Original Research

Maternal and Fetal Outcome in Pregnancy with diabetes mellitus: Study in a district hospital, Jamalpur, Bangladesh

Dr. Fakhria Alam[1], Dr. Jannatul Ferdous[2], Dr. Mohammad Mostafizur Rahman[3]

[1]Senior Consultant, Dept. of Gynaeocology &Obstetrics, 250 bedded General Hospital, Jamalpur, Bangladesh

[2]Associate Professor, Department of Gynae & Obstetric, Ashiyan Medical College Hospital, Barua Khilkhet, Dhaka, Bangladesh

[3]Assistant Professor & Head, Dept. of Anesthesiology & ICU, Ashiyan Medical College Hospital, Barua Khilkhet,Dhaka, Bangladesh

Address for Correspondence:

Dr. Fakhria Alam
Senior Consultant, Dept. of Gynaeocology &Obstetrics, 250 bedded General Hospital, Jamalpur, Bangladesh

Key words: *Diabetes, Pregnancy, Maternal and Fetal Outcome.*

Article Information:

Received Date: Jan 20, 2021
Revised Date: Sep 02, 2021
Accepted Date: Oct 25, 2021
Published Date: Dec 05, 2021

Abstract

Introduction: *Cardiac disease is an important cause of maternal mortality and morbidity in antepartum and postpartum period. Objectives of our study was to determine maternal and fetal outcome in pregnant women in Bangladesh.* ***Material & Methods:*** *This was a cross-sectional analytical study was conducted in the department of Obstretics & Gynecology in 250 bedded General Hospital, Jamalpur, Bangladesh during the period from January 2018 to in December 2018. The aim of this study was to find out the maternal and fetal outcome of the pregnancies complicated by pre-gestational and gestational diabetes mellitus. In this study, a total of 225 patients were selected using purposive sampling technique. There were three groups of pre-gestational diabetic, gestational diabetic and non-diabetic control, designated as Group A, Group B, Group C accordingly; and each consists of 75 patients. Information collected from all pregnant women (After 28 weeks of gestation) with diagnosed GDM and Pre-GDM and symptoms signs suggestive of GDM and Pre-GDM later confirmed by relevant investigation (FBS, 2h PPBS & HbA1C) using a questionnaire made for recoding all relevant parameters under study, after proper counseling and taking written consent of the patient or her legal guardian admitted during the study period in obstetric ward in Rangpur Medical College & Hospital, Rangpur.* ***Results:*** *History of GDM was significantly more common among patients with pre-GDM (38%) and GDM (18%) compared to controls. History of abortion, IUFD and congenital anomaly were significantly higher among pre-GDM mothers than GDM mothers and controls ($p<0.05$). History of deliveries with macrosomia and still birth was distributed similarly across the groups ($p>0.05$). Pre–GDM and GDM patients had significantly higher number of patients with HbA_1C >6.5% than controls. Mean FBS and PPBS was significantly higher in pre-GDM & GDM patients than control ($p<0.05$). APGAR score was <7 in significantly higher number of pre–GDM and GDM babies than controls ($p <0.05$). Mean Weight of the babies was significantly lower among pre–GDM patients than GDM patients ($p <0.05$). Among pre–GDM patients and GDM patient's cases of birth asphyxia, Hypoglycemia, hyperbilirubinemia and congenital anomalies were significantly higher than controls ($p< 0.05$).* ***Conclusion:*** *Interventions such as preconception care for women with pre-gestational diabetes, screening for early diagnosis, patient education, multidisciplinary approach and good metabolic control maintained throughout the pregnancy is the key to successful fetomaternal outcome.*

INTRODUCTION

Poor pregnancy outcomes have association with diabetes mellitus.[1] There are countless differences in the frequency and the effect of PGDM and GDM among different indigenous groups.[2,3] Epidemiological studies has established that the commonness of GDM isin direct percentage to the commess of type 2 diabetes mellitus T2DM).[4] Patients with obesity, polyhydramnios, suspected macrosomia, history of GDM or macrosomia in previous pregnancy, unexplained stillbirth, medical/familial type 2 diabetes in a first-degree relative, or patients treated for polycystic ovary syndrome were considered to be high-risk patients and were screened directly by GTT.[5,6] Besides, obesity and age above 30 years, and many other pre-diabetic risk

situations are associated with both circumstances[4] and women with GDM are at increased risk of developing T2DM.[7,8] Diagnosis of GDM was established on the basis of NDDG criteria by carrying out oral GTT.[9] Universal screening of all nondiabetic pregnancies is performed as a protocol engaging either a 1-hour 50 g glucose trial test or by an oral glucose tolerance test (GTT) reliant on low- or high-risk standards.[6] Some evidence says, the occurrence of T2DM in Saudi Arabia to be between 21% to 24%, which reveals a fivefold increase in the pretentious population in just over 20 years.[10,11] Among the Middle East countries, the Gulf region countries presented the maximum frequency of Diabetes Mellitus (DM); with the Kingdom of Saudi Arabia (KSA) testified the utmost commonness associated to the other Gulf countries. While in Bangladesh, almost 9.7% of pregnancies are affected by GDM.[12] The pregnancy specific hormone such as Human placental lactogen, cortisol, prolactin increases the insulin resistance. This diabetogenic stress causes production of more insulin as a compensatory mechanism. When this balance is inadequate gestational diabetes occur.[13] Both pregestational and gestational diabetes are associated with insulin resistance and impaired insulin secretion. These two diseases also have same genetic susceptibility.[14] The interaction between Human Leucocytic Antigen G (HLA–G) and Nuclear factor kB (NF- kB) is responsible for development of GDM.[15] The effect of hyperglycemia on pregnancy outcome varies with the level of maternal blood glucose and the time during pregnancy with uncontrolled hyperglycemia. Uncontrolled type 1 & type 2 diabetes mellitus in early pregnancy and during organogenesis is associated with increased risk of adverse maternal & fetal outcome. But in GDM complications is less frequent and less severe due to late occurrence of the hyperglycemia.[16] Interventions such as preconception care for women with pre-gestational diabetes, screening for early diagnosis, patient education, multidisciplinary approach, (including obstetrician, dietician, endocrinologist, neonatologist and anaesthesiologist) and good metabolic control maintained throughout the pregnancy is the key to successful feto-maternal outcome. Therefore, this study was conducted to find out the maternal and fetal outcome of the pregnancies complicated by pre-gestational and gestational diabetes mellitus.

METHODS

This was a cross-sectional analytical study which was conducted in the department of obstetrics and gynecology, Rangpur Medical College Hospital, Rangpur. The aim of this study was to find out the maternal and fetal outcome of the pregnancies complicated by pre-gestational and gestational diabetes mellitus. In this study, a total of 225 patients were selected using purposive sampling technique. There were three groups of pre-gestational diabetic, gestational diabetic and non-diabetic control, designated as Group A, Group B, Group C accordingly; and each consists of 75 patients. Duration of data collection was from March 2019 to February 2020. Information collected from all pregnant women (After 28 weeks of gestation) with diagnosed GDM and Pre-GDM and symptoms signs suggestive of GDM and Pre-GDM later confirmed by relevant investigation (FBS, 2h PPBS & HbA1C) admitted during the study period in obstetric ward in Rangpur Medical College & Hospital, Rangpur using a questionnaire made for recoding all relevant parameters under study, after proper counseling and taking written consent of the patient or her legal guardian. Data were analyzed using SPSS software and p value <0.05 was considered as statistically significant.

Inclusion Criteria

Gestational age >28 weeks
All the diagnosed case having GDM & Pre-gestational DM admitted for delivery in Rangpur Medical College Hospital
Newly diagnosed College Hospital
Singleton pregnancy

Exclusion Criteria for Pre-GDM & GDM mothers:

Multiple Pregnancy
Patient with any medical or surgical illness i.e. renal disease, liver disease & endocrine disorder that may affect the blood sugar level
Non-compliant patient

Exclusion criteria for control mothers:

Multiple Pregnancy.
Patients with any medical or surgical illness i.e. renal disease, liver disease, endocrine disorder that may affected the blood sugar level.
Non –compliant patient.
Not willing to participate.

RESULTS

Table 1 shows that age distribution among the study groups were similar (p>0.005), mean age of Group A (28.62 ±2), Group B (27 .90 ± 2.04) and Group C Was (26.56 ± 2.65) years. Most of the participants were educated below

Table 1: Socio-demographic profile of participants (n=225)

Variables	Group A Pre-GDM (n=75)		Group B GDM (n=75)		Group C Control (n=75)		P value
	N	%	N	%	N	%	
Age (in year)							
<25	3	4	12	16	14	18.6	0.069ns
25-29	49	65.3	44	58.6	44	58.7	
≥30	23	30.6	19	25.4	17	22.7	
Mean±SD	28.62±2.1		27.90± 2.04		27.56± 2.65		0.064ns
Education							
Illiterate	6	8.2	6	8	11	14.7	0.886ns
Below SSC	41	54.6	44	58.5	31	41.3	
SSC	17	22.6	17	22.3	17	22.7	
HSC	7	9.3	7	9.2	15	20	
Graduate and above	4	5.3	1	2	1	1.3	
Occupation							
Housewife	63	84	60	80	66	88	0.860ns
Service Holder	5	6.7	3	4	3	4	
Day Labourer	6	8	8	10.7	4	5.3	
Others	1	1.3	4	5.3	2	2.7	
Socio-economic status							
Lower	35	46.7	36	48	45	60	
Middle	31	41.3	30	40	24	32	
Higher	9	12	9	12	6	8	
Residence							
Rural	54	72	54	72	62	82.7	0.464ns
Urban	21	28	21	28	13	17.3	
Family history							
Present	53	70.7	49	65.3	8	10.7	<0.001s
Absent	22	29.3	26	34.7	67	89.3	

P value determined by Chi- squared test and ANOVA as appropriate. ns= non-Significant: s = Significant

SSC (respectively 54.6%, 58.5% and 41.3% in pre-GDM, GDM and controls), were housewives (84%, 80% and 88% respectively), came from rural area (72%, 72% and 82.7%) and were from lower socioeconomic class (46.7%, 48% and 60% respectively). These distributions were statically similar across the groups.

Both pre–GDM and GDM mothers has significantly higher number of positive family history then control mothers (p< 0.001). Table 2 shows that among pre–GDM patients 73.3% were multi-para, among GDM patients 88% patients were multi-para and among control 80% were multipara (p>0.05).

Gestational age at delivery was significantly lower among pre-GDM mothers than GDM mothers and controls (p< 0.05). History of GDM was significantly more common among patients with pre-GDM (38%) and GDM (18%) compared to controls. History of abortion, IUFD and congenital anomaly were significantly higher among pre-GDM mothers than GDM mothers and controls (p<0.05). History of deliveries with macrosomia and still birth was distributed similarly across the groups (p>0.05).

Table 2: Obstetric profile of participants. (n=225)

Variables	Group A Pre-GDM (n=75)		Group B GDM (n=75)		Group C Control (n=75)		P
	N	%	N	%	N	%	
Parity							
Primi-parous	20	26.7	9	12	15	20	0.206n
Multi-parous	55	73.3	66	88	60	80	s
Gestationam Age Delivery (week0							
28-32	12	16	2	2.7	0	0	0.045n
33-36	22	29.3	15	20	5	6.7	s
<36	41	54.7	58	77.3	70	93.3	
Mean±SD	36.06 ± 2.71		37.34± 1.12		38.46±1.13		0.001s
Past obstetric history							
H/O GDM	19	38	9	18	4	8	0.001s
H/O HTN	9	18	4	8	5	10	0.266ns
H/O congenital anoaly baby	5	10	1	2	0	0	0.026ns
H/O macrosomia	4	8	1	2	0	0	0.068ns
H/O IUFD	7	14	1	2	0	0	0.014ns
H/O stillbirth	1	2	0	0	0	0	0.365ns
H/O abortion	10	20	3	6	2	4	0.015s
ANC							
Regular	58	7.3	48	64	42	56	0.046 s
Irregular	14	18.7	23	30.7	27	36	
None	3	4	4	5.3	6	8	

P value determined by Chi- squared test and ANOVA as appropriate. ns= non-Significant: s = Significant

ANC follow-ups were significantly more regular in both diabetic mothers than control (p<0.05). Figure 1 shows Mode of delivery was Caesarian section in respectively 62%, 52% and 20% of PGDM, GDM and control mothers; and vaginal delivery in respectively 38%, 48%, 80% of PGDM, GDM and control mothers.

Pre–GDM and GDM patients had significantly higher number of patients with HbA_1C >6.5% than controls. Mean FBS and PPBS was significantly higher in pre-GDM & GDM patients than control (p<0.05).

Table 3 shows all of the diabetic mothers received diet and exercise. Among them 88% pre–GDM and 40% GDM mothers received insulin along with diet and exercise. Pre–GDM, GDM and control mothers had respectively 94%, 96%, 100% live births. Distribution was similar across groups (p >0.05).

Table 4 shows APGAR score was <7 in significantly higher number of pre–GDM and GDM babies than controls (p <0.05). Mean Weight of the babies was significantly lower among pre–GDM patients than GDM patients (p <0.05). Among pre–GDM patients and GDM patient's cases of birth asphyxia, Hypoglycemia, hyperbilirubinemia and congenital anomalies were significantly higher than controls (p< 0.05).

Table 3: Maternal outcome. (n=225)

Variables	Group A Pre-GDM (n=75)		Group B GDM (n=75)		Group C Control (n=75)		P value
	N	%	N	%	N	%	
Antepartum complications							
Pre – eclampsia	5	10	8	16	4	8	0.056[ns]
UTI	6	12	8	16	4	8	0.469[ns]
Vulvovaginitis	10	20	3	6	0	0	0.001[s]
Polyhydramnios	11	22	3	6	0	0	< 0.001[s]
PROM	6	12	8	16	1	2	0.564[ns]
Preterm delivery	23	46	11	22	3	6	< 0.001[s]
Intrapartum Complication							
Cervical tear (VD)	3	6	4	8	1	2	0.397[ns]
Perineal Tear (VD)	3	6	4	8	1	2	0.397[ns]
Instrumental delivery	0	0	2	4	0	0	0.876[ns]
Postpartum Complication							
PPH	6	12	5	10	2	4	0.339[ns]
Mastitis	4	8	3	6	0	0	0.143[ns]
Caesarian	5	10	13	26	0	0	<0.001[s]
Wound Infection							
UTI	10	20	13	26	1	2	0.003[s]
Overall complications							
Present	35	70	19	38	9	18	<0.001[s]

Multiple response recorded. P value determined by Chi- squared test; ns = non-significant, s= Significant

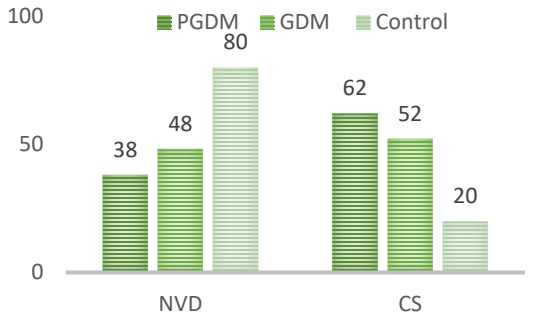

Figure 1: Mode of delivery of patients.

DISCUSSION

Diabetes in pregnancy is a common and potentially serious condition. Early studies have strongly indicated that untreated carbohydrate intolerance during pregnancy is associated with higher rate of feto-maternal morbidity and mortality. This study reflects the maternal and fetal outcome in pregnant women with pregestational and gestational DM. The present study was conducted in the department of obstetrics and gynecology, Rangpur Medical College Hospital, Rangpur. Total 225 patients were selected in this study. Three groups, each consists of 75 patients of pre-gestational diabetic, gestational diabetic and non-diabetic control was designated as Group A, Group B, Group C accordingly. In this study most of the patients belonged to age group 25- 29 years. Mean age of Group A was (28.62± 2.11), Group B was (27.90±2.04), Group C Was (27.56±2.65) years. Group A patients had slightly higher age than Group B and Group C, but there was no significant difference among the groups (p > 0.05). A study done by Mustary and her colleagues[17] showed that maternal age was higher in PGDM (26.67± 4.57) than that of GDM (26.04) which is similar to our study.

Table 4: Fetal outcome. (n=225)

Variables	Group A Pre-GDM (n=75)		Group B GDM (n=75)		Group C Control (n=75)		P value
	N	%	N	%	N	%	
Fetal outcome	71	94.6	72	96	75	100	0.344[ns]
Still birth	4	5.4	3	4	0	0	
Apgar score at 5 min							
≤ 7	45	60	20	26.6	8	10.6	<0.001[s]
≥ 7	30	40	55	73.4	67	89.4	
Birth weight of neonate (kg)							
<2	18	24	4	5.3	3	4	0.001[s]
2-4	57	76	63	84.1	70	93.3	
>4	0	0	8	10.6	2	2.7	
Mean ± SD (gram)							
Need for NICU							
No	42	56	53	70.7	67	89.3	<0.000[s]
Yes	33	44	22	29.3	8	10.7	
Perinatal Complications							
Birth asphyxia	19	38	8	16	3	6	<0.001[s]
Hypoglycemia	11	22	5	10	2	4	0.019[ns]
Hyperbilirubinemia	8	16	6	12	0	0	0.017[ns]
Congenital anomaly	1	2	0	0	0	0	
Perinatal Death	2	4	1	2	0	0	0.566[ns]

P value determined by Chi- squared test ANOVA as appropriate; ns = non-significant, s = Significant

Mean age of diabetic mothers as relatively higher than control. The similar findings were observed in some other studies which may be due to the fact that, increasing maternal age is one of the risk factors. [18,19] Most of the pre–GDM, GDM and control mothers were educated below SSC (54.6%, 58.5%, and 41.3% respectively). Literacy was relatively higher in diabetic mothers than non–diabetic controls. Concordant to this study Chanu, et al.[20] found that GDM was higher among literate women. Higher number of diabetic mothers (pre – GDM and GDM both) came from higher socio-economic condition than control mothers. Although the difference was not statistically significant, but a similar finding was reported.[18] Majority of the mothers came from rural area in this study. More diabetic mother came from urban than control mothers. This finding is similar to that of Chanu, et al.[10] who revealed that 79% of GDM mothers came from urban area and 72% of non-diabetic mothers came from rural area. Present study showed that diabetic mothers had significantly higher positive family history of diabetes than non-diabetic mothers (p< 0.001). Similar results were observed in some other studies.[21,22] Family history of diabetes could be an

important predictor of DM as well as GDM. Therefore, a high prevalence of positive family history of DM among diabetic mothers in this cohort is explainable. Regarding obstetric parameters in Table II represented that most of the mothers were multipara and there was no difference across groups in relation to parity ($p > 0.05$); this finding is similar to some other studies.[21,23,24,] Chanu, et al.[20] showed that higher parity carried a significant risk for developing GDM. Mean gestational age at delivery was significantly lower in pre- GDM patients than GDM patients and control (36.06±2.71, 37.34±1.12, and 37.46±1.13 weeks respectively). This indicates that, earlier termination of pregnancy in diabetic patients was needed. Study conducted by Abu- Heiza, et al.[25] found a mean gestational age of 38±2.1 and 38.6±5.9 weeks in pre-GDM and GDM mothers. History of GDM IUFD and abortion were significantly higher among pre-GDM and GDM patients than control groups. In addition to above mentioned complications history of congenital anomaly was also significantly higher among diabetic mothers than non-diabetic mothers. This is similar to the findings of Mustary and colleagues[17] which might be because many of pre-GDM patients could possibly had continuation of diabetes after previous episode of GDM. In a study done by Fareed et al.[26] found that past history of GDM was significantly more common among diabetic mother than non–diabetic mother. This result was consistent with my study. Regarding glycemic profile of the patients in table III that there were significant ($p<0.001$) differences between fasting and 2 hours post prandial blood glucose level among diabetic and non –diabetic control group of patients. But no significant difference was found between Group A and Group B. Fasting blood glucose level were 6.88 ± 1.07 mmol/L and 6.63±1.24 mmol/L and 2 hours post prandial blood glucose level were 11.87 ± 2.01 and 12.11 ± 2.43 mmol/L in pre –GDM and GDM patient respectively. Mustary et al.[17] showed similar result which is consistent with our study. In UK Corrodo, et al.[27] showed diabetic patient had higher mean fasting glycaemia than GDM patients, which was inconsistent with the present study. HbA1c level was significantly high in both diabetic group than control group. Poor glycaemic control was related to the development of complications. Lack of education, infrequent follow-up and non-compliance of patient poses difficulty in better glycaemic control. Regarding other antepartum complications, polyhydramniso and valvovaginits were significantly higher in pre GDM than GDM patients, whereas UTI and PROM were higher in GDM than pre- GDM but statistically non- significant. In concordance Mastary and colleagues[17] found that polyhydramnios, preterm delivery, valvovaginitis[28] and polyhydramnios[18]. But higher prevalence of these complications among pre- GDM patients may be explained by decreased immunity and glucose imbalance from onset of pregnancy. Fetal birth weight although within normal limit but macrosomia was significantly higher in infant of GDM mothers ($p< 0.001$) than infant of pre GDM and controls mothers. In a study Abu- Heija et al.[25] showed that fetal birth weight was higher in PGDM mothers than GDM mothers, which was inconsistent with the present study. Need of NICU admission was significantly more common in babies of diabetic mothers than non –diabetic mothers ($p < 0.000$). Similar to the findings of Abu Heija[25] it was more common in babies born to PGDM mother than GDM mothers. Birth asphyxia was significantly more common among infants of PGDM mothers among other complications reported. Birth asphyxia was fond higher in the study of Sultana, et al.[21], and Mustary et al.[17] Incidence of neonatal hypoglycaemia and hyperbillirubinaemia was similar in PGDM and GDM patient in this study, which is contradictory to the findings of Elango, et al.[29] In this study we found that perinatal mortality was higher in infant of both diabetic patients (pre GDM & GDM) in comparison to infant of non-diabetic control mothers. Dunne & Brydon[30] also showed similar result in their study.

Limitations of the study

The study was conducted at a very short period due to time constrain & fund limitation. Which is why it might not reflect overall situation of our country. Most of the study subject who had normal vaginal delivery was discharge after 24 to 48 hours of delivery. So long term follows up were beyond the scope of the study.

Conclusion

Awareness about outcome of DM and its long-term sequelae should be created among the general people. Role of stringent control of blood sugar is advised to reduce complications. Further Population based study is necessary to infer the findings over the general population.

REFERENCES

1. Shand AW, Bell JC, McElduff A, Morris J, Roberts CL (2008) Outcomes of pregnancies in women with pre-gestational diabetes mellitus and gestational diabetes mellitus; a population-based study in New South Wales, Australia, 1998-2002. Diabet Med 25: 708-715.
2. Verheijen EC, Critchley JA, Whitelaw DC, Tuffnell DJ (2005) Outcomes of pregnancies in women with pre-existing type 1 or type 2 diabetes, in an ethnically mixed population. BJOG 112: 1500-1503.

3. Savitz DA, Janevic TM, Engel SM, Kaufman JS, Herring AH (2008) Ethnicity and gestational diabetes in New York City, 1995-2003. BJOG 115: 969-978.
4. Ben-Haroush A, Yogev Y, Hod M (2004) Epidemiology of gestational diabetes mellitus and its association with Type 2 diabetes. Diabet Med 21: 103-113
5. Naylor CD, Sermer M, Chen E, Farine D. Selective screening for gestational diabetes mellitus.Toronto Trihospital Gestational Diabetes Project Investigators. N Engl J Med. 1997; 337:1591–6.
6. American College of Obstetricians and Gynecologists Committee on Practice Bulletins—Obstetrics. ACOG Practice Bulletin. Clinical management guidelines for obstetrician-gynecologists. Number 30, September 2001 (replaces Technical Bulletin Number 200, December 1994). Gestational diabetes. Obstet Gynecol. 2001; 98:525–38.
7. Jang HC (2011) Gestational diabetes in Korea: incidence and risk factors of diabetes in women with previous gestational diabetes. Diabetes Metab J 35: 1-7.
8. Albareda M, Caballero A, Badell G, Piquer S, Ortiz A, et al. (2003) Diabetes and abnormal glucose tolerance in women with previous gestational diabetes. Diabetes Care 26: 1199-1205.
9. National Diabetes Data Group. Classification and diagnosis of diabetes mellitus and other categories of glucose intolerance. Diabetes. 1979; 28:1039–57.
10. Al-Daghri NM, Al-Attas OS, Alokail MS, Alkharfy KM, Yousef M, et al. (2011) Diabetes mellitus type 2 and other chronic non-communicable diseases in the central region, Saudi Arabia (Riyadh cohort 2): a decade of an epidemic. BMC Med 9: 76.
11. Fatani HH, Mira SA, el-Zubier AG (1987) Prevalence of diabetes mellitus in rural Saudi Arabia. Diabetes Care 10: 180-183.
12. Das, A.C., Azad, M. T., Name, N.I., Chowdhury, J. F., Rahman, F. 2017. Incidence and glycemic stutas of infant of diabetic mothers among 189 hospitalized low birth weight babies, Delta Med Col J. 5 (1) . pp 4 – 8.
13. Shukla, A., Burute, S. &Meena, A., 2017.'Maternal and fetal outcome in gestational diabetes – A retrospective study,' 3 (9), pp. 305 – 309.
14. Ben – Haroush, A., Yogev, Y. and Hod, M., 2003. 'Epidemiology of gestational diabetes mellitus and its association with type 2 diabetes ', Diabetic Medicine, 21 , pp. 103 - 13
15. Kajja, R., Ronnemaa, T., 2008. Gestational Diabetes: Pathogenesis and consequences to mother and offsring . Diabetic Studies. 5(4). PP. 192 – 202.
16. Wahabi, H., Fayed, A., and Esmaeil, S. A. 2014. Maternal and Perinatal outcome of pregnancies complicated with pregestational and gestational diabetes mellitus in Saudi Arabia. Diabetes and Metabolism, 57(7), pp. 1- 5.
17. Mustary , F., Chowdhury, T., Begum, F &Mahjabeen, N., 2019. 'Maternal and Perinatal Outcome in Gestational Diabetes Mellitus Compared to pregestational Diabetes Mellitus,' BIRDEM Medical Journal, 9 (2), pp. 127 – 132.
18. Swaroop, N., Rawat, R., Lal, P., Pal, N., Kumari, K. & Sharma, P., 2015. 'Gestational diabetes mellitus : study of prevalence using criteria of diabetes in pregnancy study group in India and its impact on maternal and fetal outcome in a rural tertiary institute, ' International Journal of Reproduction , Contraception, obstetrics and gynecology, 4(6), pp. 1950 - 1953.
19. Lee, Kw., Ching, SM., Ramachandran, V., Yee, A., Hoo, FK., Chia, YC., Wan Sulaiman, WA., Suppiah, S, Mohamed, MH. &Veetil, S.K., 2018. 'Prevalence an risk factors of gestational diabetes mellitus in Asia : A systematic review and meta-analysis,' BMC pregnancy and Childbirth, 18 (1), pp. 1- 20 .
20. Chanu, MM., June Syiemleh, A., Pradhan, B. & Devi , RK. P., 2015. 'Clinical Study of Fetomaternal Outcome of Gestational Diabetes Mellitus ', IOSR Journal of Dental and Medical Sciences, 14 (4), pp. 53 – 56.
21. Sultana, N., Shermin, S., Nahar, N., Ferdous, F. &Farjana, S., 2016, 'Diabetes in Pregnancy: Maternal Profile and Neonatal Outcome,' Delta Medical College Journal, 4(2), pp. 83 -88.
22. Wasim , T., Amer, W. &Majrooh, A., 2015, 'Fetomaternal Outcome in Pregnant patients with Diabetes, 'Annals, 21 (2), pp. 108 – 112.
23. Dahiya, K., Sahu, J &Dahiya A., 2014. 'Maternal and Fetal Outcome in Gestational Diabetes Mellitus – A study at tertiary Health Center in Northern India,' OALib, 01(03), pp. 1 – 5 .
24. Sheffield, JS., Butler – Koster, EL., Casey, BM., Mcintire, DD. &Leveno, KJ., 2002. 'Maternal Diabetes Mellitus and infant Malformations, ' Elsevier Science Inc, 100(5), pp. 925 – 930.
25. Abu – Haija , AT., Al – Bash , M. & Mathew , M., 2015 , 'Gestational and pregestational diabetes mellitus in Omani women : Comparison of obstetric and perinatal outcomes,' Sultan Qaboos University Medical Journal , 15 (4), pp. 496 – 500.

26. Fareed, p., Siraj, F. &Lone, K., 2017, Fetomaternal outcome in women it gestational diabetes mellitus,' International Journal of Research in Medical Sciences, 5 (9), p. 4151.
27. Corrado, F., Pintaudi, B., D'Anna, R., Santamaria, A., Giunta, L. & Di Bendetto, A., 2016. 'Perinatal outcome in a Caucasian population with gestational diabetes and preexisting diabetes first diagnosed in pregnancy', Diabetes and Metabolism. Elsevier Masson SAS, 42 (2), pp. 122 – 125.
28. Zhang, x., Liao, Q., Wang, F. & Li, D., 2018.'Association of gestational diabetes mellitus and normal vaginal flora with adverse pregnancy outcomes,' Medicine (United States), 97 (34), pp. 1- 7.
29. Elango, S., Sankarasubramanian , ML &Marimuthu, B., 2018. 'An observational study of clinical profile of infants born to pregestational and gestational diabetic mothers,' International Journal of Contemporary Pediatrics, 5(2), pp. 557 -567.
30. Dunne, F & Brydon, P., 2003. 'Pregnancy in women with Type 2 diabetes: 12 years outcome 1992 – 2002,' Diabetes care, 27, pp. 969- 974.

Access this article online

Website: www.ssbjournals.org