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Original Article

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Maternal and neonatal outcomes among women diagnosed with GDM by NICE criteria but not by IADPSG criteria in China: A retrospective cohort study

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Abstract

In China, gestational diabetes mellitus (GDM) is typically diagnosed using the International Association of Diabetes and Pregnancy Study Groups (IADPSG) criteria. This study retrospectively analyzed 19 152 pregnant women who underwent an oral glucose tolerance test between 2015 and 2021, comparing the IADPSG and the National Institute for Health and Care Excellence (NICE) criteria. GDM prevalence was 20.39% (IADPSG) and 23.67% (NICE, $P < 0.01$), with a moderate diagnostic agreement (kappa = 0.59; $P < 0.01$). Compared with women having normal glucose tolerance (NGT group), women diagnosed with GDM by either the IADPSG (GDM-I) or NICE (GDM-N) criteria had significantly higher risks of adverse outcomes (including gestational hypertension, pre-eclampsia, preterm delivery, macrosomia, low birth weight, and neonatal jaundice). However, those diagnosed by NICE but not by IADPSG (GDM-NI) showed no significant increase in adverse maternal or neonatal outcomes except for neonatal jaundice. Furthermore, the GDM-NI group had significantly lower rates of most adverse outcomes compared wtih the GDM-I group. These findings indicate that the IADPSG criteria are more effective than the NICE criteria for predicting adverse pregnancy outcomes in Chinese women, as they identify a higher proportion of complications while diagnosing fewer patients with GDM.

Keywords: Gestational diabetes mellitus, IADPSG, NICE, Incidence, Adverse Pregnancy Outcomes

Introduction

Gestational diabetes mellitus (GDM), defined as any degree of glucose intolerance with onset or first recognition during pregnancy, is increasing in prevalence worldwide, driven in part by rising obesity rates[1]. According to the 2021 International Diabetes Federation (IDF) report, approximately 16.7% (21.1

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million) of live births globally were affected by maternal hyperglycemia, with GDM accounting for 80.3% of cases, pre-existing diabetes for 10.6%, and first-diagnosed diabetes during pregnancy (including type 1 and type 2 diabetes) for 9.1%[2]. Untreated GDM poses significant risks to both mother and baby, increasing the risk of adverse outcomes such as pre-eclampsia, preterm delivery, cesarean section, macrosomia, shoulder dystocia, and neonatal hyperbilirubinemia[3–4]. However, early diagnosis through standardized screening allows prompt intervention with dietary control, physical activity advice, or even insulin therapy if needed, thereby markedly improving pregnancy outcomes[5].

The prevalence of GDM varies widely among populations, ranging from 5% to 25%[6–7]. This variability stems not only from geographical and ethnic factors but also critically depends on the screening methods and diagnostic criteria applied. Currently, there is no universal consensus on the definition of GDM, leading to significant variations in diagnostic thresholds, screening timing, and testing methodologies. Before 2008, the diagnostic criteria for GDM were the same as those for non-pregnant individuals, which did not account for the changes in carbohydrate metabolism during pregnancy. In 2010, the International Association of Diabetes and Pregnancy Study Group (IADPSG) established new diagnostic criteria for GDM based on glucose thresholds associated with an odds ratio of 1.75 for adverse pregnancy outcomes, as identified in the Hyperglycemia and Adverse Pregnancy Outcomes (HAPO) study. These criteria recommend a 75-g oral glucose tolerance test (OGTT) at 24–28 weeks of gestation, with thresholds of fasting plasma glucose (FPG) ≥ 5.1 mmol/L, 1-hour glucose ≥ 10.0 mmol/L, or 2-hour glucose ≥ 8.5 mmol/L (***Table 1***)[8]. Although multiple studies have shown that the IADPSG criteria identify more GDM cases than the two-step approach[9–10], Duran *et al*[10] demonstrated that application of the IADPSG criteria improved pregnancy outcomes at a lower cost compared with prior diagnostic criteria. Consequently, the IADPSG criteria have since been widely adopted by major organizations, including the World Health Organization (WHO)[11], the American Diabetes Association (ADA)[12], the Australian Diabetes in Pregnancy Society[13], and the European Board and College of Obstetrics and Gynecology[14]. In China, both the 2014 "Guidelines for Diagnosis and Treatment of Diabetes in Pregnancy"(published in Chinese)[15] and the 2022 "Guidelines for Diagnosis and Treatment of Hyperglycemia in Pregnancy"[16] also endorse the IADPSG diagnostic approach.

However, the IADPSG criteria's lower fasting glucose cutoff has raised concerns regarding potential overdiagnosis, increased resource allocation, and increased medicalization of pregnancy[17]. In contrast, the UK's National Institute for Health and Care Excellence (NICE) developed alternative criteria in 2015, which feature a higher fasting threshold (≥ 5.6 mmol/L), lower 2-hour cutoff (≥ 7.8 mmol/L), and exclusion of the 1-hour measurement, based on comprehensive health economic modeling of immediate pregnancy complications (***Table 1***). Several studies have found that the NICE criteria result in a lower incidence of GDM than the IADPSG criteria[18–20] and are cost-effective[20]. This divergence in diagnostic approaches reflects ongoing debates about optimal GDM screening strategies and threshold determinations, and to date, no studies have specifically compared these diagnostic approaches in Chinese populations.

In the present study, we aimed to compare the performance of the IADPSG and NICE criteria for diagnosing GDM and to assess pregnancy outcomes in women diagnosed by NICE but not by IADPSG in a Chinese cohort.

Subjects and methods

Study population

This retrospective cohort study included 19 152 women with singleton pregnancies who received complete prenatal care and delivered at the First Affiliated Hospital of Nanjing Medical University

Table 1 **Diagnostic Thresholds for GDM Based on IADPSG and NICE Criteria**

	Plasma Glucose level (mmol/L)			Diagnostic criteria
	FPG	1-hour OGTT	2-hour OGTT	
IADPSG	≥ 5.1	≥ 10.0	≥ 8.5	If any value meets the requirements, it is diagnosed as GDM
NICE	≥ 5.6	–	≥ 7.8	

To convert glucose value from mmol/L to mg/dL, multiply by 18. "–" indicates data not available.
Abbreviations: FPG, fasting plasma glucose level; OGTT, oral glucose tolerance test; IADPSG, International Association of Diabetes and Pregnancy Study Groups; NICE: National Institute for Health and Care Excellence.

between January 2015 and December 2021. Inclusion criteria were: (1) singleton live birth after 28 weeks' gestation; and (2) completion of 75-g OGTT at 24-28 gestational weeks. We excluded pregnancies with any of the following conditions: pre-gestational diabetes mellitus (defined as diabetes diagnosed prior to pregnancy or overt diabetes in pregnancy[21]—fasting plasma glucose ⩾ 7.0 mmol/L, 2-hour plasma glucose ⩾ 11.1 mmol/L on a 75-g OGTT, random plasma glucose ⩾ 11.1 mmol/L, or glycated hemoglobin ⩾ 6.5%), multiple gestation, fetal demise (stillbirth or miscarriage), pre-existing chronic medical conditions, severe pregnancy complications, or incomplete clinical records.

All procedures in this study were approved by the ethics committee of the First Affiliated Hospital of Nanjing Medical University (Approval No. 2021-SR-055). Informed consent was waived due to the retrospective nature of the study.

Information collection

Maternal and neonatal data were obtained from electronic medical records. Maternal parameters included: (1) demographic data (age, pre-pregnancy weight, and height); (2) metabolic parameters (75-g OGTT values at 24–28 gestational weeks); and (3) maternal outcomes (gestational hypertension, preeclampsia, cesarean delivery, preterm birth, and macrosomia). Neonatal outcomes included fetal distress and neonatal jaundice. Pre-pregnancy body mass index (BMI) was calculated by dividing pre-pregnancy weight in kilograms by the square of height in meters.

Diagnostic definition of GDM by IADPSG and NICE criteria

All participants completed a standardized 75-g OGTT between 24-28 weeks of gestation. As shown in ***Table 1***, women whose FPG was ⩾ 5.1 mmol/L and/or 1-hour OGTT was ⩾ 10.0 mmol/L and/or 2-hour OGTT was ⩾ 8.5 mmol/L were defined as GDM by IADPSG criteria (Chinese criteria), whereas those whose FPG was ⩾ 5.6 mmol/L and/or 2-hour OGTT was ⩾ 7.8 mmol/L were defined as GDM by NICE criteria.

All women diagnosed with GDM by IADPSG criteria received intensive dietary and lifestyle counseling plus instructions for self-monitoring of capillary glucose, in accordance with the Chinese guidelines derived from IADPSG. Insulin therapy was initiated if fasting glucose exceeded 5.3 mmol/L or 2-hour postprandial glucose exceeded 6.7 mmol/L despite optimized intervention.

Definition of maternal and neonatal outcomes

We compared ten adverse maternal and neonatal outcomes: (1) Gestational hypertension (blood pressure >140/90 mm Hg after the 20th week of pregnancy without proteinuria); (2) Preeclampsia (blood pressure > 140/90 mm Hg after the 20th week of pregnancy and proteinuria >300 mg in 24-h); (3) Prenatal hemorrhage (any vaginal blood loss after the 24th week of gestation); (4) Postpartum hemorrhage (⩾ 500 mL of blood loss within 24 h in vaginal delivery or ⩾ 1 000 mL in cesarean delivery); (5) Preterm delivery (< 37 weeks of gestation); (6) Fetal distress (a combination of symptoms that endanger the health and life of the fetus in utero due to acute or chronic hypoxia); (7) Cesarean section status; (8) Macrosomia (birth weight > 4 000 g); (9) Low birth weight (birth weight < 2 500 g); and (10) Neonatal jaundice (requiring phototherapy).

Statistical analysis

Statistical analyses were performed using IBM SPSS Statistics for Windows, Version 27.0 (IBM Corp., Armonk, NY, USA), with a valid license, in compliance with IBM's licensing agreements. Continuous variables were expressed as mean ± standard deviation and were compared using ANOVA for normally distributed data, and the Kruskal-Wallis test for skewed data, with the Bonferroni correction applied for multiple comparisons. Categorical variables are expressed as *n* (%) and compared using Pearson's Chi-square test. Logistic regression analyses were employed to evaluate odds ratios (ORs), along with their 95% confidence intervals (CIs). Diagnostic agreement between the criteria was evaluated with Cohen's kappa coefficient (k; 0.8–1.0, very good; 0.6–0.8, good; 0.4–0.6, moderate). Statistical significance was set at $P < 0.05$.

Results

Prevalence of GDM by the IADPSG and NICE criteria

Among the 19 152 pregnant women, the prevalence of GDM was 20.39% (*n* = 3 906) using the IADPSG criteria,whichsignificantlyincreasedto23.67%(*n*=4 533) using the NICE criteria were applied ($P < 0.001$; OR = 1.21), indicating a notable difference in detection rates. Agreement between the criteria was moderate (kappa = 0.59, $P < 0.01$).

Diagnostic concordance analysis (***Fig. 1B***) revealed that 14.92% (*n* = 2 858) met both IADPSG and NICE criteria, 5.47% (*n* = 1 048) were identified exclusively

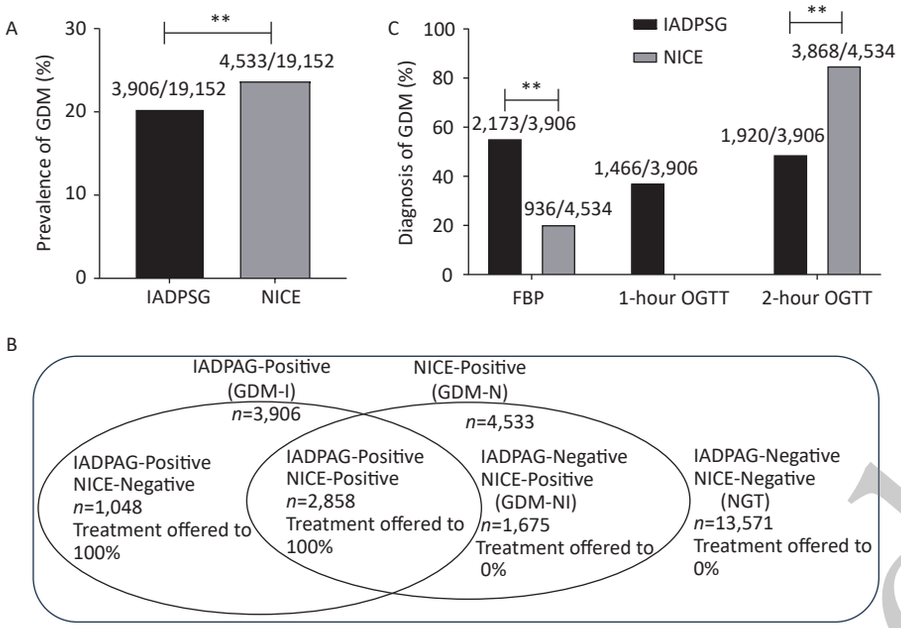

Fig. 1 **Prevalence of GDM by IADPSG and NICE criteria.** A: Percentage of patients diagnosed with GDM according to IADPSG and NICE criteria. B: Classification of pregnant women according to GDM diagnosis. C: Percentage of patients with GDM diagnosed by at least one blood glucose level of OGTT. $^{**}P < 0.01$ by Chi-square test. Abbreviations: IADPSG, international association of diabetes and pregnancy study groups; NICE: national institute for health and care excellence; FPG, fasting plasma glucose level; OGTT, oral glucose tolerance test; NGT, normal glucose tolerance.

by the IADPSG, and 8.75% (n = 1 675) only by NICE. The majority of cases (70.86%, n = 13 571) were classified as non-GDM by both criteria.

Analysis by OGTT values (***Fig. 1C***) revealed that elevated fasting plasma glucose (FPG) idenyified 55.66% (n = 2 173) of GDM cases by IADPSG, but only 20.56% (n = 936) by NICE (P < 0.01). Conversely, the 2-hour OGTT plasma glucose detectedmoreGDMcasesusingNICE(85.33%,n=3 868) than IADPSG (49.16%, n = 1920, P < 0.01). The 1-hour OGTT included only in IADPSG contributed to 37.53% (n = 1 466) of GDM diagnoses.

When considering any single OGTT values (***Table 2***), under IADPSG, 39.25% were diagnosed solely by elevated fasting glucose, 6.68% by abnormal 1-hour glucose value, and 37.69% by abnormal 2-hour glucose; 7.09% met two abnormal thresholds, and 9.29% met all three. Under NICE, 14.67%were diagnosed by fasting glucose alone, 79.35% by elevated 2-hour glucose, and 5.98% met both thresholds.

Evaluation of maternal variables, maternal and neonatal outcomes

Women diagnosed with GDM by IADPSG received glycemic management, whereas those in the NICE^{+}/IADPSG^{-} (GDM-NI) group did not receive therapy. Women were classified into four subgroups: NGT (IADPSG^{-}/NICE^{-}), GDM-I (IADPSG^{+}), GDM-N (NICE^{+}), and GDM-NI (NICE^{+}/IADPSG^{-}) (***Fig. 1B*** and ***Table 3***).

Table 4 presents the maternal and demographic characteristics stratified by the GDM classification used in this analysis. In total, 13 571 pregnant women

Table 2 **Distribution of GDM women based on IADPSG or NICE criteria**

Plasma glucose	IADPSG (n = 3 906)	NICE(n = 4 533)
Only FPG	1 533 (39.25)	665 (14.67)
Only 1-hour OGTT	261(6.68)	–
Only 2-hour OGTT	1 472 (37.69)	3 597 (79.35)
Any two abnormal values	277 (7.09)	271 (5.98)
All three abnormal values	363 (9.29)	–

Values are presented as n (%). "–" indicates data not available.
Abbreviations: FPG, fasting plasma glucose level; OGTT, oral glucose tolerance test; IADPSG, International Association of Diabetes and Pregnancy Study Groups; NICE: National Institute for Health and Care Excellence.

Table 3 **The classification of the study population according to the OGTT results and GDM diagnostic criteria**

Group	Definitions	Plasma Glucose level (mmol/L)		
		Fasting	1-hour OGTT	2-hour OGTT
NGT*	Non-GDM IADPSG-negative, NICE-negative	≤ 5.0	≤ 9.9	≤ 7.7
GDM-I&	GDM according to IADPSG criteria	≥ 5.1	≥ 10	≥ 8.5
GDM-N&	GDM according to NICE criteria	≥ 5.6	–	≥ 7.8
GDM-NI*	GDM according to NICE criteria, but not IADPSG criteria	≤ 5.0	≤9.9	7.8–8.4

To convert glucose value from mmol/L to mg/dL, multiply by 18. "–" indicates data not available.
*Pregnant women whose all glucose values met the thresholds were assigned to this group.
&Pregnant women whose any glucose value met the thresholds were assigned to this group.
Abbreviations: NGT, normal glucose tolerance; OGTT, oral glucose tolerance test; IADPSG, international association of diabetes and pregnancy study groups; NICE: national institute for health and care excellence.

Table 4 **Characteristics of pregnancies classified according to OGTT diagnosis**

Characteristics	NGT	GDM-I*	GDM-N*	GDM-NI
N	13 571	3 906	4 533	1 675
Age at OGTT (years)	30.78 ± 4.62	31.5 ± 4.76	31.45 ± 4.71	31.21 ± 4.51
P-value	–	< 0.001	< 0.001	< 0.001
Pre-pregnancy BMI (kg/m²)	27.4 2± 3.66	27.8 ± 3.87	27.68 ± 3.85	27.62 ± 3.89
P-value	–	< 0.001	< 0.001	0.247
FBG (mmol/L)	4.39 ± 0.35	5.37 ± 1.51	5.08 ± 1.48	4.45 ± 0.34
P-value	–	< 0.001	< 0.001	0.015
1-hour (mmol/L)	7.51 ± 1.16	9.25 ± 1.95	9.25 ± 1.61	8.71 ± 0.74
P-value	–	< 0.001	< 0.001	< 0.001
2-hour OGTT (mmol/L)	6.13 ± 0.96	8.03 ± 2.02	8.47 ± 1.54	8.11 ± 0.20
P-value	–	< 0.001	< 0.001	< 0.001
Birthweight (g)	3 383.41 ± 449.84	3 418.11 ± 530.59	3 407.09 ± 506.69	3 400.02 ± 475.65
P-value	–	< 0.001	0.004	0.179

Data are expressed as means ± standard deviation (SD), and ANOVA for continuous variables (according to the conformity of the data to normal distribution) was used to calculate the *P*-values. "–" indicates data not available
*Some women were in group GDM-I and GDM-N.
Abbreviations: NGT, normal glucose tolerance; OGTT, oral glucose tolerance test; BMI: body mass index; GDM: gestational diabetes mellitus.

had no GDM (*i.e.*, normal glucose tolerance by both IADPSG and NICE criteria, IADPSG$^-$/NICE$^-$, NGT group), 3 906 met criteria for GDM based on the IADPSG criteria (IADPSG$^+$, GDM-I group), 4 533 met criteria for GDM based on the NICE criteria (NICE$^+$, GDM-N group), and 1 675 were diagnosed with GDM based on the NICE criteria but not the IADPSG criteria (NICE$^+$/IADPSG$^-$, GDM-NI). As expected, pregnant women with GDM diagnosed by any of the criteria were older and had higher BMI, OGTT plasma glucose, and newborn birthweight than those with normal glucose tolerance (***Table 4***). There were no significant differences in pre-pregnancy BMI and newborn birthweight between the NI group and the NGT group.

As shown in ***Table 5***, women diagnosed with GDM by IADPSG (GDM-I) or NICE (GDM-N) had a significant increase in gestational hypertension (5.22% and 4.59% *vs.* 2.61%), pre-eclampsia (5.68% and 4.57% *vs.* 2.87%), preterm delivery (7.91% and 6.78% *vs.* 4.07%), macrosomia (10.27% and 8.98% *vs.* 6.58%), low birth weight (LBW, 4.69% and 4.08% *vs.* 2.16%), and neonatal jaundice (55.12% and 51.89% *vs.* 36.03%) compared with the NGT group. Moreover, the GDM-I group had a significantly higher cesarean delivery rate than the NGT group (40.83% *vs.* 38.35%), while the GDM-N group showed no significant difference compared with the NGT group (39.95% *vs.* 38.35%). Further analysis revealed that, compared with the GDM-I group, the GDM-N group exhibited decreased incidence rates across gestational hypertension, pre-eclampsia, preterm delivery, intrauterine distress, cesarean delivery, macrosomia, LBW and neonatal jaundice, with only neonatal jaundice demonstrating a statistically significant decrease (51.89% vs. 55.12%).

Table 5 **Maternal and neonatal outcomes**

Outcome	NGT group (n = 13 571)	GDM-I* (n = 3 906)	GDM-N* (n = 4 533)	GDM-NI (n = 1 675)	Test statistic	P
Gestational hypertension	354 (2.61)^{A}	204 (5.22)^{B}	208 (4.59)^{BC}	53(3.16)^{AC}	83.57	< 0.001
OR (95% CI)	1(Ref.)	2.06 (1.73–2.45)	1.80 (1.51–2.14)	1.22 (0.91–1.64)		
Preeclampsia	390 (2.87)^{A}	222 (5.68)^{B}	208 (4.59)^{BC}	61 (3.64)^{AC}	78.77	< 0.001
OR (95% CI)	1	2.037 (1.72–2.41)	1.625 (1.37–1.93)	1.28(0.97–1.68)		
Preterm delivery	553 (4.07)^{A}	309 (7.91)^{B}	308 (6.79)^{B}	82 (4.90)^{A}	114.63	< 0.001
OR (95% CI)	1	2.02 (1.75–2.34)	1.72 (1.49–1.98)	1.21 (0.96–1.54)		
Intrauterine distress	273 (2.01)^{A}	87 (2.22)^{A}	89 (1.96)^{A}	31 (1.85)^{A}	1.16	0.763
OR (95% CI)	1	1.11 (0.87–1.42)	0.98 (0.77–1.24)	0.92 (0.63–1.34)		
APH	72 (0.53)^{A}	26 (0.67)^{A}	33 (0.73)^{A}	14 (0.84)^{A}	4.05	0.257
OR (95% CI)	1	1.26 (0.80–1.97)	1.375 (0.91–2.08)	1.58 (0.89–2.81)		
PPH	1,314 (9.68)^{A}	375 (9.60)^{A}	450 (9.93)^{A}	167 (9.97)^{A}	0.42	0.936
OR (95% CI)	1	0.99 (0.878–1.118)	1.03 (0.92–1.15)	1.03 (0.87–1.22)		
Cesarean delivery	5,204 (38.35)^{A}	1,595 (40.83)^{B}	1,811 (39.95)^{AB}	637 (38.03)^{AB}	10.33	0.016
OR (95% CI)	1	1.11 (1.03–1.19)	1.07 (0.99–1.15)	0.99 (0.89–1.10)		
Macrosomia	893(6.58)^{A}	401 (10.27)^{B}	407 (8.98)^{BC}	127 (7.58)^{AC}	70.44	< 0.001
OR (95% CI)	1	1.62 (1.44–1.84)	1.40 (1.24–1.58)	1.17 (0.96–1.41)		
LBW	334 (2.46)^{A}	183 (4.69)^{B}	185 (4.08)^{BC}	50 (2.99)^{AC}	63.78	< 0.001
OR (95% CI)	1	1.95 (1.62–2.34)	1.69 (1.40–2.03)	1.22 (0.90–1.65)		
Neonatal jaundice	4,890 (36.03)^{A}	2,153 (55.12)^{B}	2,352 (51.89)^{C}	681 (40.66)^{D}	652.41	< 0.001
OR (95% CI)	1	2.18 (2.03–2.34)	1.91 (1.79–2.05)	1.22 (1.10–1.35)		

Data are presented as n (%); categorical variables were compared using the Chi-square test with Bonferroni's post-hoc test. Values in the same row with different superscript letters differ significantly (P < 0.05), and a value with superscripts 'AB' is not significantly different from values with superscript 'A' or 'B'. Odds ratios (ORs) and 95% confidence intervals (CIs) were calculated to compare the frequency of adverse pregnancy outcomes between groups.
*Some women were in group GDM-I and GDM-N.
Abbreviations: NGT, normal glucose tolerance; OR, odds ratio; CI, confidence interval; Ref., reference; APH, antepartum hemorrhage; PPH, postpartum hemorrhage; LBW, low birth weight.

with only neonatal jaundice demonstrating a statistically significant decrease (51.89% *vs.* 55.12%). These findings suggest that the IADPSG criteria can identify more adverse pregnancy outcomes.

Further analysis revealed that, compared with those in the NGT group, women in the GDM-NI group (diagnosed with GDM by NICE but not by IADPSG) only showed a significantly higher incidence of neonatal jaundice (40.66% *vs.* 36.03%), with no significant differences in other outcomes. However, when compared with the GDM-I group, the GDM-NI group had significantly lower rates of gestational hypertension (3.16% *vs.* 5.22%), pre-eclampsia (3.64% *vs.* 5.68%), preterm delivery (4.90% *vs.* 7.91%), macrosomia (7.58% *vs.* 10.27%), low birth weight (2.99% *vs.* 4.69%), and neonatal jaundice (40.66% *vs.* 55.12%). Additionally, there were no significant differences among the four groups in terms of intrauterine distress, antepartum hemorrhage (APH), or postpartum hemorrhage (PPH).

Association between fasting/post-load glucose levels and pregnancy outcomes

Numerous studies have shown that only elevated fasting glucose significantly increases the risk of adverse pregnancy outcomes[22–23]. To explore why the GDM-NI group exhibited a lower rate of adverse pregnancy outcomes, all participants were divided into five groups: (1) Women with normal glucose tolerance by IADPSG and NICE criteria (NGT); (2) GDM women with only elevated fasting blood glucose diagnosed by IADPSG (IADPSG-only FBG); (3) GDM women with only elevated post-load hyperglycaemia (1 h and/or 2 h) diagnosed by IADPSG (IADPSG-only post-load); (4) GDM women with only elevated fasting blood glucose diagnosed by NICE (NICE-only FBG); and (5) GDM women with only elevated post-load hyperglycaemia (2 h) diagnosed by NICE (NICE-only post-load).

As expected, compared with the NGT group, all

GDM subgroups showed significantly higher risks for several key adverse pregnancy outcomes, with the highest risks generally observed in the IADPSG-only FBG group, followed by the NICE-only FBG, IADPSG-only post-load, and NICE-only post-load groups (***Table 6***). Further analysis, as shown in ***Table 6***, revealed that the IADPSG-only FBG group and NICE-only FBG group had a significant increase in gestational hypertension (4.96% *vs.* 3.75% and 4.36% *vs.* 3.95%), pre-eclampsia (6.91% *vs.* 3.69% and 5.26% *vs.* 4.14%), preterm delivery (8.61% *vs.* 6.35% and 9.77% *vs.* 5.98%), macrosomia (10.76% *vs.* 8.37% and 10.08% *vs.* 8.23%), and low birth weight (LBW, 4.83% *vs.* 4.10% and 5.71% *vs.* 3.67%) compared with the respective post-load groups (IADPSG-only post-load or NICE-only post-load), with the exception of neonatal jaundice (40.51% *vs.* 65.78% and 39.25% *vs.* 53.68%). These findings indicate that GDM with isolated abnormal fasting blood glucose may be an independent risk factor for adverse pregnancy outcomes.

Table 6 **Association between fasting/post-load glucose levels and pregnancy outcomes**

Outcome	NGT (n = 13 571)	IADPSG-only FBG (n = 1 533)	IADPSG-post load (n = 1 733)	NICE-only FBG (n = 665)	NICE-post load (n = 3 597)	Test statistic	P
Gestational hypertension	354 (2.61)^{A}	76 (4.96)^{B}	65 (3.75)^{AB}	29 (4.36)^{AB}	142 (3.95)^{B}	42.12	< 0.001
OR (95% CI)	1 (Ref.)	1.95 (1.51–2.51)	1.46 (1.11–1.91)	1.70 (1.16–2.51)	1.54 (1.26–1.88)		
Pre-eclampsia	390 (2.87)^{A}	106 (6.91)^{B}	64 (3.69)^{AC}	35 (5.26)^{BC}	149 (4.14)^{C}	78.77	< 0.001
OR (95% CI)	1	2.51 (2.01–3.13)	1.30 (0.99–1.70)	1.88 (1.32–2.68)	1.46 (1.21–1.77)		
Preterm	553 (4.07)^{A}	132 (8.61)^{BC}	110 (6.35)^{CD}	65 (9.77)^{B}	215 (5.98)^{D}	109.92	< 0.001
OR (95% CI)	1.00	2.22 (1.82–2.70)	1.60 (1.29–1.97)	2.55 (1.95–3.34)	1.497 (1.27–1.76)		
Intrauterine distress	273 (2.01)^{A}	42 (2.74)^{A}	30 (1.73)^{A}	18 (2.71)^{A}	63 (1.75)^{A}	7.65	0.110
OR (95% CI)	1	1.37 (0.99–1.91)	0.86 (0.59–1.26)	1.36 (0.84–2.20)	0.87 (0.66–1.15)		
APH	72 (0.53)^{A}	10 (0.65)^{A}	9 (0.52)^{A}	5 (0.75)^{A}	25 (0.70)^{A}	2.00	0.740
OR (95% CI)	1	1.23 (0.63–2.39)	0.98 (0.49–1.96)	1.42 (0.57–3.53)	1.31 (0.83–2.07)		
PPH	1 314 (9.68)^{A}	143 (9.33)^{A}	164 (9.46)^{A}	68 (10.23)^{A}	350 (9.73)^{A}	0.54	0.970
OR (95% CI)	1	0.96 (0.80–1.15)	0.98 (0.82–1.16)	1.06 (0.82–1.37)	1.01 (0.89–1.14)		
Cesarean section	5 204 (38.35)^{A}	609 (39.73)^{A}	715 (41.26)^{A}	272 (40.9)^{A}	1 420 (39.48)^{A}	7.83	0.100
OR (95% CI)	1	1.06 (0.95–1.18)	1.13 (1.02–1.25)	1.11 (0.95–1.30)	1.05 (0.97–1.13)		
Macrosomia	893 (6.58)^{A}	165 (10.76)^{B}	145 (8.37)^{ABC}	67 (10.08)^{BC}	296 (8.23)^{C}	51.38	< 0.001
OR (95% CI)	1	1.71 (1.44–2.04)	1.30 (1.08–1.56)	1.59 (1.23–2.07)	1.27 (1.11–1.46)		
LBW	334 (2.46)^{A}	74 (4.83)^{B}	71 (4.1)^{B}	38 (5.71)^{B}	132 (3.67)^{B}	58.81	< 0.001
OR (95% CI)	1	2.01 (1.55–2.60)	1.69 (1.30–2.20)	2.40 (1.70–3.39)	1.51 (1.23–1.85)		
Neonatal jaundice	4 890 (36.03)^{A}	621 (40.51)^{B}	1 140 (65.78)^{C}	261 (39.25)^{AB}	1931 (53.68)^{D}	806.17	< 0.001
OR (95% CI)	1	1.21 (1.09–1.35)	3.41 (3.07–3.79)	1.15 (0.98–1.35)	2.06 (1.91–2.22)		

Categorical variables were compared using the Chi-square test with Bonferroni's post-hoc test. Values in the same row with different superscript letters differ significantly (P < 0.05), and a value with superscripts 'AB' is not significantly different from values with superscript 'A' or 'B'. Odds ratios (ORs) and 95% confidence intervals (CIs) were calculated to compare the frequency of adverse pregnancy outcomes between groups.
Abbreviations: NGT, normal glucose tolerance; IADPSG-only FBG, GDM women with only elevated fasting blood glucose diagnosed by IADPSG; IADPSG-only post load, GDM women with elevated only post-load hyperglycaemia (1 h and/or 2h) diagnosed by IADPSG; NICE-only FBG, GDM women with elevated only fasting blood glucose diagnosed by NICE; NICE-only post load, GDM women with elevated only post-load hyperglycaemia (2 h) diagnosed by NICE; Ref., reference; APH, antepartum hemorrhage; PPH, postpartum hemorrhage; LBW, low birth weight.

Discussion

To our knowledge, this is the first study to compare GDM prevalence using IADPSG and NICE criteria in China. Since adopting the IADPSG one-step approach in 2014 (updated in 2022), China has shifted from the WHO two-step method[15–16]. In our analysis of 19 152 pregnant women (2015–2021), GDM prevalence was 20.39% by the IADPSG criteria. However, when applying the NICE criteria, the prevalence increased to 23.67%, identifying an additional 627 GDM cases. This finding is consistent with the data from Vietnam (IADPSG criteria: 22.8%; NICE criteria: 24.2%, n = 2030)[24] and the Hong Kong center of HAPO study

(majority Chinese, IADPSG criteria: 14.7%; NICE criteria: 17.4%, *n* = 1 654)[25], but inconsistent with data from India (IADPSG criteria: 25.10% *vs.* NICE criteria: 11.60%, *n* = 680[19]; 23.80% *vs.* 21.50%, *n* = 353[26]), South Africa (IADPSG criteria: 25.10% *vs.* NICE criteria: 17.00%, *n* = 554)[27], Croatia (23.10% *vs.* 17.80%, *n* = 4 646)[28], Ireland (53.00% *vs.* 18.00%, *n* = 202)[29], Finland (36.50% *vs.* 15.80%, *n* = 4 939)[30], Qatar (21.50% *vs.* 20.10%, *n* =2000)[18], and the other four centers of the HAPO study: Bellfolower (IADPSG criteria: 25.50%; NICE criteria: 13.70%, *n* = 1981), Cleveland (25.00% *vs.* 16.80%, *n* = 797), Brisbane (12.40% *vs.* 11.80%, *n* = 1 444), and Newcastle (15.30% *vs.* 13.90%, *n* = 668)[25]. These findings demonstrate significant heterogeneity in GDM prevalence trends across different diagnostic criteria when applied to diverse geographic regions and ethnic populations.

Furthermore, we assessed the agreement between the IADPSG and NICE criteria and obtained a κ statistic of 0.59 (moderate concordance), consistent with previous reports by Goyal *et al*. (κ = 0.58)[26]. This modest agreement likely stems from NICE's omission of the 1-hour glucose threshold and its adoption of a higher fasting but lower 2-hour glucose cut-off. In our study, most GDM cases under the NICE criteria were diagnosed based on 2-hour OGTT values (79.35% *vs.* 37.69% by IADPSG), whereas IADPSG identified more cases through fasting glucose (39.25% *vs.* 14.67%). The resulting prevalence difference aligns with trends seen in an Argentine study comparing the Latin American Diabetes Association (ALAD) criteria (which uses similar standards to NICE) with the IADPSG criteria[31]. These differences suggest that the etiology of GDM may vary among different patient populations, and such variations may be mediated by distinct pathophysiological mechanisms. Therefore, to effectively reduce the adverse outcomes caused by GDM in different populations, further research is needed to explore whether personalized treatment strategies for specific populations are warranted.

The NICE criteria, developed based on cost-effectiveness considerations, may not offer a cost advantage in China because of the higher GDM prevalence they yield. Whether the NICE criteria can be applied to GDM diagnosis in China still requires further evaluation of pregnancy outcomes to determine their suitability. In our study, women in the GDM-I and GDM-N groups had significantly higher risks of adverse outcomes, including gestational hypertension, pre-eclampsia, preterm delivery, macrosomia, low birth weight, and neonatal jaundice, compared with those in the NGT group. However, the GDM-N group showed consistently lower incidence rates than the GDM-I group, with a significant reduction observed in neonatal jaundice. These data indicate that although the IADPSG criteria diagnose a lower prevalence of GDM than the NICE criteria, they identify more adverse maternal and neonatal pregnancy outcomes.

Furthermore, we also analyzed the pregnancy outcomes of women who were diagnosed with GDM by NICE but not by IADPSG (GDM-NI). Compared with the NGT group, the GDM-NI group showed no significant increase in adverse outcomes, other than neonatal jaundice, consistent with prior reports[19]. However, when compared with the GDM-I group, the GDM-NI group had significantly lower rates of all adverse outcomes. This may be because GDM-NI cases were identified solely by elevated 2-hour OGTT values, which are associated with lower risks than those identified by fasting hyperglycemia (***Table 6***)[22–23]. These results indicate that the GDM-NI group had outcomes similar to NGT but better than GDM-I, suggesting the limited suitability of the NICE criteria for Chinese pregnant women.

Given participant overlap between the GDM-I and GDM-N groups, we re-classified the cohort into four mutually exclusive subgroups: NGT, IADPSG$^+$/NICE$^-$ (GDM-IN), IADPSG$^+$/NICE$^+$ (GDM-All), and GDM-NI. As shown in ***Supplementary Tables 1*** and ***5***, compared with the NGT group, the incidence ranking of most adverse pregnancy outcomes was highly consistent. Specifically, the rates of preeclampsia, preterm birth, and macrosomia followed the following order: GDM-IN > GDM-I > GDM-All > GDM-N > GDM-NI. This trend is similar to several indicators reported by Meek *et al*[32], underscoring that elevated fasting glucose is a key contributor to these adverse pregnancy outcomes and affirming the reliability of our data.

Notably, despite glucose management, the GDM-I group had worse pregnancy outcomes, underscoring the difficulty of improving outcomes (e.g., macrosomia, cesarean rates) through glycemic control alone[33–34]. Future research should focus on developing and evaluating innovative treatment strategies that address the multifactorial nature of GDM and its impact on maternal and neonatal health.

Limitations

First, the findings of this study do not reflect the whole population of China as the study was undertaken at a tertiary hospital in Nanjing only.

Second, several maternal and neonatal outcomes, such as SGA/LGA and neonatal hypoglycemia, were excluded due to insufficient or incomplete data. For example, some pregnant women lacked early ultrasound confirmation, which is critical for accurately defining SGA or LGA based on population standards. Third, future work will assess postpartum outcomes in women negative by IADPSG criteria but positive by NICE criteria, particularly given evidence linking discordant GDM diagnoses to later cardiometabolic risk[35]. Finally, information on GDM treatment was not collected, which may affect the adverse outcomes for some pregnant women.

Conclusion

In this retrospective cohort study of 19 152 pregnant Chinese women, the IADPSG criteria appear to be more robust than the NICE criteria for diagnosing GDM and predicting adverse maternal and neonatal outcomes for Chinese pregnant women. Further large cohort studies with longer follow-up and a multi-center design are needed for agreement on the adoption of either criterion.

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