

Diagnosing gestational diabetes mellitus (GDM): Implications of recent changes in diagnostic criteria and role of glycated haemoglobin (HbA1c)

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Background/Aim

Gestational diabetes mellitus (GDM; ~5% of pregnancies), represents the most important risk factor for development of later-onset diabetes mellitus.

Recently, the World Health Organisation (WHO) and National Institute for Health and Care Excellence (NICE) published new recommendations for GDM diagnosis.

New guidance could potentially result in a significantly increased healthcare workload.

Aim:

To explore the impact of new guidelines on GDM diagnosis at University Hospitals of North Midlands.

Design/Methods

Design: The study comprised two groups;

1. A case-control group of 523 pregnancies (257 GDM positive, 266 GDM negative cases)
2. A cohort of 6930 incident pregnancies (699 GDM positive, 6231 GDM negative cases)

We examined concordance between GDM diagnosis defined using the WHO[1999] criteria, the WHO[2013] criteria and NICE[2015] criteria. We assessed the characteristics of discordant cases and the potential of HbA1c in GDM diagnosis.

Statistical analysis: Performed using the Stata statistical software package (v. 12):

- Fisher's exact tests: to compare between classification groups using the different criteria.
- Mann-Whitney U test: Comparison of median HbA1c concentrations between groups.
- Chi-squared tests: to compare proportions of cases with an HbA1c ≥ 42 mmol/mol ($\geq 6.0\%$) between categories.

Definitions of GDM

	Original WHO (1999) criteria	NICE (2015) criteria	Revised WHO (2013) criteria*
Baseline (fasting) plasma glucose (mmol/l)	≥ 7.0	≥ 5.6	≥ 5.1
	and/or	and/or	and/or
2-hour plasma glucose (mmol/l)	≥ 7.8	≥ 7.8	≥ 8.5

*baseline and 120-minute values only

Comparison of criteria for classifying GDM

Case-control study	WHO[1999] criteria; N= (%)	NICE[2015] criteria; N= (%)	WHO[2013] criteria; N= (%)
Sub-group 1 (normal baseline/normal 2-hr results)	275 (52.2)	233 (44.6)	263 (50.3)
Sub-group 2 (raised baseline/normal 2-hr results)	6 (1.1)	47 (9.0)	109 (20.8)
Sub-group 3 (normal baseline/raised 2-hr results)	228 (43.6)	163 (31.2)	65 (12.4)
Sub-group 4 (raised baseline/raised 2-hr results)	14 (2.7)	79 (15.1)	86 (16.4)

Cohort Study	WHO[1999] criteria; N= (%)	NICE[2015] criteria; N= (%)	WHO[2013] criteria; N= (%)
Sub-group 1 (normal baseline/normal 2-hr results)	6257 (96.3)	6138 (88.6)	5983 (86.3)
Sub-group 2 (raised baseline/normal 2-hr results)	11 (0.2)	130 (1.9)	564 (8.1)
Sub-group 3 (normal baseline/raised 2-hr results)	625 (9.0)	493 (7.1)	194 (2.8)
Sub-group 4 (raised baseline/raised 2-hr results)	37 (0.5)	169 (2.4)	189 (2.7)

Concordance between criteria in GDM diagnosis: case-control study

a) WHO (1999) vs NICE (2015)				
WHO (1999)*	NICE (2015)*	N= (%)	Median HbA1c (mmol/mol)	%age HbA1c >42 mmol/mol
Normal	Normal	233 (44.6)	30	1.7%
Normal	GDM	42 (8.1)	36	16.7%
GDM	Normal	0	-	-
GDM	GDM	247 (47.3)	37	22.1%

b) WHO (1999) vs WHO (2013)				
WHO (1999)*	WHO (2013)*	N= (%)	Median HbA1c (mmol/mol)	%age HbA1c >42 mmol/mol
Normal	Normal	213 (40.7)	31	1.4%
Normal	GDM	62 (11.9)	36	12.9%
GDM	Normal	50 (9.5)	34	8.2%
GDM	GDM	198 (37.9)	38	26.2%

c) NICE (2015) vs WHO (2013)				
NICE (2015)*	WHO (2013)*	N= (%)	Median HbA1c (mmol/mol)	%age HbA1c >42 mmol/mol
Normal	Normal	213 (40.8)	30	1.4%
Normal	GDM	20 (3.8)	33	5.0%
GDM	Normal	50 (9.6)	36	8.2%
GDM	GDM	239 (45.8)	37	24.1%

Concordance between criteria in GDM diagnosis: cohort study

a) WHO (1999) vs NICE (2015)				
WHO (1999)*	NICE (2015)*	N= (%)	Median HbA1c (mmol/mol)	%age HbA1c >42 mmol/mol
Normal	Normal	6138 (88.6)	34	2.5%
Normal	GDM	119 (1.7)	37	17.7%
GDM	Normal	0	-	-

b) WHO (1999) vs WHO (2013)				
WHO (1999)*	WHO (2013)*	N= (%)	Median HbA1c (mmol/mol)	%age HbA1c >42 mmol/mol
Normal	Normal	5780 (83.4)	33	2.0%
Normal	GDM	477 (6.9)	37	13.2%
GDM	Normal	203 (2.9)	35	7.4%

c) NICE (2015) vs WHO (2013)				
NICE (2015)*	WHO (2013)*	N= (%)	Median HbA1c (mmol/mol)	%age HbA1c >42 mmol/mol
Normal	Normal	5780 (83.4)	34	2.0%
Normal	GDM	358 (5.2)	37	11.7%
GDM	Normal	203 (2.9)	35	7.4%
GDM	GDM	589 (8.5)	39	26.8%

Potential role of HbA1c as a GDM screening tool

	N	GDM positive by:		
		WHO (1999)	NICE (2015)	WHO (2013)
HbA1c ≥ 42 mmol/mol	329	152 (46.2%)	173 (52.6%)	200 (60.8%)
HbA1c < 42 mmol/mol	6601	521 (7.9%)	619 (9.4%)	747 (11.3%)

Results summary & Conclusions

In the incident cohort, GDM prevalence was 3.7% (WHO[1999] criteria), 11.4% (NICE[2015] criteria) and 13.7% (WHO[2013] criteria). Discordant cases (i.e. those classified as GDM positive by the WHO[2013] or NICE[2015], but not by the WHO[1999] criteria and *vice versa*) showed HbA1c values intermediate between concordant cases.

HbA1c was poor at predicting GDM diagnosis irrespective of the criteria used.

- (i) Significant additional cases are detected using the WHO[2013] criteria and NICE criteria
- (ii) These additional cases represent an intermediate group with 'moderate' dysglycaemia,
- (iii) A similar group of intermediate cases is missed by use of the WHO[2013] criteria
- (iv) HbA1c is unlikely to replace GTT in GDM diagnosis, at least in isolation