An analysis of demographic and pregnancy outcome data to explain non-attendance for postpartum glucose testing in women with gestational diabetes mellitus: Why are patients missing follow-up?

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Abstract

Objectives: To identify significant differences in the demographic and pregnancy factors for women with gestational diabetes mellitus who attended or failed to attend for postpartum glucose testing.

Study design: A database of 1052 patients with gestational diabetes mellitus was reviewed. The sample was divided into those who attended for postpartum glucose testing and those who did not. Demographic and obstetric outcomes for the two groups were compared.

Results: Seventy-four per cent of patients who did not attend for postpartum glucose testing were in the two most deprived quintiles. Smokers, unemployed, younger women, those of higher parity and those who did not breast feed were less likely to attend.

Conclusions: Failure to attend for postpartum glucose testing is associated with demographic factors reflective of deprivation. The opportunity to afford lifestyle changes and diabetes screening in these groups of women has been missed. Targeted patient education and accessible postpartum testing may improve compliance.

Keywords

Diabetes, gestational

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Introduction

Gestational diabetes mellitus (GDM) is defined as hyperglycaemia first occurring or detected in pregnancy.¹ UK guidance previously recommended use of the 1999 WHO diagnostic criteria, which included fasting plasma glucose (FPG) ≥ 7.0 mmol/l or 2 h plasma glucose ≥ 7.8 mmol/l following a 75 g oral glucose load.¹ At the time of this study, with mounting evidence that the diagnostic fasting level was too high, a level ≥ 6.1 mmol/l (diagnostic of impaired fasting glucose) was instead used to diagnose GDM. This was superseded in 2015 following the publication of the HAPO study² and UK national guidance now recommends diagnostic criteria of an FPG level of ≥ 5.6 mmol/l or a 2 h plasma glucose level of ≥ 7.8 mmol/l.³

This group of women will include some with undiagnosed pre-existing diabetes which will be confirmed on postnatal testing at six weeks. The National Institute for Health and Clinical Excellence in the UK recommend testing blood glucose in women who were diagnosed with GDM before they are transferred to community care.³ New guidance recommends a fasting glucose test postnatally,³ but at the time of this study, our unit was using a 2 h 75 g glucose tolerance test (GTT), arranged and performed by the hospital at six weeks postpartum.

The rationale for postnatal glucose testing is to ensure that a diagnosis of pre-existing diabetes or non-diabetic hyperglycaemia is

not missed following pregnancy in a high-risk group. Postnatal testing also provides an opportunity to address lifestyle choices, weight, exercise and diet, to reduce the risk of future development of non-insulin-dependent diabetes.³ The attendance for postnatal glucose testing is generally poor, potentially leading to missed diagnosis and counselling opportunities for these women.

The aim of this study is to provide information that can be used to help improve attendance for postpartum glucose testing. The objective is to identify significant differences in the demographic and pregnancy factors for women with GDM who attended and those who failed to attend for postpartum glucose testing.

The RCOG recently identified social deprivation as a significant barrier to accessing maternity services.⁴ Given the cultural diversity

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of women in an inner-city population there is an argument to suggest that factors associated with social deprivation may be prevalent in the group of non-attenders which would then enable us to identify interventions which may improve postnatal glucose testing attendance.

Materials and methods

This is a retrospective review of an existing maternity database of 1052 patients diagnosed with GDM who delivered at a tertiary referral unit in the UK between 2008 and 2012.

The population in this study reside in the city of Sheffield in the north of England. Sheffield is a post-industrial city with a population of 551,800.⁵ Eighty-four per cent of its population are ethnically white with 8% Asian, 3.6% Black, 2.4% of mixed race, 1.5% Arab and 0.7% of other ethnicity.⁵

The sample was divided into those who attended for their postpartum GTT and those who failed to attend their pre-arranged six-week follow-up appointment.

In order to maximise the number of cases, all patients with GDM who had been entered on to the database were included in the study. The existing database had been updated to 2012 at the time of data collection.

Data available included postcode, ethnicity, age, BMI, smoking, employment status, parity, insulin use in pregnancy, onset of labour (spontaneous/induced), mode of delivery, any adverse obstetric outcome (stillbirth, shoulder dystocia, SCBU admission, low birthweight, prematurity) and feeding method. The postnatal GTT results were also available for those patients who attended follow-up.

Social deprivation scores standardised for 2010 and presented as IMD deprivation quintiles were calculated by inputting postcode data into an online calculator from the National Perinatal Epidemiology Unit accessed via <https://tools.npeu.ox.ac.uk/imd/>.

The IMD score range for each quintile group was:

Quintile group	IMD score range
1 (least deprived)	≤8.49
2	8.5–13.79
3	13.8–21.35
4	21.36–34.17
5 (most deprived)	≥34.18

Data for attenders and non-attenders were compared using the Chi-squared statistical test. A *p* value of <0.05 was considered statistically significant.

Due to differences in socio-demographic and disease factors,⁶ secondary analysis was performed to compare attenders and non-attenders in the white ethnic and Black, Asian and minority ethnic (BAME) subgroups.

Results

Demographic and pregnancy outcome data were available for 1052 patients during the study period, of whom 258 women (25%) failed to attend their pre-arranged postpartum GTT at six weeks.

Table 1 lists the demographic and pregnancy outcome findings based on whether the woman attended her postnatal GTT. Those women who were living in a deprived area, smokers, unemployed and those under 25 years of age were more likely to fail to attend postnatal testing. Similarly, women of high parity and those who did not breastfeed were more likely to fail to attend. Onset of labour, mode of delivery and adverse obstetric outcomes did not influence attendance for postpartum glucose testing.

Sixty-six per cent (689/1052) of the study population were resident in areas considered to be the most deprived (quintiles 4 and 5) based

on the IMD score. Seventy-four per cent (191/258) of women who did not attend for postpartum GTT lived in a deprived area compared to 63% (498/794) in the attenders.

Within the study population, 56% (587/1052) were of white British or Irish ethnicity, 25% (263/1052) were of Asian ethnicity of whom the majority (253/263) were South Asian (10/263 East Asian), 9% (94/1052) Black (90 African, 4 Caribbean), 8% Arab (81/1052) and 2% Eastern European (18/1052). Two patients did not have ethnicity recorded.

Twenty-six per cent of the white population (151/587) failed to attend for postnatal GTT. On secondary analysis, similar outcome results were seen for the white group and whole sample, with living in a deprived area, smoking, unemployment, younger age, higher parity and not breastfeeding being significantly associated with non-attendance for postpartum GTT.

Twenty-three per cent of the BAME population (107/463) failed to attend for postpartum GTT. On secondary analysis, only the absence of antenatal insulin use was associated with non-attendance in this population. There was significantly more insulin use in the non-attenders in the white ethnic group. Variations between ethnic groups were noted with significantly poor attendance amongst the Eastern European and Caribbean ethnic groups, although numbers were small.

For those women who did attend for postpartum GTT (794) the total impaired glucose result rate was 16% (126/794). Nine per cent (69/794) had impaired glucose tolerance (IGT) of whom 16 (2%) also had impaired fasting glucose (IFG), 4% (34/794) had IFG only and 3% (23/794) type 2 diabetes. Applying these rates to the 258 non-attenders we estimate that 41 women will fail to have some form of postnatal hyperglycaemia identified (23 IGT, 10 IFG and eight type 2 diabetes) (Table 2). Factors significantly associated with postnatal hyperglycaemia in the sample were South Asian ethnicity, parity of two or more at booking, antenatal insulin use, preterm delivery, still birth, larger birthweight and Neonatal Unit admission.

Discussion

This small retrospective study has demonstrated that failure to attend for a postpartum GTT was associated with demographic factors generally reflective of deprivation such as living in a deprived area, smoking, unemployment, younger age, higher parity and not breastfeeding.

When attenders and non-attenders were compared within the white ethnic and BAME subgroups, the findings persisted for white ethnic women only. For BAME women the only significant factor that remained was the use of antenatal insulin in pregnancy. Those women not receiving antenatal insulin were significantly less likely to attend for postpartum GTT. This finding suggests that those BAME women who are receiving insulin treatment have a greater understanding of the need for follow-up. This may be due to improved patient education as a result of being on insulin, although this benefit did not persist in the white population where there was significantly more insulin use in the non-attenders. It could be speculated that these differences may be due to greater disease awareness amongst BAME women as a result of the higher prevalence of diabetes in these communities.

The Eastern European population had significantly low attendance rates (50%) and language is the most likely barrier to effective patient education in this group, with a need to ensure appropriate use of translators.

Sixteen per cent (126/794) of women who attended for a six-week GTT were found to have some form of hyperglycaemia. This rate is less than that reported in other studies which have found rates of 25.3⁷ and 42.5%⁸ at early postpartum testing (6 weeks–6 months). These differences are most likely to be due to the ethnicity of this

Table 1. Demographic and obstetric findings in attenders and non-attenders for postpartum GTT.

	Whole sample (n = 1502)		White ethnic group (n = 587)		Black, Asian and minority ethnic group (n = 463)	
	GTT (n=794)	No GTT (n=258)	GTT (n=436)	No GTT (n=151)	GTT (n=356)	No GTT (n=107)
Smoker	53	41*	44	37*	9	4
Non-smoker	734	217	387	114	345	103
Unemployed	228	115*	64	55*	163	60
Employed	269	65	207	46	61	19
Age 25 or under	34	27*	23	18*	11	9
Age 26–35	183	66	89	33	92	33
Age >35	112	31	61	17	51	14
Deprivation (4th/5th quintile)	498	191*	205	105*	291	86
Not deprived (1st/2nd/3rd quintile)	262	57	211	39	51	18
BMI >35	229	92	169	70	60	22
BMI <35	546	162	263	78	282	84
Para 2+	282	114*	103	57*	178	57
Pri/Para 1	507	143	328	93	178	50
Not breastfeeding	192	101*	143	80*	49	21
Any breastfeeding	562	147	279	62	281	85
Antenatal insulin	187	55	85	38*	102*	17
Not on insulin	606	201	351	111	253	90
White British/Irish	436	151	—	—	—	—
South Asian	196	57	—	—	—	—
East Asian	9	1	—	—	—	—
Black African	72	18	—	—	—	—
Black Caribbean	1	3*	—	—	—	—
Arab	65	16	—	—	—	—
Mixed	4	2	—	—	—	—
Eastern European	9	9*	—	—	—	—
Other	0	1	—	—	—	—
Ethnicity not recorded	2	0	—	—	—	—
Onset of labour spontaneous	224	71	115	40	110	31
Onset of labour IOL	401	137	221	79	178	58
Elective CS	133	40	83	24	50	16
Emergency CS	172	47	96	28	76	19
Instrumental delivery	77	29	47	19	30	10
Normal vaginal delivery	404	138	206	77	197	61
Vaginal breech	2	2	1	2	1	0
SCBU admission	67	26	43	15	24	11
Any adverse obstetric outcome (stillbirth, shoulder dystocia, low birthweight <2.5 kg, prematurity <37 weeks)	150	50	69	27	81	23

BMI: body mass index; GTT: glucose tolerance test; IOL: Induction of labour; SCBU: Special Care Baby Unit.

*p < 0.05 Chi-squared test.

Significant findings highlighted in bold.

Table 2. Predicted additional cases of hyperglycaemia in the non-attended group (n = 258) based on the cases identified in those who attended postnatal GTT (n = 794).

	Number of cases in tested group (%)	Additional cases in the non-tested group
Impaired fasting glucose alone	34 (4)	10 (4)
Impaired glucose tolerance	69 (9)	23 (9)
Type 2 diabetes mellitus	23 (3)	8 (3)

GTT: glucose tolerance test.

study population who were largely (56%) ethnically white. Diabetes rates are known to be lower in white ethnic populations.

Extrapolating the incidence of hyperglycaemia on postnatal testing to the 258 women who failed to attend, around 41 women with significant hyperglycaemia have potentially not been identified. The opportunity to afford lifestyle changes, diabetes screening and treatment in this group of women has therefore been missed.

Although there is a need to improve attendance for postpartum glucose testing in this population, the attendance rate of 75% in our sample is exceptionally high compared to the published literature.

The major strength of this study is that it has been conducted in the context of a universal publicly-funded healthcare system. Every

woman in the study population had free access to the same high quality antenatal and postnatal care irrespective of their background. The limitations of this study are that it is based on available retrospective data for a relatively small cohort and some data were missing for individual cases.

A similar, recently published study from Chicago found a 50% attendance rate for postpartum glucose testing with particularly low rates in patients with markers of deprivation, such as public insurance, low education levels and low health literacy.⁹

The TRIAD study¹⁰ (USA) also examined trends in postpartum glucose screening (FPG or GTT) for women with gestational diabetes with attendance rates improving over time to just 53.8% in 2006. Older age, Asian or Hispanic ethnicity, higher education, earlier diagnosis of GDM, use of diabetes medications antenatally and more provider contacts after delivery were independent predictors of postpartum screening. Obesity and higher parity were predictors of non-attendance for postpartum testing. These factors are in keeping with the findings in our sample.

Another smaller study¹¹ found that the majority of patients did not attend for postpartum GTT and the only factor implicated in a higher rate of attendance was the use of antenatal insulin, as found in the BAME subgroup in our study.

Although this study and the others referenced above have identified factors that may help to predict non-attendance for postpartum glucose testing, these factors may not explain the whole picture.

The DIAMIND trial¹² (Australia) was a randomised control trial which assessed whether a SMS (short message service or 'text message') reminder system would increase attendance for GTT within six months postpartum. The authors concluded that SMS reminders did not increase uptake of postpartum GTT, fasting glucose or HbA1c. They also suggested that more research was required into factors influencing non-attendance from the perspective of women with gestational diabetes.

A six-month follow-up study¹³ attempted to address this by assessing the views of women who participated in the original DIAMIND trial.¹² Of the 208 women who responded 73% who had not yet attended stated 'not having enough time' as the reason for this. Other barriers were inadequate childcare (30%), which supports the association of increased parity with non-attendance, and a need to focus on the health of the baby (30%).

The follow-up study¹³ also asked women about reminder systems to attend after the original DIAMIND trial¹² had shown that a SMS reminder system did not increase uptake of postpartum GTT. SMS was, however, the preferred reminder system of the women who responded. A Cochrane Systematic Review¹⁴ also looked at reminder systems and found one trial which showed low quality evidence that postal reminders increased uptake of postpartum glucose testing at 6–12 weeks.

A large study from the USA,¹⁵ which again showed poor attendance for postpartum glucose testing (75% failed to attend within one year), found that antenatal diabetes medication or visit to a nutritionist-diabetes educator or endocrinologist predicted screening within 12 weeks postpartum. This may explain the high attendance rate in our sample and reflect the benefits of a publicly funded health service in terms of access for all patients to a specialist joint diabetes/antenatal clinic.

Current studies largely review the uptake of postnatal GTT, as in our study; however, UK guidance now recommends an FPG test rather than a GTT.³ The rationale for FPG over GTT in the early postpartum period is that it is more convenient, will detect most women with pre-existing diabetes and a later follow-up test (HbA1c) will be required annually as this population remains high risk.¹⁶ There is little evidence currently that FPG alone increases uptake of postpartum glucose testing and the guideline itself quotes a median uptake of only 20% for FPG compared to 52% for GTT.¹⁶

There are several studies that suggest FPG alone lacks sensitivity as an early screening test for type 2 diabetes in comparison to a GTT^{10,17} and practice therefore continues to vary. Of concern, a review carried out in primary care suggested that only 20% of women with previous GDM attended for their annual screening tests.¹⁸ There was no difference between the rates of screening before and after the implementation of the 2008 UK guidance, which recommended FPG as the annual screening test.¹ Although offering an FPG test instead of a GTT would seem more convenient, this has yet to be shown to improve attendance for postpartum glucose testing.

Finally, the challenges of life with a new baby, as alluded to by the 73% in the DIAMIND trial follow-up study¹³ who did not have time to attend, may be the 'elephant in the room'. In which case, measures that improve patient education and access to postpartum glucose testing within the community may improve follow-up. Approximately 90% of postnatal patients attend a routine six-week postnatal appointment within primary care.^{19,20} This is a potential opportunity to perform,¹⁸ arrange or educate patients about postpartum glucose testing. Although current UK guidance places this responsibility with secondary care,³ better communication with primary care could improve outcomes. There may also be value in exploring the possibility of introducing peer supporters to those communities with poor attendance for postpartum glucose testing.

Conclusion

There is a need to improve attendance for postpartum glucose testing in patients with GDM. This study and those referenced here have identified factors that may help predict which patients are less likely to return for follow-up. More research is needed into potential methods that could be employed to improve attendance. It may be time to rethink how patient education and follow-up is delivered with consideration of a shift in focus from a hospital- to a community-based approach.

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Ethical approval

Patient consent and ethical approval was not required for this study as it is a Service Review and was registered as such with the Clinical Effectiveness Unit at the Jessop Wing, Royal Hallamshire Hospital, Sheffield.

Guarantor

ZAC.

Contributorship

TF provided overall supervision of the project. ZAC processed and analysed the data. Both authors contributed to writing the final manuscript.

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