However, others (5–7), including the American College of Obstetricians and Gynecologists and the Canadian Diabetes Association (CDA) (now Diabetes Canada), recommend a 2-step approach to screening and diagnosis as their preferred method, with the latter using thresholds that correspond to a 2-fold risk for adverse outcomes in the HAPO study (HAPO 2.0) (7).

The recent National Institutes of Health Consensus Statement on diagnosing GDM (8) is supportive of a 2-step approach but identified the lack of "real world" data on the risk for adverse pregnancy outcomes, care utilization and practice patterns associated with different GDM diagnostic criteria as a major research gap. Accordingly, we examined maternal and neonatal outcomes associated with the 1.75 and 2.0 risk thresholds identified by the HAPO study in a large population-level cohort of pregnant women screened and diagnosed as having GDM using a 2-step approach in Alberta, Canada.

Methods

Data sources and linkages

Ethics approval for this study was obtained from the University of Alberta institutional review board IRB (# Pro 00020230).

The data sources and linkages have been previously described (9). Briefly, data from the Alberta Perinatal Health Program (APHP), a provincial perinatal database, were linked, using unique personal health numbers, with laboratory data from the Data Integration Measurement and Reporting unit of Alberta Health Services. The APHP collects maternal information, including age; prepregnancy weight (collected as categorical variable ≤45 kg and ≥91 kg); prepregnancy medical conditions; smoking during pregnancy; gestational age; pregnancy complications; obstetric information, including labour induction, caesarean delivery (C-section); and neonatal information, including birth weight, Apgar score, stillbirth, death, from the provincial delivery record for all hospital and registered midwife-attended home births in the province of Alberta, Canada. Centralized laboratory data on glucose-related testing were available from January 1, 2008. During the study period, the women were delivered at 78 hospitals. Four provincial laboratories administered the collection and measurement of glucose tests. All laboratories used in Alberta are accredited for glucose measurement by the College of Physicians and Surgeons of Alberta and have acceptable precision for glucose measurements. The 2006 census data were used to incorporate median household income (MHI) information at a neighbourhood level as a measure of the socioeconomic status of the mothers in the cohort (10).

Study design and population

Our retrospective population-based cohort study included all pregnancies that occurred between October 1, 2008, and December 31, 2012, in the province of Alberta, Canada. Alberta has universal healthcare for its approximately 4 million residents (11). These dates were selected because province-wide laboratory reporting became available on January 1, 2008. In order to avoid missing any pregnancies with early screening or diagnoses of GDM, we restricted the population to birth events that occurred after the first 270 days of 2008 (i.e. October 1, 2008). Our available data set contained information through December 31, 2012. Screening for GDM is recommended by 28 completed weeks of gestation; therefore, women who delivered prior to 29 gestational weeks were excluded. Pregnancies of women with preexisting diabetes, identified from the APHP antepartum record, were also excluded. We included only pregnant women who had had gestational diabetes screening, i.e. a 50 g GDM screen followed by a 75 g OGTT when screening was 7.8 mmol/L (140 mg/dL) or higher or a 75 g OGTT alone. We have previously documented that more than 90% of pregnant women in Alberta undergo GDM screening (9).

Definition of diagnostic groups

In Alberta, GDM is diagnosed using a 2-step approach, in keeping with the *Canadian Diabetes Association 2013 Clinical Practice Guidelines for the Prevention and Management of Diabetes in Canada* (7,12). They recommend a randomly timed 50 g glucose screen for all pregnant women without previous diagnoses of diabetes by 24 to 28 weeks' gestation, followed by a 75 g OGTT when the screening test is 7.8 mmol/L (140 mg/dL) or higher and less than a high threshold