



Original Article

An Evaluation of the Metabolic Parameters in Women with Gestational Diabetes Mellitus after Delivery

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Abstract

Objective: To evaluate the metabolic parameters in women with gestational diabetes mellitus after delivery in north Indian women.

Methods: This was a comparative study. A total of 50 patients were included in the study. Only those cases were included who had delivered in the study setting. On the first visit, detailed family history, personal history and dietary history were recorded. Patients were followed up at 6 weeks, 6 months, 1 year, 2 year and 3 years after delivery. At each visit BMI, glucose level, blood pressure and lipid levels were measured. 75 gm OGTT as defined by ADA for measuring glucose tolerance was used.

Results: Out of 50 patients, 33 (66%) were found to be dysglycemic. The Acanthosis nigricans was positive in 48.5% of Dysglycemia and in 5.9% of Normoglycemia. The BMI was found to be significantly ($p < 0.05$) higher among the patients of Dysglycemia than Normoglycemia at all the time periods. The SBP and DBP was found to be significantly ($p = 0.0001$) higher among the patients of Dysglycemia than Normoglycemia at all the time periods. The TG was found to be significantly ($p = 0.0001$) higher among the patients of Dysglycemia than Normoglycemia at all the time periods. The HDL was also found to be significantly ($p < 0.01$) lower among the patients of Dysglycemia than Normoglycemia at 6 weeks, 6 months and 1 year. LDL was significantly higher among the patients of Dysglycemia than Normoglycemia at 1 year, 2 years and 3 years.

Conclusion: The end pregnancy is not the end of the story. In fact, it is the beginning of the new chapter for the prevention of diabetes and cardiovascular risk factors after delivery. Women with GDM should realize that they are sitting on an active volcano of metabolic syndrome which can erupt any time unless preventive measures are started at a war footing right from the every beginning.

Key words: Gestational diabetes, Dysglycemia, Normoglycemia.

Introduction

Gestational diabetes mellitus (GDM) as a clinical entity officially began in 1979 when the National

Diabetes Data Group (NDDG) issued an updated classification of diabetes types including one that was present only during pregnancy (Hadden,

1998). The prevalence of GDM in India varied from 3.8 to 21% in different parts of the country depending on the geographical locations and diagnostic methods used. GDM has been found to be more prevalent in urban areas than in rural (Seshiah et al, 2009).

Most women with GDM will not have severe hyperglycemia after delivery. This group should be followed for at least 6-12 weeks to determine their glucose status. Many studies over 3 decades on all the continents of the globe demonstrate the high risk of subsequent diabetes in this female population (Ferrara, 2007; Kitzmiller et al, 2007). The degree of this risk is best assessed by glucose tolerance testing. Randomized controlled trials have proven that several interventions can significantly delay or prevent the appearance of T2DM in women with impaired glucose tolerance. High risk women can also be assessed for cardiovascular risk factors with appropriate management and follow-up to reduce the risk of coronary heart diseases, cardiomyopathy and stroke. These women should be educated to seek specific preconception consultation before the next pregnancy to avoid the teratogenic effect of unrecognized diabetes.

Metabolic syndrome or insulin resistance is a distinctive constellation of risk factors for T2DM and cardiovascular disease described by Reaven in 1988. As the key component of GDM is insulin resistance, it can be assumed that GDM is not only indicative of increased risk of latter type-2 DM but the metabolic syndrome as well (Yajnik et al, 2004).

The present study was conducted to evaluate the metabolic parameters in women with gestational diabetes mellitus after delivery in north Indian women.

Material and Methods

This comparative study was conducted in the Department of Medicine and Gynecology, Integral Institute of Medical Sciences, Lucknow. All females coming to the hospital and were diagnosed to have GDM as per carpenter and

coustan criteria were included in the study. The study was approved by the Ethical Committee of the Institute and the consent was taken from each participant before enrolling in the study.

Methods

A total of 50 patients were included in the study. Only those cases were included who had delivered in the study setting. On the first visit, detailed family history, personal history and dietary history were recorded. Patients were followed up at 6 weeks, 6 months, 1 year, 2 year and 3 years after delivery. At each visit BMI, glucose level, blood pressure and lipid levels were measured. 75 gm OGTT as defined by ADA for measuring glucose tolerance was used.

Statistical analysis

The results are presented in percentages and mean \pm SD. Unpaired t-test was used to compare the continuous variables. The p-value $<$ 0.05 was considered significant. All the analysis was carried out on SPSS 16.0 version (Chicago, Inc., USA).

Results

Out of 50 patients, 33 (66%) were found to be dysglycemic.

Table-1 shows the basic characteristics of the women in Normoglycemia and Dysglycemia. The mean age of patients in both Normoglycemia and Dysglycemia (33.52 \pm 3.5) groups was almost similar. OGT at all the time period was significantly (p $<$ 0.05) higher among the patients of Dysglycemia than Normoglycemia.

The Acanthosis nigricans was positive in 48.5% of Dysglycemia and in 5.9% of Normoglycemia (Fig.1).

The BMI was found to be significantly (p $<$ 0.05) higher among the patients of Dysglycemia than Normoglycemia at all the time periods (Table-2).

The SBP was found to be significantly (p=0.0001) higher among the patients of Dysglycemia than Normoglycemia at all the time periods. The DBP was also found to be significantly (p=0.0001) higher among the patients of Dysglycemia than

Normoglycemia at all the time periods except at 2 years (Table-3).

The TG was found to be significantly ($p=0.0001$) higher among the patients of Dysglycemia than Normoglycemia at all the time periods. The HDL was also found to be significantly ($p<0.01$) lower

among the patients of Dysglycemia than Normoglycemia at 6 weeks, 6 months and 1 year. LDL was significantly higher among the patients of Dysglycemia than Normoglycemia at 1 year, 2 years and 3 years (Table-4).

Table-1: Basic characteristics of the women in Normoglycemia and Dysglycemia

Basic characteristics	Normoglycemia (n=17)	Dysglycemia (n=33)	p-value ¹
Age in years, mean±SD	32.00±3.37	33.52±3.5	0.14
Diagnosis of GDM in weeks, mean±SD	32.82±1.74	21.58±7.76	0.0001*
OGT , mean±SD			
Fasting	65.41±9.79	96.18±18.71	0.0001*
1 hour	189.29±5.29	204.12±22.12	0.0001*
2 hours	152.41±14.62	164.67±20.90	0.001*
3 hours	72.82±11.83	84.18±23.65	0.001*

¹Unpaired t-test, *Significant

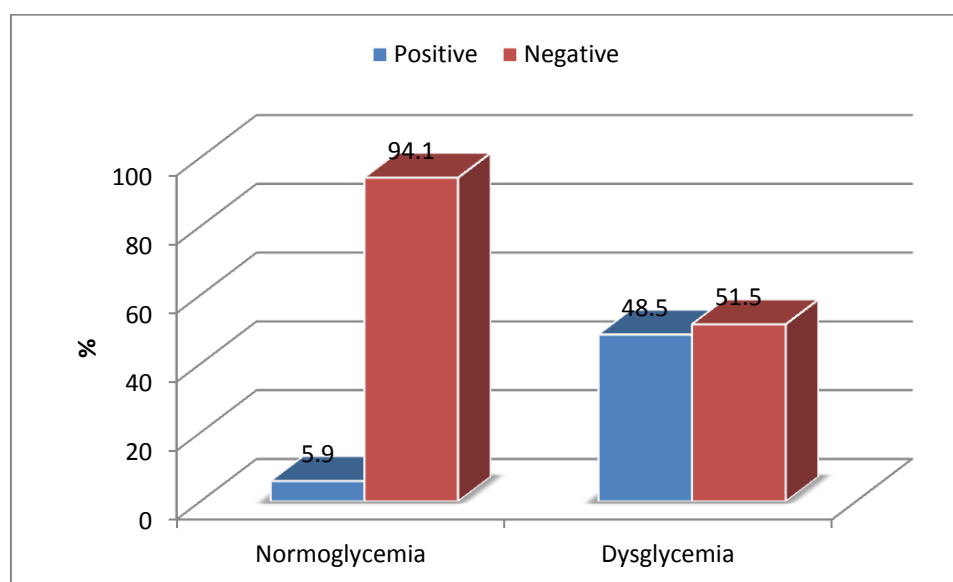


Fig. 1: Comparison of Acanthosis nigricans in Normoglycemia and Dysglycemia

Table-2: Comparison of BMI in Normoglycemia and Dysglycemia across the time periods

BMI	Normoglycemia (n=17)	Dysglycemia (n=33)	p-value ¹
6 weeks	21.96±0.98	26.39±3.80	0.0001*
6 months	21.92±1.71	27.16±4.23	0.0001*
1 year	21.76±2.25	29.70±4.50	0.0001*
2 years	20.74±0.79	22.96±3.58	0.01*
3 years	21.36±1.17	25.30±4.36	0.002*

Table-3: Comparison of blood pressure in Normoglycemia and Dysglycemia across the time periods

Blood pressure	Normoglycemia (n=17)	Dysglycemia (n=33)	p-value ¹
SBP			
6 weeks	118.57±5.38	132.77±9.11	0.0001*
6 months	123.43±3.41	134.80±10.59	0.0001*
1 year	127.71±3.35	135.50±14.08	0.0001*
2 years	119.71±2.69	124.29±4.76	0.0001*
3 years	122.20±4.76	129.50±9.69	0.0001*
DBP			
6 weeks	71.14±3.02	79.85±6.61	0.0001*
6 months	73.43±3.78	79.60±6.38	0.0001*
1 year	75.43±2.99	80.50±5.74	0.0001*
2 years	73.43±3.21	74.86±7.29	0.11
3 years	72.20±3.05	77.90±7.30	0.0001*

Table-4: Comparison of lipid levels in Normoglycemia and Dysglycemia across the time periods

Lipid levels	Normoglycemia (n=17)	Dysglycemia (n=33)	p-value ¹
TG			
6 weeks	141.71±21.05	175.00±37.27	0.0001*
6 months	145.00±23.37	173.36±38.42	0.0001*
1 year	144.29±20.92	174.80±41.89	0.0001*
2 years	127.29±8.228	156.43±20.88	0.0001*
3 years	136.20±13.32	154.00±24.28	0.0001*
HDL			
6 weeks	39.00±2.24	35.08±5.30	0.0001*
6 months	39.43±2.57	36.09±4.32	0.002*
1 year	40.86±3.80	33.20±3.90	0.0001*
2 years	39.29±3.25	39.00±5.92	0.12
3 years	40.30±3.30	39.1±5.34	0.10
LDL			
6 weeks	87.43±5.77	89.46±13.61	0.09
6 months	87.00±8.25	88.73±12.12	0.13
1 year	87.14±6.12	91.00±13.15	0.0001*
2 years	80.43±6.90	88.00±7.72	0.0001*
3 years	82.50±6.47	90.1±10.28	0.0001*

Discussion

Several authors have reported an increased risk of impaired glucose tolerance and type 2 diabetes among women with abnormal glucose screening results in pregnancy in the setting of both normal OGTT (Retnakaran et al, 2009) and one abnormal GTT result (Retnakaran et al, 2008; Carr et al, 2008; Vambergue et al, 2008). Moreover, both IGT and GDM have been associated with the metabolic syndrome at 3 months postpartum (Retnakaran et al, 2010). Other authors have reported associations between GDM and markers of metabolic dysfunction after pregnancy. At a mean of 2 years postpartum, Costacou et al reported adverse associations between history of GDM (N=22) and waist circumference,

hemoglobin A1c, and HOMA-IR, compared with women without a history of pregnancy complications (N=29) (Costacou et al, 2008). Heitritter et al (2005) similarly compared women with a GDM history (N=23) with normal controls (N=23) at a mean of 4 years postpartum. Women in the GDM group had higher diastolic blood pressure, mean arterial pressure, heart rate, fasting glucose, HOMA, triglycerides, CRP, IL-6, and PAI-1 and lower adiponectin than women in the control group.

In the present study, a total of 33 (66%) had some degree of Dysglycemia on postpartum screening with mean duration of follow-up being 16.85±13.94 months. In the study by Yajnik et al

(2004), 52% had T2DM with mean time from index pregnancy being 2.8 years.

The results of the present is consistent with the data from other countries that have confirmed an association between GDM and subsequent development of T2DM. In the meta-analysis by Bellamy et al (2009), the risk of T2DM after GDM was found to be 7 time increased as compared to those with normoglycemic pregnancy, the relative risk varied from 1.32 to 47.25 in various studies. In the present study, the Acanthosis nigricans was positive in 48.5% of Dysglycemia and in 5.9% of Normoglycemia. The mean TG were higher and mean HDL was lower in Dysglycemic women compared to Normoglycemic women which was consistent with the study b Yajnik et al (2004).

There was some limitations of this study. Firstly, the sample size was small. Secondly, the study was not case-control, so we could not find the risk of Dysglycemia in pregnancies complicated with GDM.

Conclusion

The end pregnancy is not the end of the story. In fact, it is the beginning of the new chapter for the prevention of diabetes and cardiovascular risk factors after delivery. Women with GDM should realize that they are sitting on an active volcano of metabolic syndrome which can erupt any time unless preventive measures are started at a war footing right from the every beginning.

References

1. Hadden DR. A historical perspective on Gestational diabetes. *Diabetes Care* 1998; 21.
2. Seshiah V, Balaji V, Madhuri S Balaji, Kapur PA. Pregnancy and diabetes scenario around the World. *Indian Int J Gynaecologist Obstet* 2009; 104.
3. Ferrara A. Increasing prevalence of GDM: A public health prospective. *Diabetes Care* 2007; 30 (2).
4. Kitzmiller JL, Dang-Kilduff L, Taslimi MM. Gestational diabetes after delivery short term management and long term risks. *Diabetes Care* 2007; 20 (2).
5. Yajnik CS, Kale SD, Kulkarni SR, Meenakumari K, Jogleker AA et al. High risk of diabetes and metsbolic syndrome in Indian women with gestational diabetes mellitus. *Diabetes Medicine* 2004; 21: 1257-9.
6. Retnakaran R, Qi Y, Sermer M, Connelly PW, Hanley AJ, Zinman B. An abnormal screening glucose challenge test in pregnancy predicts postpartum metabolic dysfunction, even when the antepartum oral glucose tolerance test is normal. *Clin Endocrinol (Oxf)* 2009; 71(2):208–214.
7. Retnakaran R, Qi Y, Sermer M, Connelly PW, Hanley AJ, Zinman B. Glucose intolerance in pregnancy and future risk of pre-diabetes or diabetes. *Diabetes Care*. 2008;31(10):2026–2031.
8. Carr DB, Newton KM, Utzschneider KM, Tong J, Gerchman F, Kahn SE, et al. Modestly elevated glucose levels during pregnancy are associated with a higher risk of future diabetes among women without gestational diabetes mellitus. *Diabetes Care* 2008;31(5):1037–1039.
9. Vambergue A, Dognin C, Boulogne A, Rejou MC, Biaisque S, Fontaine P. Increasing incidence of abnormal glucose tolerance in women with prior abnormal glucose tolerance during pregnancy: DIAGEST 2 study. *Diabet Med*. 2008; 25(1):58–64.
10. Retnakaran R, Qi Y, Connelly PW, Sermer M, Zinman B, Hanley AJ. Glucose intolerance in pregnancy and postpartum risk of metabolic syndrome in young women. *J Clin Endocrinol Metab*. 2010; 95(2):670–677.
11. Costacou T, Bosnyak Z, Harger GF, Markovic N, Silvers N, Orchard TJ. Postpartum adiponectin concentration,

insulin resistance and metabolic abnormalities among women with pregnancy-induced disturbances. *PrevCardiol*. 2008 Spring;11(2):106–115.

12. Heitritter SM, Solomon CG, Mitchell GF, Skali-Ounis N, Seely EW. Subclinical inflammation and vascular dysfunction in women with previous gestational diabetes mellitus. *J ClinEndocrinolMetab*. 2005; 90(7):3983–3988.
13. Ballamy L, Casas JP, Hingorani AD, Williams, D. Type-2 diabetes mellitus after gestational diabetes: a systematic review and meta-analysis . *Lancet* 2009; 23 (373): 1773-9.