The Research of Medical Science Review

Received: 27 November , 2024
Accepted: 27 December , 2024
Published: 2 January, 2025

ISSN: 3007-1208 | 3007-1216
Volume 3, Issue 1, 2025

MATERNAL AND NEONATAL COMPLICATIONS IN GESTATIONAL DIABETES MELLITUS COMBINE MILITARY HOSPITAL PESHAWAR

Dr. Yasmeen Ashraf[1], Dr. Munawar Jannat Rana [2], Dr. Aiman Mehtab*[3], Dr. Nosheen[4] Dr. Afshan Iram[5], Dr Inayat ul Haq[6]

[1]Obstetrics & Gynecology, Obs &Gynae Trainee, Gynae B Ward, MTI Khyber Teaching Hospital Peshawar
[2]Obs & Gynae Trainee, CMH Peshawar
[3] Obstetrics & Gynecology, Obs &Gynae Trainee, Gynae B Ward, MTI Khyber Teaching Hospital Peshawar
[4]Obs & Gynae Trainee, Khyber Teaching Hospital, Peshawar
[5]Fcps Government maternity hospital guliyana tehsil kharian
[6]Ex-Post Graduate Resident, Cardiology Unit, MTI Khyber Teaching Hospital, Peshawar

*[3]aiman.mehtab@yahoo.com, [1]yasmeenashraf63@yahoo.com, [2]drmunawarjr@gmail.com, [4]shina.afridi123@gmail.com, [5]drafshanhasan01@gmail.com, [6]dr.inpk@gmail.com

ABSTRACT

Gestational diabetes mellitus (GDM) is a pregnancy complication in which the placenta releases hormones that interfere with the body's ability to use insulin effectively, leading to elevated blood glucose levels. This condition can have significant impacts on both maternal and neonatal health. GDM is characterized by spontaneous high blood sugar during pregnancy and can increase the risk of complications for both the mother and the baby.

The objective of this study was to examine the maternal and neonatal complications in women diagnosed with GDM. This cross-sectional descriptive study was carried out at obstetrics and gynecology department in Combined Military Hospital Peshawar, from June 13, 2022 to December 13, 2022. One hundred and fourteen women participated in this study using a non-probability consecutive sampling technique. The study was to identify the maternal and neonatal consequences of gestational diabetes.

The age breakdown of the participants exploded the following working ages 31-35 years (28.1%) and the 36-40 years (21.1%). The age of participants was also calculated from their provided birth dates, and the mean age was 36 years with standard deviation ± 2.87 years. As observed from the gestational age distribution most of the women delivered at full term in the range of 39-40 weeks (42.1%) followed by late term of 41-42 weeks (34.2%). The mean gestational age was taken as 35 weeks with a SD of plus/minus 6.818. For the type of diabetes, 81 women suffered from gestational diabetes 71.1%, and 33 (28.9%) had pre-existing diabetes mellitus.

Some of the maternal complications were; PIH (15.8%), hypoglycemia (23.7%), PPH (33.3%) and Cesarean section delivery (27.2%). Poor perinatal outcomes were; congenital abnormalities, 33.3%, preterm births 21.9%, macrosomia 25.4% and neonatal hypoglycemia 19.3%. Increase awareness of the maternal and fetal complications of gestational diabetes are presented in these findings.

Thus, adequate glycemic control in women with pregestational diabetes is crucial to lowering maternal and fetal morbidity. Luckily, these risks are manageable if high risk patients are first diagnosed then prevented after identification. Moreover, modification of the behaviors/states that are deemed to predispose women to GDM including; obesity, nutrition, etc are very important especially in women without diabetes before the conception. Education on these aspects can help to decrease the negative consequences that gestational diabetes mellitus has for a woman and her baby.

Keywords: *GDM, DM1, DM2, pregnancy complications, maternal-fetal-neonatal characteristics*

INTRODUCTION

Gestational diabetes mellitus (GDM) is a common pregnancy complication where placental hormones interfere with insulin use, causing glucose to accumulate in the blood instead of being absorbed by cells. Risk factors include obesity, westernized diets, micronutrient deficiencies, advanced maternal age, and a family history of insulin resistance or diabetes. GDM increases the likelihood of complications such as large or small-for-gestational-age newborns, neonatal hypoglycemia, respiratory distress syndrome, pregnancy-associated hypertension, cesarean sections, preterm delivery, and a higher risk of developing type 2 diabetes postpartum. Proper management, as shown in a meta-analysis, can reduce maternal and fetal morbidity.1-3

GDM is associated with hypertension, hypothyroidism, obesity, and lipid abnormalities. Insulin therapy is commonly required, and effective glucose management reduces neonatal complications. Obese GDM mothers are more likely to require medication rather than dietary management, experience pregnancy-induced hypertension, and undergo cesarean delivery. About one-third of GDM mothers develop gestational hypertension, and their infants face risks such as feeding difficulties, higher birth weights, and low blood glucose levels, especially in cases managed by diet alone.5

The American Diabetes Association recommends screening for GDM at 24–28 weeks of gestation using one-step (75-g OGTT) or two-step (50-g glucose load followed by 100-g OGTT if needed) methods. Diagnostic thresholds for the one-step method include fasting plasma glucose ≥92 mg/dL, 1-hour glucose ≥180 mg/dL, and 2-hour glucose ≥153 mg/dL. For the two-step method, fasting glucose ≥95 mg/dL, 1-hour glucose ≥180 mg/dL, 2-hour glucose ≥155 mg/dL, or 3-hour glucose ≥140 mg/dL confirms GDM. The American Congress of Obstetricians and Gynecologists (ACOG) suggests thresholds of 135–140 mg/dL for the two-step method.6

Globally, the prevalence of hyperglycemia in pregnancy was estimated at 16.2% in 2017, with 86.4% attributed to GDM. In the U.S., 6–9% of pregnancies involve GDM, while 1–2% of pregnancies involve pre-existing diabetes. The incidence of diabetes during pregnancy has risen in recent years.8

In a study by Prakash GT et al., involving 139 women with an average age of 28 years, 18% had a poor obstetric history, 25% had gestational hypertension, and 6.4% had chronic hypertension. Hypothyroidism was present in 30%, and 65% required insulin therapy. While 60% maintained glucose levels within the recommended range, maternal hypoglycemia occurred in 5%. Cesarean sections were performed in 40%, and 34% experienced complications. Neonatal outcomes included macrosomia in 3 neonates, NICU admissions in

20% of cases, and 3% neonatal mortality. Optimally treated GDM mothers had better outcomes.4

GDM affects gestational age and delivery mode. Neonates of diabetic mothers were more likely to be delivered prematurely at 32–36 weeks (11.1% versus 6.96%, $p = 0.031$). These neonates also had a higher incidence of hypoglycemia (20.9% compared to 1.99%, $p < 0.001$).9

MATERIALS AND METHODS:

Study Design.

This research employs a descriptive cross-sectional design aimed at investigating the maternal and neonatal complications associated with gestational diabetes mellitus (GDM) in pregnant women.

Study Setting

The study was conducted at the Department of Obstetrics and Gynecology, Combined Military Hospital (CMH), Peshawar.

Study Duration

The research was carried out over six months, from 13th June 2022 to 13th December 2022.

Sample Size

The sample size was calculated using the finite population correction factor (FPC) with a confidence level of 95% and a margin of error of 5%. A total of 114 women diagnosed with GDM were included in the study.

Sample Technique

A non-probability consecutive sampling technique was employed, ensuring that each participant who met the inclusion criteria had an equal chance of being selected until the desired sample size was reached.

Sample Selection Criteria

Inclusion Criteria: Cohort study participants of pregnant women with GDM aged between 18 and 45 years of age at diagnosis.
Exclusion Criteria: Pregnant women with diabetes before pregnancy. Women with twin pregnancies as they can have individual impact on both maternal and perinatal results.

Data Collection

Data collection was done and with permission from the Institution Review Board (IRB) and consent from all the parties involved. According to the ADA diagnostic criteria, GDM was diagnosed based on any of the following: Some of the information collected included the mother's age, gestational age, and any complications the mother had. The participants were followed up to delivery and any complications that arose during this period recorded.

Data Analysis

The collected data was analyzed using Statistical Package for Social Sciences (SPSS) at the twenty third edition. The non-numerical variables included pregnancy induced hypertension, pre-eclampsia, mode of delivery (cesarean section), neonatal complications were summarized using frequencies and percentages. Continuous variables such as maternal age, gestational age and blood sugar level were summarized as mean ± standard deviation.
Stratification of Complications: Maternal and neonatal complications were analyzed according to different parameters including maternal age, gestational age as well as blood sugar level. Stratification was then followed by chi-square testing of associations where a p value of ≤ 0.05 was considered statistically significant.

RESULTS

The study gives useful information on demographic correlates of GDM self-monitoring and gestational characteristics, maternal and fetal outcome indicators. Participants were primarily age 31-35 years (28.1%) with average age of 36 years (± 2.87) thus supporting established knowledge that GDM is most prevalent in women over 30 years of age as their risk factor. Explorations of gestational cycles showed that most of the pregnancies were full term (39-40 weeks) 42.1%, late term (41-42weeks) 34.2% and early term (37-38weeks) 23.7%, and the average gestational age was 35(± 2.81) weeks. These results indicated that women with GDM often let pregnancies go to full term or beyond, furthering the risks of things like macrosomia and c-sections.

Of the participants, 71.1% had GDM and only 28.9% had pre-existing diabetes thus pointing towards the fact that management of GDM has become a major concern. The risks for maternal health reported in the study include postpartum hemorrhage, with (33.3%), cesarean sections (27.2%), hypoglycemia (23.7%), and pregnancy-induced hypertension (15.8%). Of the fetal outcomes, birth complications recorded were; congenital anomalies 33.3%, neonatal big babies 25.4%, premature birth 21.9% and neonatal low blood sugar 19.3% indicating the effect of D Reads on fetal health and the imperative for increased patient surveillance among women with GDM.

The maternal complications appeared to differ by the age categories of the women. The findings revealed further that young women ages 18-25 experienced high rates in pregnancy-induced hypertension (57.9%) and cesarean sections (42.1%); and on the other hand, postpartum hemorrhage affected older women aging 41-45 years (66.7%). The group of 31-35 years had greatest percentage of about postpartum hemorrhage (53.1%) in contrast to hypoglycemia present in 26-30 years group 61.1%. The value of p is equal to 0.000, which means that maternal outcomes depend on age and postnatal women suffered serious outcomes.

In general, the results unique to maternal age heighten the risk of complications; whereas younger women are most at risk for cesarean sections, older women are at a higher risk of severe outcomes such as postpartum hemorrhage. Full-term and late-term pregnancies in GDM also increase maternal and fetal risks, and, thus, require appropriate control of maternal glycemia and specific antepartum care. Rates of cesarean section, postpartum hemorrhage and fetal complications such as macrosomia and congenital abnormalities underscore need for further enhanced close scrutiny/intervention of pregnancies involving GDM.

Table 1: Age Distribution of Participants (n=114)

Age Group	Frequency	Percent
18-25 Years	19	16.7%
26-30 Years	18	15.8%
31-35 Years	32	28.1%
36-40 Years	24	21.1%
41-45 Years	22	18.4%
Total	**114**	**100.0%**

Mean Age: 36 years (SD ± 2.87)

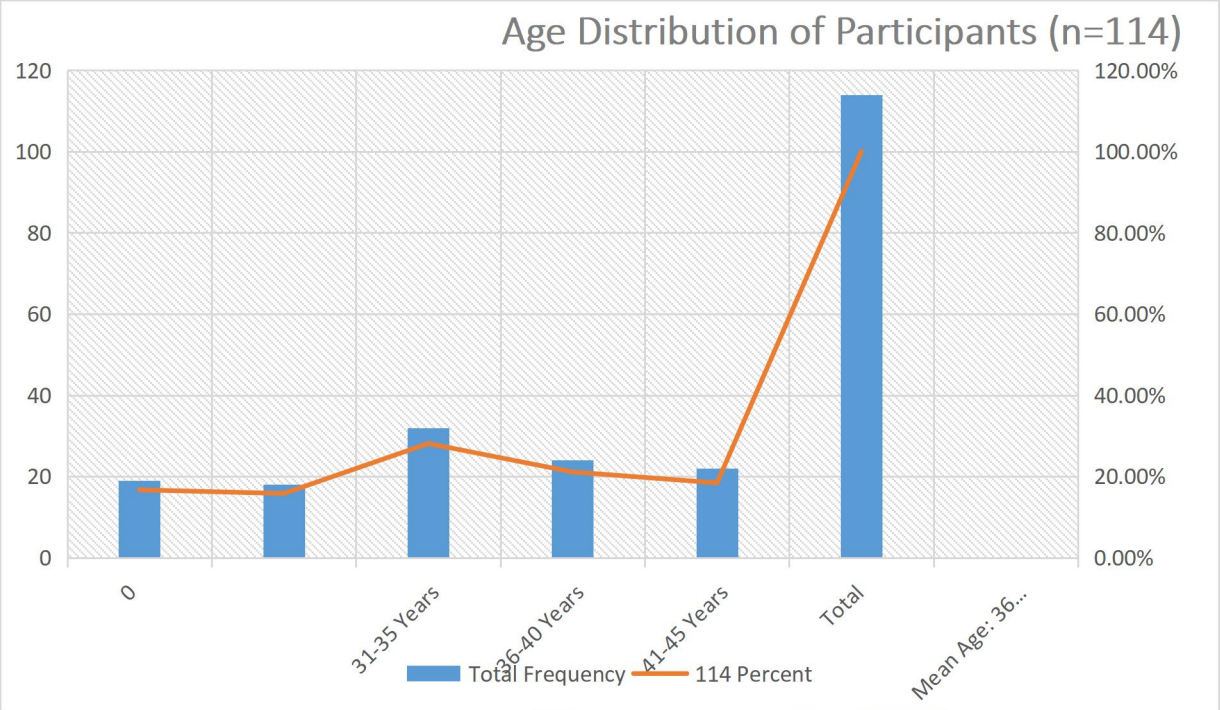

Table 2: Gestational Age Distribution (n=114)

Period of Gestation	Frequency	Percent
Early term (37-38 weeks)	27	23.7%
Full term (39-40 weeks)	48	42.1%
Late-term (41-42 weeks)	39	34.2%
Total	**114**	**100.0%**

Mean Gestational Age: 35 weeks (SD ± 2.81)

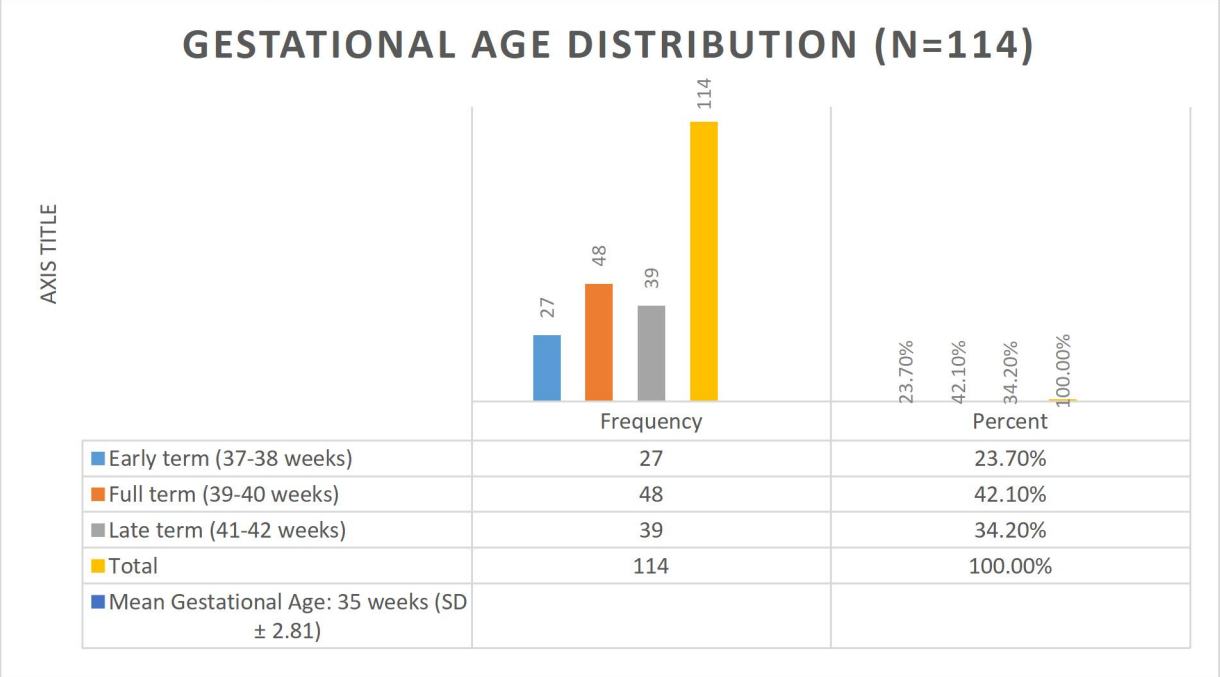

Table 3: Types of Diabetes (n=114)

Type of Diabetes	Frequency	Percent
Gestational Diabetes Mellitus (GDM)	81	71.1%
Pre-existing Diabetes Mellitus	33	28.9%
Total	**114**	**100.0%**

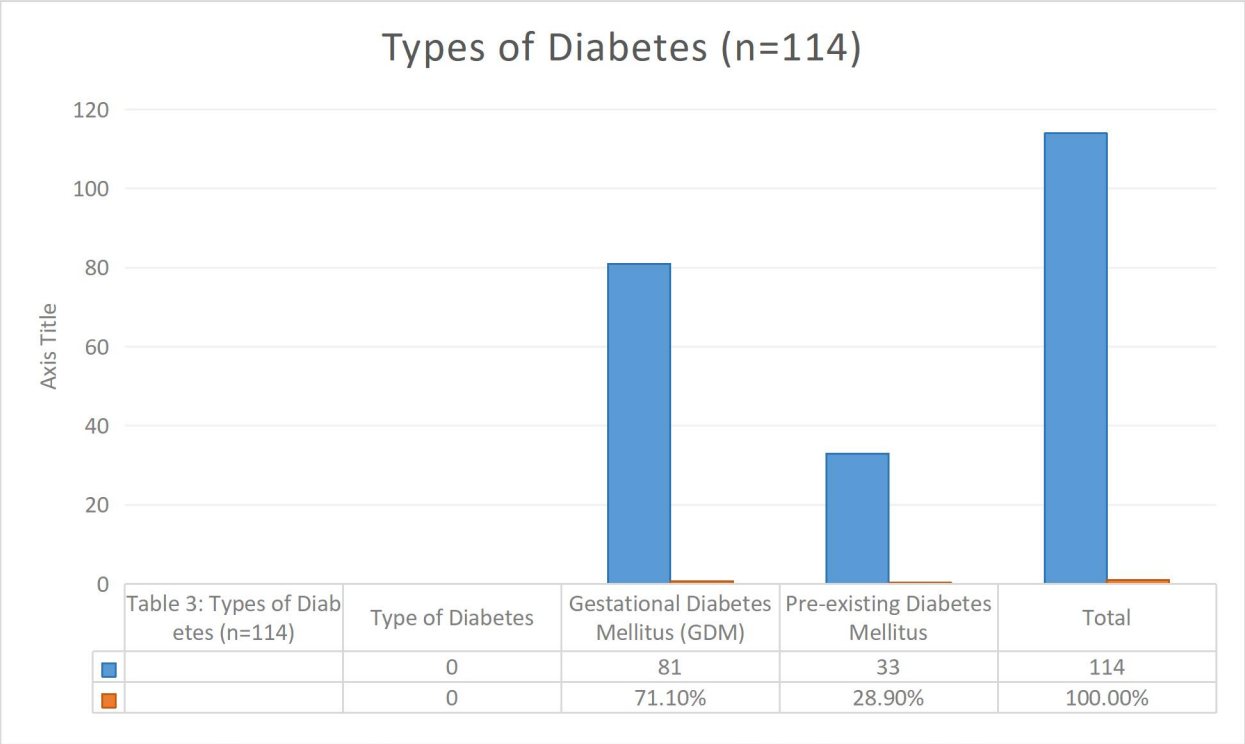

Table 4: Maternal Outcomes (n=114)

Maternal Outcome	Frequency	Percent
Pregnancy Induced Hypertension	18	15.8%
Hypoglycemia	27	23.7%
Postpartum Hemorrhage	38	33.3%
Cesarean Section	31	27.2%
Total	**114**	**100.0%**

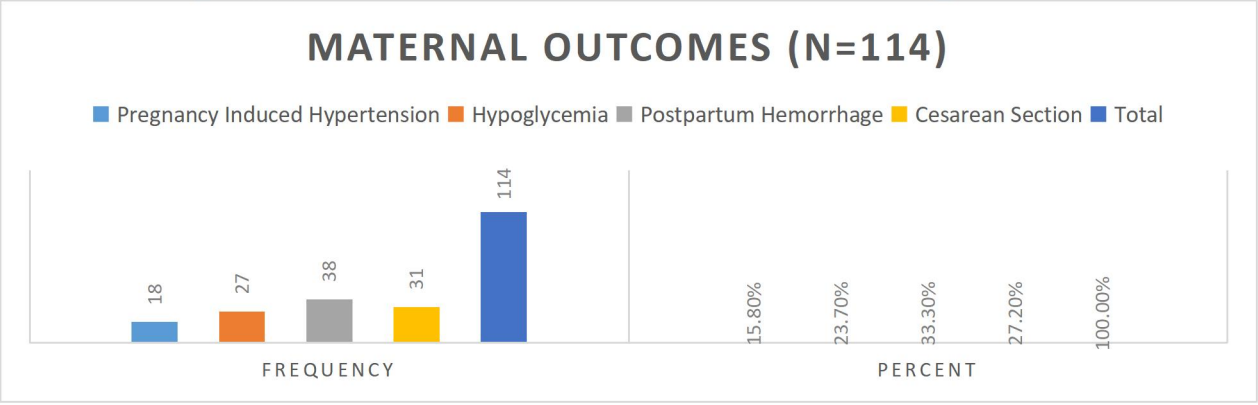

Table 5: Fetal Outcomes (n=114)

Fetal Outcome	Frequency	Percent
Birth Defects	38	33.3%
Pre-term Births	25	21.9%
Macrosomia	29	25.4%
Neonatal Hypoglycemia	22	19.3%
Total	**114**	**100.0%**

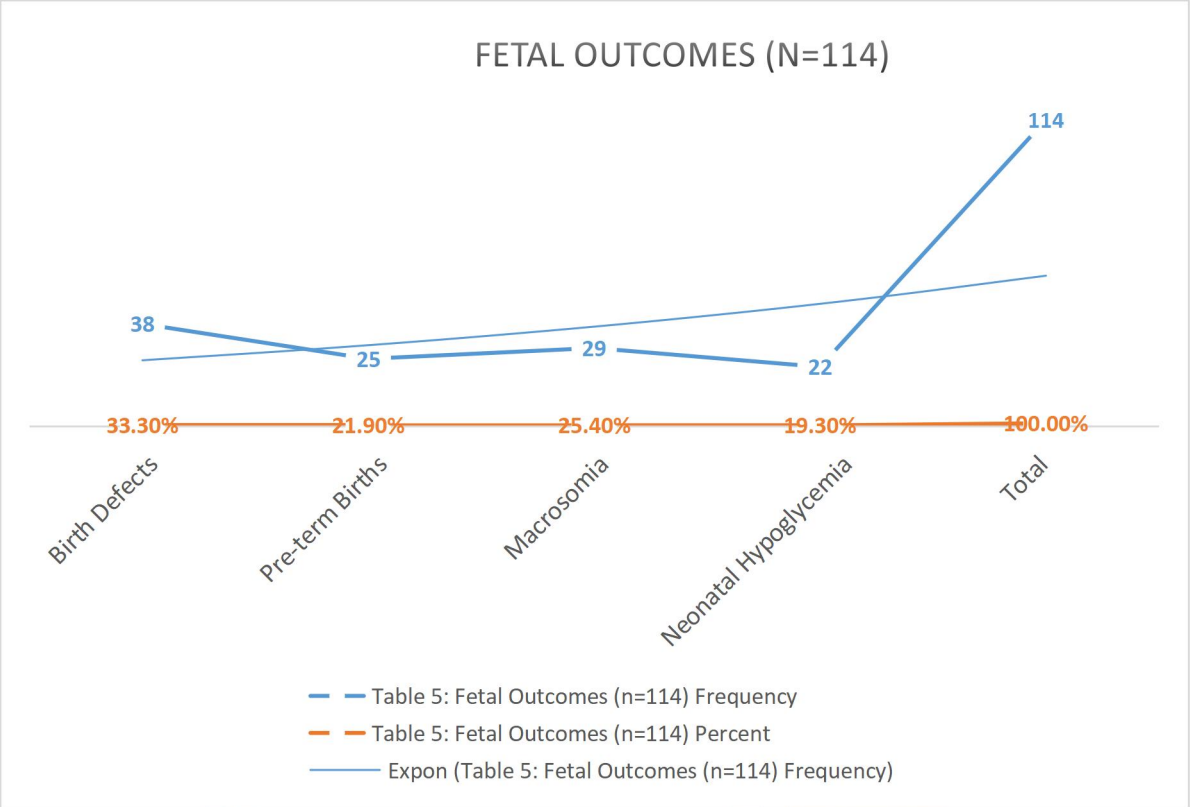

Table 6: Stratification of Maternal Outcomes by Age Group (n=114)

Age Group	Pregnancy Induced Hypertension	Hypoglycemia	Postpartum Hemorrhage	Cesarean Section	Total	P-Value
18-25 Years	11 (57.9%)	0 (0%)	0 (0%)	8 (42.1%)	19	0.000
26-30 Years	0 (0%)	11 (61.1%)	0 (0%)	7 (38.9%)	18	
31-35 Years	0 (0%)	3 (9.4%)	17 (53.1%)	12 (37.5%)	32	
36-40 Years	7 (29.2%)	10 (41.7%)	7 (29.2%)	0 (0%)	24	
41-45 Years	0 (0%)	3 (14.3%)	14 (66.7%)	4 (19%)	21	
Total	**18 (15.8%)**	**27 (23.7%)**	**38 (33.3%)**	**31 (27.2%)**	**114**	**0.000**

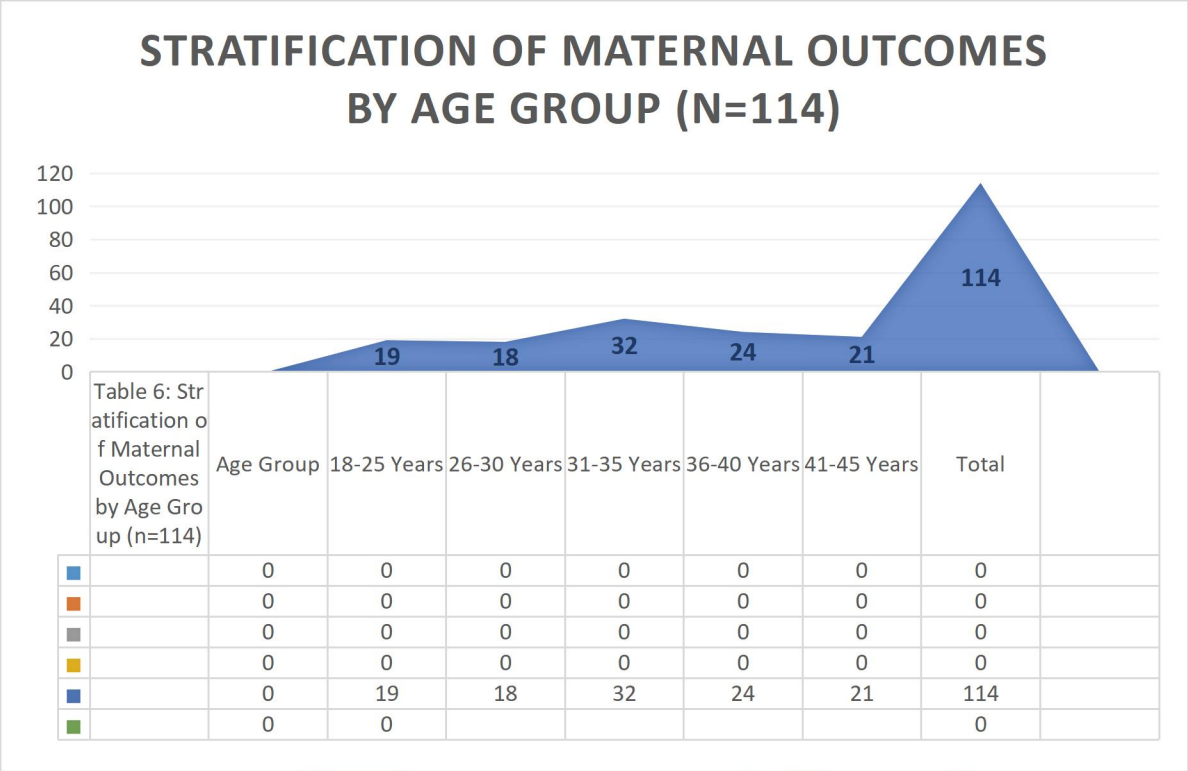

Table 6: Stratification of Maternal Outcomes by Age Group (n=114)	Age Group	18-25 Years	26-30 Years	31-35 Years	36-40 Years	41-45 Years	Total
	0	0	0	0	0	0	0
	0	0	0	0	0	0	0
	0	0	0	0	0	0	0
	0	0	0	0	0	0	0
	0	19	18	32	24	21	114
	0	0					0

DISCUSSION

Diabetic patients in the case group had higher pregravidic body weight and BMI than controls (median BMI: 25.6 vs. 22). A study in Australia also pointed out that the GDM rate rises with BMI ranging from 6.74% for overweight patients, 13.42% for mildly obese and 20% for severely obese patients [17]. The pregnancy weight gain in control group was higher than the cases (mean 12 kg vs. 10 kg); excessive weight gain was more common in controls than cases (40.6% vs 25.6%) [18]. Even when diabetic women sought dietary control, they had a higher BMI at childbirth (29.4 than 26.7). The study reported that no correlation existed between BMI and pregnancy risks such as preeclampsia or PROM. A study by Martin et al said that there was no increased risk of GDM and BMI > 25 while Sugiyama et al increased risks of hypertension 10.8% in GDM patients with BMI 25–30 , 14.8% in BMI > 30, cesarean section 39.2% for BMI 25–30, 46.2% for BMI > 30 and induction of labor 24 The miscarriage frequency was equal (diabetic women 1.5%, controls 1.9%) but due to low numbers statistical significance was not achieved 5 [19]. Threatened abortion shown to be related with both DM1($p = 0.001$) and GDM ($p = 0.05$), yet there was 23.2% preterm delivery in cases and preterm delivery was 66.7% in Diabetic 1/2 [20]. Gestational hypertension, 2.19 % in GDM and 12.5 % in DM1/2, Preeclampsia, 20.8 % in DM1 significantly higher than other groups ($p < 0.0001$). HELLP syndrome occurred in only 6 women (1%) and remained associated with GDM.

Diabetes also had increased incidences of fetal growth abnormalities, IUGR was 4,8% vs 1,9% and macrosomia was 10,8% vs 0 of pregnant women [21]. LGA infants were recorded more in diabetics (22.3% vs. 9%) with higher fetal percentiles associated with pregestational diabetes [21]. These cesarean rates were significantly higher in diabetics (58.5% vs 41.6%); particularly in DM1/2; (91.7% of which 63.6% cases were of emergency) [22]. The rate of labor induction was higher in diabetics (29.6% vs. 6.6 %) [22]. The risk of preterm delivery was higher among those patients who used insulin, and PROM was very nearly associated with the dietary therapy [23]. Abnormal development was more common among infants born to diabetic mothers, as well as neonatal examinations revealed subtle abnormalities that were not observable by ultrasound examinations [24]. Concerning the newborns respiratory disorders findings are conflicting with the literature expect for hypoglycemia incidence (25.1%) higher in DM1 (58.3%). Neonatal jaundice was higher (51.7%) but closely associated with literature for cases of neonates who received phototherapy (32.8%) [27].

CONCLUSION:

Pregestational diabetes patients need to have meticulous glycemic control to decrease maternal fetal complications and neonatal morbidity. The preventive measures should be taken only after the assessment of risk factors, and therefore, the identification of the higher risk patients at an early stage is the key to successful intervention. More importantly, knowing the women who are likely to develop pregestational diabetes before getting pregnant will help reduce incidence of GDM in non-diabetic group because risk factors including sedentary living, obesity and poor diet can easily be managed through teaching.

REFERENCES:

Waheed S, Malik FP, Mazhar g13. Efficacy of metformin versus insulin in the man's end of pregnancy with diabetes. J Coll Physicians Surg Pak. 2013 Dec 1;23(12):866-9.

Deepaklal MC, Joseph K, Kurian R, Thakkar NA. Efficacy of insulin lispro in improving glycemic control in gestational diabetes. Indian journal of endocrinology and metabolism. 2014 Jul:18(4):491.

Nguyen CL, Pham NM, Binns CW, Duong, D.V. and Lee, A.H. Prevalence of Gestational Diabetes Mellitus in Eastern and Southeastern Asia: ik Systematic Eeview and Iteta-Analysis. Journal of diabetes research.2018;2018.

Colatrella A, Visalli N, Abbruzzese S, Leotta S, Bongiovanni M, Napoli A. Comparison of insulin lispro protamine suspension with NPH insulin in pregnant women with type 2 and gestational diabetes mellitus: maternal and perinatal outcomes. International journal of endocrinology. 2013;2013.

Ceriello A, Cremasco F, Romoli E, Rossi A, Gentilella R. Insulin lispro protamine suspension in the treatment of patients with type 1 and type 2 diabetes mellitus: a systematic review of published data. Expert opinion on pharmacotherapy. 2012 Feb 1;13(2):255-81.

Jovanovic L, Ilic S, Pettitt DJ, Hugo K, Gutierrez M, Bowsher RR, et al. Metabolic and immunologic effects of insulin lispro in gestational diabetes. r,Diabetes Care .1999 Sep;22(9):1422-7

Bhattacharyya A, Brown S, Hughes, Vice PA. Insulin lispro and regular insulin in pregnancy. Qjm. 2001 May 1;94(5):255-60.

Wilmot EG, Mansell P. Diabetes and pregnancy. *Clin Med (Lond)*. 2014 Dec. 14 (6):677- 80. [Medline]. [Full Text].

McIntyre HD. Discovery, Knowledge, and Action-Diabetes in Pregnancy Across the Translational Spectrum: The 2016 Norbert Freinkel Award Lecture. *Diabetes Care*. 2018 Feb. 41 (2):227-32. [Medline]. [Full Text].

Stuebe AM, Mantzoros C, Kleinman K, et al. Gestational glucose tolerance and maternal metabolic profile at 3 years postpartum. *Obstet Gynecol*. 2011 Nov. 118(5):1065-73. [Medline].

Boinpally T, Jovanovic L. Management of type 2 diabetes and gestational diabetes in pregnancy. *Mt Sinai J Med*. 2009 Jun. 76(3):269-80. [Medline].

O'Reilly MW, Avalos G, Dennedy MC, O'Sullivan EP, Dunne F. Atlantic DIP: high prevalence of abnormal glucose tolerance postpartum is reduced by breast-feeding in women with prior gestational diabetes mellitus. *Eur J Endocrinol*. 2011 Dec. 165(6):953-9. [Medline].

Benhalima K, Jegers K, Devlieger R, Verhaeghe J, Mathieu C. Glucose Intolerance after a Recent History of Gestational Diabetes Based on the 2013 WHO Criteria. *PLoS One*. 2016. 11 (6):e0157272. [Medline]. [Full Text].

Wallace ME, Bazzano L, Zhang C, Harville E. Fasting glucose concentrations and associations with reproductive history over 40 years of follow-up. *Gynecol Endocrinol*. 2018 Jan 24. 1-[Medline].

Franzago M, Lanuti P, Fraticelli F, et al. biological insight into the extracellular vesicles in women with and without gestational diabetes. *J Endocrinol Invest*. 2020 Apr 25. [Medline].

Rebarber A, Istwan NB, Russo-Stieglitz K, Cleary-Goldman J, Rhea DJ, Stanziano GJ. Increased incidence of gestational diabetes in women receiving prophylactic 17alphahydroxyprogesterone caproate for prevention of recurrent Neonatal NICU Admissions. *Diabetes Care*. 2007 Sep. 30(9):2277-80. [Medline].

Spong CY, Guillermo L, Kuboshige J, Cabalum T. Recurrence of gestational diabetes mellitus: identification of risk factors. *Am J Perinatol*. 1998 Jan. 15(1):29-33. [Medline].

Oldfield MD, Donley P, Walwyn L, Scudamore I, Gregory R. Long-term prognosis of women with gestational diabetes in a multiethnic population. *Postgrad Med J*. 2007 Jun. 83(980):426- 30. [Medline].

Ehrenberg HM, Mercer BM, Catalano PM. The influence of obesity and diabetes on the prevalence of Neonatal Death. *Am J Obstet Gynecol*. 2004 Sep. 191(3):964-8. [Medline].

Homko CJ, Sivan E, Nyirjesy P, Reece EA. The interrelationship between ethnicity and gestational diabetes in fetal Neonatal Death. *Diabetes Care*. 1995 Nov. 18(11):1442-[Medline].

Anderwald C, Tura A, Winhofer Y, et al. Glucose absorption in gestational diabetes mellitus during an oral glucose tolerance test. *Diabetes Care*. 2011 Jul. 34(7):1475-80. [Medline]. [Full Text].

Sugiyama T, Saito M, Nishigori H, et al. Comparison of pregnancy outcomes between women with gestational diabetes and overt diabetes first diagnosed in pregnancy: a retrospective multi-institutional study in Japan. *Diabetes Res Clin Pract*. 2014 Jan. 103 (1):20-5. [Medline].

Hopp H, Vollert W, Ebert A, Weitzel H, Glöckner E, Jährig D. [Diabetic retinopathy and nephropathy--complications in pregnancy and labor]. *Geburtshilfe Frauenheilkd*. 1995 May. 55(5):275-9. [Medline].

Feldt-Rasmussen B, Mathiesen ER, Deckert T. Effect of two years of strict metabolic control on the progression of incipient nephropathy in insulin-dependent diabetes. *Lancet*. 1986 Dec 6. 2(8519):1300-4. [Medline].

Deshpande NA, James NT, Kucirka LM, et al. Pregnancy outcomes in kidney transplant recipients: a systematic review and meta-analysis. *Am J Transplant*. 2011 Nov. 11(11):2388404. [Medline].

Tobias DK, Hu FB, Forman JP, Chavarro J, Zhang C. Increased Risk of Hypertension After Gestational Diabetes Mellitus: Findings from a large perspective cohort study. *Diabetes Care*. 2011 Jul. 34(7):1582-4. [Medline]. [Full Text].

Yogev Y, Xenakis EM, Langer O. The association between preeclampsia and the severity of gestational diabetes: the impact of glycemic control. *Am J Obstet Gynecol*. 2004 Nov. 191(5):1655-60. [Medline].

PRO-FORMA

Category	**Details**
Patient Details	
Name	_____
Age	_____ years
Gestational Age	_____ weeks
Blood Sugar and Diabetes Information	
Blood Sugar Levels	_____
Gestational Diabetes Mellitus	☐ Yes ☐ No
Pre-pregnancy Diabetes Diagnosis	☐ Yes ☐ No
Maternal Health Complications	
Pregnancy-Induced Hypertension	☐ Yes ☐ No
Hypoglycemia	☐ Yes ☐ No
Postpartum Hemorrhage	☐ Yes ☐ No
Cesarean Section	☐ Yes ☐ No
Neonatal Health Complications	
Birth Defects	☐ Yes ☐ No
Pre-term Births	☐ Yes ☐ No
Macrosomia (Large Baby)	☐ Yes ☐ No
Neonatal Hypoglycemia	☐ Yes ☐ No
Additional Notes	
	_____
	_____
	_____