TAJ June 2023; Volume 36 Number-1

ISSN 1019-8555
The Journal of
Teachers Association
RMC, Rajshahi

Original Article

The Outcome of Obese Pregnant Mother Having Gestational Diabetes Mellitus

Hamida Pervin,[1] Shahela Jesmin,[2] Nazmun Nahar,[3] Nahid Yusuf,[4] Mst. Shorifa Rani [5]

Abstract

Background: Gestational diabetes mellitus (GDM) is a public health issue, mainly affecting the Southeast Asian region and Bangladesh(prevalence 9.7 % - 12.9%). It has a significant adverse impact on maternal and fetal outcomes. Obesity is one of the common nutritional problems complicating pregnancy in developed countries. Body mass index > 30 kg/m^2 is a globally accepted definition of obesity. The body fat percentage is considered to be higher in the Asian population compared to the European population at the same level of BMI, and therefore, different cut-off levels are recommended for Asians. The provisional recommendations for the Asian Pacific region published in February 2000 by the WHO regional office for the western pacific, the International Association for the Study of Obesity, and the international obesity Task Force are overweight at BMI >23 and obese at BMI > 25 kg/m^2. There is a strong association between maternal obesity and gestational diabetes mellitus. So it needs to be addressed energetically to avoid maternal and fetal morbidity and mortality.

Materials and methods: This cross-sectional type of comparative study was carried out in the Gynae outdoor and indoor departments of Rajshahi medical college hospital, Rajshahi, and Rajshahi Diabetic Hospital. All patients following inclusion and exclusion criteria on the basis of history and clinical examination were selected. 37 patients are obese having BMI > or = 25 kg/m^2 and 55 having BMI < 25 kg/m^2. Besides the baseline investigations, some specific investigations like serum urea, creatinine, HbA1C, lipid profile, and ophthalmoscopy were carried out to assess the status of end organs.

Results: Vulvovaginitis was more in the obese group than without the obese group, which was 27.03% and 7.24%, respectively. The difference was statistically significant between the two groups (P < 0.05). But PET, UTI, and polyhydramnios were statistically not significant between the two groups (P>0.05). Cesarean section incidence was higher in all GDM patients, and the difference was not statistically significant. Preterm delivery was 13.51% in GDM with obese patients and 3.64% in GDM with non-obese patients, which was statistically significant. Maternal postpartum complications, including PPH, UTI, and wound infection, were 10.81%, 21.62%, and 5.41 %, in GDM, with the obese group and 3.64%, 12.73%, and 1.82%, respectively, in the non-obese group. The rest of the variables had statistically insignificant differences between the two groups (P> 0.05). Fetal distress was not statistically significant. Regarding perinatal outcome, macrosomia was 16.22% and 5.45% in obese and non-obese groups, respectively. The difference was statistically significant between the two groups (P< 0.05). Hypoglycemia in the obese group was 13.51%, and in the non-obese group, 3.64%; the difference is also statistically significant (P< 0.05). However, birth asphyxia, hyperbilirubinemia, and RDS were statistically not significant between the two groups (P> 0.05).

Conclusion: The current study finding indicates that obesity in GDM patients is associated with more maternal and perinatal pregnancy complications. Thus pre-pregnancy weight reduction and appropriate weight gain during the antenatal period in all women, especially in women with gestational diabetes, might reduce pregnancy and labor complications and improve maternal and perinatal outcomes.

Keywords: GDM, Obesity.

TAJ 2023; 36: No-1: 97-106

Introduction

Gestational diabetes mellitus is defined as the onset or first recognition of carbohydrate intolerance during pregnancy.[1] There are two subtypes of GDM. Type A1; abnormal oral glucose tolerance test (OGTT) but normal blood glucose levels during fasting and 2 hours after meals; diet modification is sufficient to control glucose level. Type A2; abnormal OGTT compounded by abnormal glucose levels during fasting and/ or after meals; additional therapy with

[1] Junior Consultant (Gynae), Durgapur Upazilla Health Complex , Rajshahi, Bangladesh.
[2] Professor(PRL), Department of Obstetrics and Gynecology, Rajshahi Medical College, Rajshahi, Bangladesh.
[3] Assistant Professor, Department of Obstetrics and Gynecology, Rajshahi Medical College, Rajshahi, Bangladesh.
[4] Associate Professor, Department of Obstetrics and Gynecology, Rajshahi Medical College, Rajshahi, Bangladesh.
[5] Junior Consultant (Gynae), Charghat Upazilla Health Complex, Rajshahi, Bangladesh.

insulin or other medication is required. Approximately 2% to 7% of all pregnancies are complicated by Gestational diabetes mellitus, although the prevalence may be as high as 15% depending upon the population evaluated.[2] Ethnic groups at greater risk for Gestational diabetes mellitus include populations with an inherently higher risk of type 2 diabetes mellitus, such as Native Americans, Hispanics, African American, and those of South Asian, East Asian, or pacific islander descent.[3]

Obesity has reached pandemic proportions and is of growing concern worldwide. Adverse health outcomes associated with a raised body mass index present the most significant challenge currently facing clinicians across all disciplines. Obesity is one of the common nutritional problems complicating pregnancy in developed countries. Body mass index > 30 kg/m^2 is a globally accepted definition of obesity. The body fat percentage is considered to be higher in the Asian population compared to the European population at the same level of BMI, and therefore, different cut-off levels are recommended for Asians.[4] The provisional recommendations for the Asian Pacific region published in February 2000 by the WHO regional office for the western pacific, the International Association for the Study of Obesity, and the international obesity Task Force are overweight at BMI >23 and obese at BMI > 25 kg/m^2.[5] Recently, a large study in the Chinese population has been published with same reference levels.[6] There is a strong association between maternal obesity and gestational diabetes mellitus.[7]

There is a general association that maternal obesity is associated with an increased risk of medical and pregnancy complications, including hypertension, pre-eclampsia, gestational diabetes mellitus, thrombophlebitis, labor abnormalities (including prolonged 2nd stage of labor and shoulder dystocia), delivery after 42 weeks of gestation and cesarean delivery. In addition, operative complications among obese women undergoing C/S include increased blood loss, prolonged operative time, and increased post-operative infection rate.

The most common fetal adverse outcomes found in pregnant women with diabetes are fetal and neonatal loss, a variety of congenital abnormalities and malformations, premature delivery (delivery occurring before 37 weeks of gestation), fetal growth acceleration, and macrosomia. Which are associated with several obstetric complications like birth trauma, hypertrophic myocardiopathy, stillbirth, respiratory distress syndrome, neonatal hypoglycemia, hypocalcemia, hyperglycemia, and polycythemia; maternal complication are pregnancy-induced hypertension, pre-eclampsia, hemolysis, elevated liver enzymes, low platelet syndromes (HELLP), cesarean section, hypoglycemia and the worsening of any degree of pre–existing renal insufficiency and retinopathy.[8]

Management of diet, gestational diabetes, and gestational and inter-gestational weight may improve outcomes in women who are obese during pregnancy.

Materials and Methods

This study was carried out on pregnant women attending in Obstetrics and Gynaecology outdoor and indoor department of Rajshahi Medical College Hospital, Rajshahi and Rajshahi Diabetic Hospital with GDM a gestational period of 28 weeks and onwards with their consent from Jan 2014 to Dec 2014, who fulfilled the inclusion and exclusion criteria.

All patients following inclusion and exclusion criteria on the basis of history and clinical examination were selected. A detailed history was recorded. 37 patients were obese having BMI > or = 25 kg/m^2 and 55 were non obese having BMI < 25 kg/m^2. Besides the baseline investigations, some specific investigations like serum urea, creatinine, HbA1C, lipid profile, and ophthalmoscopy were carried out to assess the status of end organs.

Gestational diabetics receive insulin if they fail to achieve normal glucose levels with diet and exercise. The efficacy of control was checked by estimating blood sugar levels four times a day, that is, fasting, pre-lunch, pre-dinner, and bedtime. The need for admission was decided individually depending upon complications during pregnancy,

inability to achieve euglycemia at home, and previous obstetric history. Fetal surveillance started from 28-32 weeks, and the test included a biophysical profile twice weekly, a growth scan 2-4 weekly for biometry, and amniotic fluid volume. All patients were admitted at 36 weeks, and close monitoring was carried out till delivery. The frequency and timing of surveillance depended upon the severity of the disease and the degree of glycemic control. The mode of delivery was decided at 38 weeks according to previous obstetric history, fetal lie, presentation, and feto-maternal complications. A neonatologist did a detailed neonatal examination for respiratory distress, congenital anomalies like cardiac and neural tube defects, and metabolic abnormalities like jaundice and hypoglycemia. Observations regarding maternal outcome were recorded in terms of PE, preterm labor, hydramnios, and operative delivery. The mother and neonate were followed for at least one week after delivery.

Results

During this study period, vulvovaginitis was more in the obese group than without the obese group, which was 27.03% and 7.24%, respectively. The difference was statistically significant between the two groups ($P < 0.05$). But PET, UTI, and polyhydramnios were statistically not significant between the two groups ($P>0.05$).

Table I: Selected antepartum complications of mother between two groups

Variables	GDM with Obesity (n=37) Group I		GDM without obesity (n=55) Group II		X^2 Value	P value
	No	%	No	%		
Pre-eclampsia	5	13.51	4	7.24	2.17	> 0.05(NS)
Vulvovaginitis	10	27.03	4	7.24	13.79	< 0.05 (S)
UTI	8	21.62	7	12.73	2.79	> 0.05 (NS)
Polyhydramnios	6	16.22	5	9.0	2.37	> 0.05 (NS)
No complication	8	21.62	35	64		
Total	37	100	55	100		

n = Number of GDM patients

NS = Non significant

S = Significant

Table II: Mode of treatment between two groups

Variables	GDM with Obesity (n=37) Group I		GDM without obesity (n=55) Group II		X^2 Value	P value
	No	%	No	%		
Diet only	5	13.51	21	38.18	15.87	< 0.05(S)
Diet + Drug	32	86.48	34	61.81		

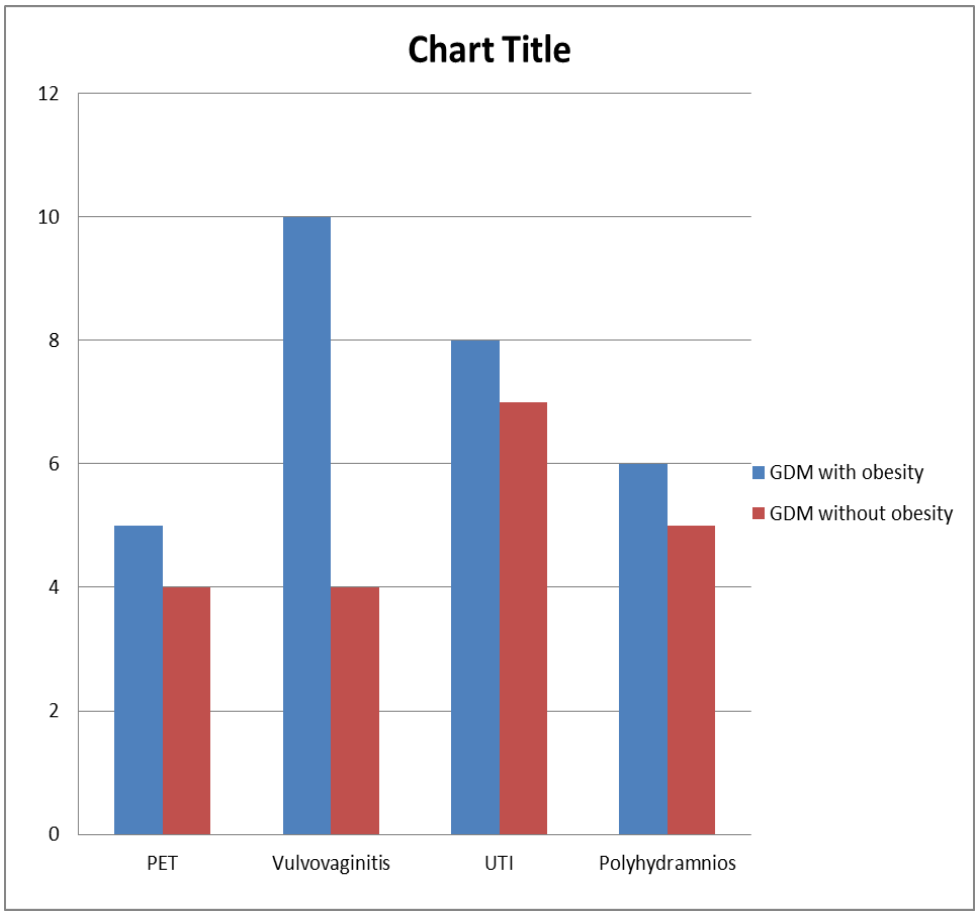

Fig I: The bar diagram shows antepartum complications between mothers of two groups.

The incidence of cesarean section was more in all GDM patients, 89.18% in the obese group and 85.45% in the non-obese group, and the difference was not statistically significant. Preterm delivery was 13.51% in GDM with obese patients and 3.64% in GDM with non-obese patients, which was statistically significant.

Table III: Mode of delivery between two groups

Variables	GDM with Obesity (n=37) Group I		GDM without obesity (n=55) Group II		X^2 Value	P value
	No	%	No	%		
Vaginal	4	10.81	8	14.55	0.631	>0.05(NS)
Cesarean- section	33	89.18	47	85.45		

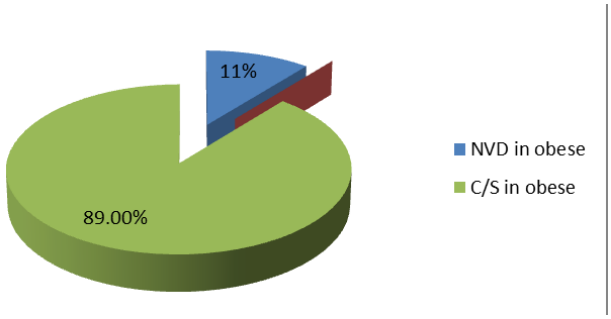

Fig II: Pie diagram shows the mode of delivery in obese GDM patients.

Table IV: Labor outcome between two groups

Variables	GDM with Obesity (n=37) Group I		GDM without obesity (n=55) Group II		X^2 Value	P value
	No	%	No	%		
Preterm	5	13.51	2	3.64	6.21	< 0.05(S)
Term	32	86.49	53	96.36		

Maternal postpartum complications, including PPH, UTI, and wound infection, were 10.81%, 21.62%, and 5.41 %, respectively, in GDM, with the obese group and 3.64%, 12.73%, and 1.82%, respectively, in the non-obese group.

Table V: Postpartum complications of mother between two groups

Variables	GDM with Obesity (n=37) Group I		GDM without obesity (n=55) Group II		X^2 Value	P value
	No	%	No	%		
PPH	4	10.81	2	3.64		
UTI	8	21.62	7	12.73	0.84	> 0.05(NS)
Abdominal wound infection	2	5.41	1	1.82		
No complication	23	62.16	45	81.81		
Total	37	100	55	100		

Regarding fetal outcome, 21.62% were significant to date, 5.41 % were congenital anomalies, and 5.41% IUGR and 2.70% IUD were in the obese group. On the other hand, in the non-obese group, 10.9% were large to date, 3.64% IUGR and had no congenital anomaly and IUD. Large for the date were statistically significantly different between the two groups ($P<0.05$). The rest of all variables were statistically insignificant differences between the two groups ($P> 0.05$). Fetal distress was found in 8.11% of the obese group and 3.64% of the non-obese group, which was not statistically significant.

Table VI: Selected antepartum complications of the fetus between two groups

Variables	GDM with Obesity (n=37) Group I		GDM without obesity (n=55) Group II		X^2 Value	P value
	No	%	No	%		
Large for date	8	21.62	6	10.9	4.21	< 0.05(S)
Congenital anomaly	2	5.41	00	00	-	-
IUGR	2	5.41	2	3.64	0.000	> 0.05 (NS)
IUD	1	2.70	00	00	-	-

Table VII: Intrapartum complications of the fetus between two groups

Variables	GDM with Obesity (n=37) Group I		GDM without obesity (n=55) Group II		X^2 Value	P value
	No	%	No	%		
Fetal distress	3	8.11	2	3.64	1.81	> 0.05(NS)
Stillbirth	0	0	0	0		
Shoulder dystocia	0	0	0	0		
No complication	34	91.89	53	96.36		

Regarding perinatal outcome, macrosomia was 16.22% and 5.45% in obese and non-obese groups, respectively. The difference was statistically significant between the two groups (P< 0.05). Hypoglycemia in the obese group was 13.51%, and in the non-obese group, 3.64%; the difference is also statistically significant (P< 0.05). Nevertheless, birth asphyxia, hyperbilirubinemia, and RDS were statistically not significant between the two groups (P> 0.05).

Table VIII: Perinatal complications between two groups

Variables	GDM with Obesity (n=37) Group I		GDM without obesity (n=55) Group II		X^2 Value	P value
	No	%	No	%		
Macrosomia	6	16.22	3	5.45	3.97	< 0.05 (S)
Birth asphyxia	9	24.32	8	14.55	3.02	> 0.05(NS)
Hypoglycemia	5	13.51	2	3.64	6.21	< 0.05(S)
Hyperbilirubinaemia	0	00	0	00	-	
Neonatal sepsis	2	5.41	0	00	-	
RDS	0	00	0	00	-	
No complication	15	40.54	42	76.36		
Total	37	100	55	100		

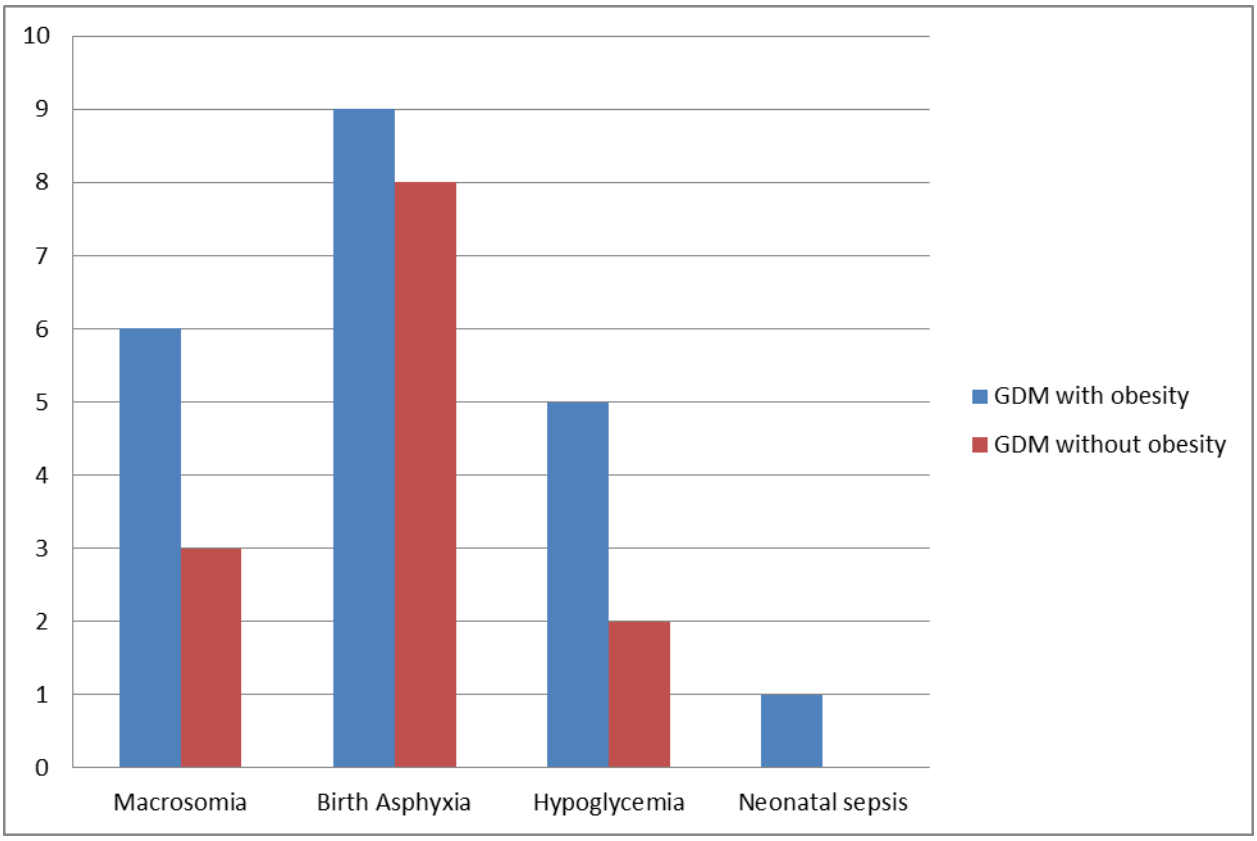

Fig III: The bar diagram shows perinatal complications between the two groups.

Discussion

This cross-sectional study has been conducted to observe the effect of obesity on the pregnancy outcome of GDM patients. This study was conducted in the Department of Obstetrics and Gynecology, Rajshahi medical college hospital, and also in Rajshahi Diabetic Hospital, Rajshahi. During the study period, 92 subjects were enrolled into two groups. Out of this, 37 were GDM patients with obesity, and 55 were GDM patients without obesity. Their antenatal, intranasal, and postnatal periods were thoroughly observed. In addition, the maternal and perinatal morbidities of these patients were recorded and analyzed statistically.

In our study, vulvovaginitis was more in the GDM with obese patients than in GDM without obesity, which was 27.03% and 7.24%, respectively. The incidence of UTI and vulvovaginitis in both diabetic subjects are in conformity with the study done by Metzger BE et al[9] and also by Michlin et al.[10] A population-based cohort study in Washington state based on birth data (n= 96801) stated that among nulliparous women, overweight and obese women had significantly increased risk for pre-eclampsia, which does not correlate with our study.

The incidence of polyhydramnios found in both groups (16.22% and 9% in obese and non-obese, respectively) are in agreement with that of Metzger BE et al.[9] (3.7%), and Yogev Y et al[38] (4%) but lower than that shown in Michlin et al.[10] The lower incidence of polyhydramnios in this study is possibly due to good glycemic control.

In the present study, the rate of cesarean sections is higher in both the diabetic group (GDM with obesity 89.18% and GDM without obesity 85.45%), which correlates with the study shown by Shikder et al. (51.6%), IVY R (57.45%), Landan and Gabbe (50%) but higher than that reported by Metzger BE et al[11] (38.3%) and Yogev Y et al[38] (41%) and also shown by Radhia khan et al.[12] While searching relationship between BMI and mode of delivery, several studies found that induction of labor and delivery by C/S were both more common in obese women in the western world, stated by Borfil et al. 1996.

A study by Bianco et al. 2004, including 5067 singleton pregnancies from 2001 to 2004 at the Department of Obstetrics and Gynecology, University of Leipzig, showed that in the group with BMI≥ 30, the rate of C/S is significantly elevated to 25.1%, with a more dramatic increase up to 30.2% in the group with BMI≥35 and 43.1% in the group of BMI ≥ 40. The frequencies of both elective and emergency section are almost twice as high for very obese women as it is for women with normal BMI. Cephalopelvic disproportion was the predominant cause of elective C/S among obese women. At the same time, fetal distress and failed induction of labor was the leading cause of emergency C/S stated by Anirban Dasgupta et al.[13] Now it is well established that maternal obesity is a risk factor for C/S. In a study by Murakami and Ohmichi, 2005 it was shown that in obese Japanese, the risk of C/S is significantly elevated compared with the normal group. All these studies correlate with our study.

The incidences of preterm delivery are more in the obese group (13.51%), which is similar to the result shown by Michlin et al.[10] A recent article by Cnattingius et al.(1998) based on a cohort study of 167,750 women reported that obesity increases the frequency of premature delivery not only in nulliparous women but in parous women.

The incidence of fetal distress is 8.11% in the obese group and 3.64% in the non-obese group. Other intrapartum complication shows a similar result with lower incidence. The lower incidence of intrapartum complications is mostly due to elective C/S in all suspected cases.

In our study, 10.81% of the obese group developed post-partum hemorrhage (PPH) compared to 3.64% in the non-obese group. There was no significant difference between the groups in these characteristics. Anirban (2014) showed that the risk of PPH is associated with increasing BMI and is about 6.2% more frequent in women with BMI over 25 and about 31.6% more frequent in women with a BMI of 35 or more compared with women with a normal BMI.

Chowdhury and Mahmud, in 2005, collected data from a population of 60,000 throughout Bangladesh over a three years period by BRAC and found that 22% of the infants were born with low birth weight, and the mean birth weight for Bangladeshi newborns (MBW) was 2.6± 0.74 kg. The incidence of macrosomia was found to be 16.22% in the obese group and 5.45% in the non-obese group. Differences were statistically significant (P< 0.05). A retrospective cohort of postpartum women in King Khalid University Hospital done by Wahabi et al.[41] (2014) showed that the combination of GDM and obesity increased the odds of delivering a macrosomic baby by nearly fourfold.

Asphyxia, respiratory distress syndrome (RDS), hypoglycemia, and hyperbilirubinemia were more common in the obese diabetic group than the normal weight group, but there was no significant difference between groups in these characteristics except hypoglycemia which is significantly more in the obese group. This may be due to the need for more hypoglycemic drugs in the obese group, which crosses the placenta and causes fetal hypoglycemia.

Women who were overweight and obese also tended to have higher complication rates than normal-weight women. Cedergren, in 2004, showed that the infants delivered by obese women had higher rates of fetal distress, high birth weight, and low APGAR score, which fairly supported our study findings; most studies have found that the fetuses of obese women are likely to deliver large for gestational age infants and macrosomia as average weight women, which was similar to our study.

Conclusion

In our country, gestational diabetes is often associated with a nutritional problem that complicates pregnancy outcomes. The current study finding indicates that obesity in GDM patients is associated with more maternal and perinatal pregnancy complications. Thus, pregnancy weight reduction and appropriate weight gain during the antenatal period in all women, especially in women with gestational diabetes, might reduce pregnancy and labor complications and improve maternal and perinatal outcomes.

Conflict of interest: None declared

References

1. American diabetic association. Gestational diabetes mellitus (position statement).*Diabetes care.* 2004; 27(suppli 1) : S88-S90.
2. King H Epidemiology of glucose intolerance and gestational diabetes in women of childbearing age. *Diabetes care.*1998: 21 (Suppl-2): B9-B13.
3. Graves CR. Management of diabetes mellitus complicating pregnancy. *Obstet Gynecol.*2003; 102: 857-868.
4. Razak F, Anand SS, Shannon H, Vuksan V, Davis B,Jacobs R et al. Defining obesity cut points in a multi-ethnic population. Circulating. 2007; 115: 2111-18.
5. WHO/IASO/IOFT. The Asia –Pacific Perspective: Redefining obesity and its treatment. Melbourne: Health Communications Australia, 2000: ISBN 0-9577082-1-1.
6. WHO expert consultation. Appropriate body mass index for Asian populations and its implication for policy and intervention strategies. Lanctet. 2004; 363: 157-63.
7. Owens LA, O'Sullivan EP, Kirwan, Avalos G , Gaffney G , Dunne F; ATLANTIC DIP collaborations. ATLANTIC DIP : The impact of obesity on pregnancy outcome in glucose tolerant women. *Diabetes care.* 2010; 33: 577-579.
8. De Valk HW, Visser GHA Insulin during pregnancy, labor, and delivery. *Best Pract Res Clin Obstet Gynecol* 2011; 25 (1): 65-76.
9. Michlin R, Oettinger M, Odeh M et al.*: Maternal obesity and pregnancy outcome. Isr Med Assoc J. 2:10–13, 2000*
10. Yogev Y, Langer O. *Pregnancy outcome in obese and morbidly obese gestational diabetic women. Eur J Obstet Gynaecol Reprod Biol*. 2008;137:21–26.
11. Khan R, Ali K Khan Z, *Maternal and fetal outcome of gestational diabetes mellitus.* Gomal J Med Sci 2013; 11.88-91.
12. Anirban Dasgupta , K T Harichandrakumer, Syed Habeebullah. "*Pregnancy outcome among obese Indians - A Prospective Cohort Study in A Tertiary Care Centre in South India*." Int J Sci Stud. 2014; 2(2): 13-18.
13. Wahabi HA, Fayed AA, Alzeidan RA, Mandil AA.: *T*he independent effect of maternal obesity and gestational diabetes on the pregnancy outcome. BMC Endocrine Disorders 2014 (14): 47.

All correspondence to
Dr. Hamida Pervin
Junior Consultant (Gynae)
Durgapur Upazilla Health Complex. Rajshahi
E-mail: hamidapervin1977rajru@gmail.com