The effect of restricted calorie diet on obese pregnant patient with diabetes mellitus

R.K. Achi, V.L. Bhargava, N. Bhatla, R. Sharma, M.G. Karmarkar, M.M.S. Ahuja

ABSTRACT

The effect of restricted caloric diet on weight gain and foetal outcome in eleven obese pregnant patients with diabetes mellitus has been assessed and compared with 14 non-obese pregnant diabetic patients. It was observed that the total weight gain during pregnancy was 3-7 kg in the obese group and 6-12 kg in the non-obese group. The infant birth weight in the obese group varied from 2900 to 4400 grams. No significant difference was noted between the two groups with regard to obstetric outcome, maternal or neonatal complications.

INTRODUCTION

Diabetes in pregnancy poses special problems since foetal growth and development occur in a setting of abnormal composition of metabolic fuels. Gestational diabetes occurs in 1-3% of all pregnant women (1). Perinatal morbidity and mortality are found to be increased when diabetes complicates pregnancy (2).

Diet plays an essential role in the management of diabetes. Dietary recommendations for diabetic pregnant women have varied remarkably during the past century (3). Pederson (4) supported a caloric restriction in obese pregnant patients irrespective of their diabetic status. In a study by Algert et al (5), no ketonuria and no untoward effects were reported in obese patients with gestational diabetes with caloric restriction.

The present study has been undertaken to assess the effect of low calorie diet on weight gain, glycemic control, infant birth weight and foetal outcome in obese pregnant patients with diabetes mellitus.

MATERIAL AND METHODS

Twenty-five pregnant diabetic patients attending the high-risk pregnancy clinic, at All India Institute of Medical Sciences, New Delhi were included in this study. They were grouped according to the body mass index as obese (BMI > 28) and non-obese (BMI < 28). There were 11 patients in the obese and 14 patients in the non-obese group. Gestational diabetes was diagnosed by 3-hour glucose tolerance test using criteria of O'Sullivan and Mahan (7). Patients were followed from the time of diagnosis till the time of delivery. The period of follow-up ranged from 6-15 weeks.

The total caloric intake was calculated for each individual according to the prepregnant weight or the weight at the first antenatal visit, if the pre-pregnant weight was not known. Obese patients were prescribed a diet of 20-25 kcal/kg/day with a minimum of 1400 kcal/day and non-obese patients were prescribed a diet of 30-35 kcal/day with a maximum of 2000 kcal/day. In both groups, the diet was distributed as carbohydrates 65%, proteins 20% and fat 15% of the calories.

All the obese patients were gestational diabetics in this study. One patient in the non-obese group had insulin dependent diabetes mellitus.

At diagnosis, blood pressure, renal functions and opthalmoscopic findings were recorded. Ultrasound examination was done at 18-22 weeks of gestation to rule out congenital anomalies. Foetal echocardiography was done in patients who had the history of previous child affected with congenital heart disease, we had two such patients in the non-obese group.

After one week of the prescribed diet blood sugar profile was done (6 times/day, pre-and post-meal levels). Postmeal values upto 130 mg% was taken as normal. Insulin was supplemented in patients who did not show control with diet alone. Two patients of the non-obese group required insulin supplementations. Subsequently maternal monitoring was done in the form of weekly urine sugar and acetone, monthly blood sugar profile and HbA_{1C} every trimester. However, in patients on insulin, daily urine sugar and weekly blood sugar profile was done.

Foetal well-being was monitored by serial ultrasound examination at 28, 32, 36 & 38 weeks of gestation for growth profile. After 32 weeks of gestation, daily foetal movement score and weekly non-stress test were done. Contraction stress test and biophysical profile were done when indicated.

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Table 1 : Age distribution		
Age (Years)	Obese (n=11)	Non-Obese (n=14)
≤ 20	nil	nil
21-25	1	2
26-30	6	7
31-35	2	4
≥36	2	1

Table 2 : Parity distribution		
Para	Obese (n=11)	Non-Obese (n=14)
0	7	5
1-2	4	6
3-4	nil	2
≥ 5	nil	1

RESULTS

In this study, non-obese pregnant diabetic patients were compared with the obese group of patients. Six out of 11 obese and seven out of 14 non-obese patients were in the age group 26-30 years. The age distribution of these patients is shown in Table 1 and their parity distribution is shown in Table 2. The previous obstetric history of these patients is shown in Table 3. 14 out of 25 patients had the previous history of recurrent abortion, stillbirth, intrauterine death, neonatal death or congenital heart disease.

All patients in the obese group were controlled with diet alone. Acetonuria was noted in 2 patients in the obese group, in one patient on one occasion and the other patient on 2 occasions. These patients were advised an extra glass of milk at bedtime and subsequently had no acetonuria. In the non-obese group, 11 patients were controlled with diet alone and three patients received insulin in addition. (see Table 5).

Mean glycosylated haemoglobin was less than 8.5% in all patients in the obese group. One patient in the non-obese group had a mean glycosylated haemoglobin level more than 8.5%, who subsequently gave birth to an infant with cleft palate. The maternal weight gain is shown in Table 4. It varied from 3-6 kg in the obese group and 6-12 kg in the non-obese group.

Maternal complications noted in this study were pregnancy-induced hypertension, vaginitis, hydramnios. No significant difference was noted between the two groups as shown in Table 6.

Inspite of the obese mothers gaining less weight than the non-obese mothers, infants of the former group were significantly heavier as observed in this study as shown in Table 7. Mode of delivery was by caesarean section in 4 patients in the obese group and 3 patients in the non-obese group.

DISCUSSION

Diabetic pregnancy with obesity increases the maternal morbidity and perinatal morbidity and mortality. Perinatal mortality varies from 5-8% (7). In our study no perinatal mortality was noted.

Restriction of calorie intake in obese diabetic has been found to be beneficial in improving the glucose tolerance. Studies have shown that restriction of calories in obese pregnant patients leads to good glycemic control in the mother and birth of normal weight infant (8).

Table 3: Previous obstetric performance

(a)

Abortion	No. of patients	
	Obese	Non-obese
0	8	9
1-2	2	3
3-4	0	2
≥ 5	1	0

(b)

Still Birth IUD	No. of patients	
	Obese	Non-obese
0	10	11
1-2	1	3
3-4	0	0
≥ 5	0	0

(c)

Neonatal Death	No. of patients	
	Obese	Non-obese
0	10	10
1	1	2
2	0	1
3	0	1

Table 4: Maternal weight gain

Wt(kg)	Obese (n=11)	Non-obese (n=14)
1-3	3	0
3.1-6	4	2
6.1-9	4	8
≥ 9.1	0	4

Pederson (9) advised caloric restriction in obese pregnant patient irrespective of their diabetic status. MacGillivray (8) demonstrated that obese women whose pregnant weight gain was limited to 5-10 kg, delivered infants with a mean birth weight of 3,302 g, which was comparable to that of women of average height and weight.

However, restriction of caloric intake during pregnancy was not advised (10) earlier for fear of maternal ketoacidosis affecting the foetus, especially the IQ. Churchill and associates (11) have reported that acetonuria during pregnancy is associated with lowering of intelligence is associated with lowering of intelligence of offspring.

Table 5: Glycemic control with mean post meal level less than 130 mg%				
	DIET	DIET+INSULIN	Mean HbA1C	
			< 8.5%	> 8.5%
OBESE (n=11)	11	NIL	11	NIL
NON OBESE (n=14)	11	3	13	1

Table 6 : Maternal complications		
Complications	Obese (n=11)	Non-obese (n=14)
PIH	2	3
VAGINITIS	4	3
CHRONIC HYPERTENSION	nil	nil
UTI	nil	nil
HYDRAMNIOS	nil	nil
TUOR	nil	nil

Table 7: Foetal outcome		
	Obese	Non-obese (n=14)
Foetal weight (gms):		
Mean	3620±468	2980±448
Range	(2900-4400)	(2500-3600)
Asymp Hypoglycemia	1	2
Symp Hypoglycemia	2	3
Polycythemia	nil	1
RDS	nil	nil
Birth Injury	nil	nil
Cong anomalies	1	1
	single umb artery	cleft palate
Mortality	nil	nil

Coetzee et al (12) studied the frequency of ketonuria in obese pregnant diabetic patients receiving low calorie diet of 1000 kcal/day, its urine and blood level correlation and foetal outcome and found that 19% of patients developed ketonuria but the simultaneous blood levels were negative. The ketonuria in these circumstances does not herald ketoacidosis. In our study, two patients developed ketonuria, which could be managed by an extra glass of milk supplementation at bed time.

Naeye et al (13) showed that infants of ketotic gestations had normal IQ levels and no increase in neurological abnormalities at 4 and 7 years of age.

In the present study, obese patients with caloric restriction gained less weight when compared to non-obese group. However, there was no intrauterine growth retardation. On the contrary, these babies were larger than those of the non-obese group. With regard to neonatal outcome, there was no abortion, pre-term birth, stillbirth and neonatal

death. Similar, outcome has been reported by other authors (14,15).

This study shows that restriction of caloric intake is beneficial for the obese pregnant diabetic patients. No adverse effects were noted in either the mother or the foetus. However, a large study is required to confirm these observations.

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