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Morbidities among Very Low Birth Weight and Very Preterm Infants of Diabetic Mothers: A Prospective, Cross-Sectional Study

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Abstract: Maternal diabetes, whether chronic or gestational, is linked to a higher likelihood of complications in very low birth weight (VLBW) and very preterm (VPT) newborns. These newborns are especially susceptible to respiratory distress syndrome (RDS), bronchopulmonary dysplasia (BPD), necrotizing enterocolitis (NEC), and other complications that occur during infancy.

This study aimed to assess the perinatal outcomes of VLBW and VPT infants born to mothers with diabetes. The main goal was to examine the neonatal problems and their correlations with maternal and neonatal variables. This study was a prospective, observational study carried out in the Neonatal Intensive Care Unit (NICU) of Baghdad Teaching Hospital. A cohort of 150 VLBW and VPT neonates whose mothers had diabetes were included. An analysis was conducted on maternal variables, including type of diabetes, hypertension, prenatal steroid use, and mode of delivery, in conjunction with neonatal outcomes such as RDS, BPD, NEC, and intraventricular hemorrhage (IVH). The statistical analysis was conducted using chi-square tests and correlation coefficients.

Among the 150 neonates, an elevated occurrence of RDS (139, 92.7%) and BPD (51, 34%) was seen in VLBW and VPT infants born to mothers with diabetes. The prevalence of NEC was 49 (32.7%), but IVH and severe retinopathy of prematurity (ROP) were less frequent diagnoses. No statistically significant correlations were found between the method of delivery and RDS or between maternal diabetes and neonatal APGAR scores.

Maternal diabetes greatly increases the risk of complications in VLBW and VPT infants. The optimization of maternal glycemic control and the provision of personalized newborn care are crucial for improving outcomes in this high-risk population.

Key words: Preterm infants, very low birth weight, maternal diabetes, respiratory distress syndrome, bronchopulmonary dysplasia.

Introduction

The health of the mother plays a crucial role in shaping the outcomes of very low birth weight (VLBW) and extremely preterm (EPT) newborns, with maternal well-being greatly influencing their chances for survival and recovery [1]. One of the many maternal variables that has recently come to

light as a major cause of negative perinatal outcomes is diabetes mellitus during pregnancy. There has been a worldwide uptick in the prevalence of maternal diabetes, which includes both type 1 and type 2 diabetes mellitus as well as gestational diabetes mellitus (GDM) [2, 3]. The rising incidence of GDM is putting further strain on maternal and newborn health care systems in Iraq and other emerging nations [4].

Among the many ways in which maternal diabetes impacts fetal development, changes in the intrauterine environment brought on by hyperglycemia are the most important [4, 5]. As a result of the increased risk of respiratory problems, maternal diabetes has a profound effect on neonates [5-9]. Babies born to mothers with diabetes have a higher risk of RDS because their lungs take longer to develop normally [10]. Bronchopulmonary dysplasia (BPD) is a chronic lung disease that causes inflammation and scarring in the lungs. As a result, these newborns are more likely to need mechanical ventilation and prolonged respiratory assistance [11].

Necrotizing enterocolitis (NEC) and other gastrointestinal problems are a major concern. Severe intestinal inflammation, or NEC, can cause necrosis and perforation [12]. Intraventricular hemorrhage (IVH) is a major neurological consequence that can cause long-term neurodevelopmental problems in neonates; it is connected with decreased blood flow and vascular integrity in mothers with diabetes [13].

It is unclear what roles various factors play in influencing neonatal outcomes, although they include the type of maternal diabetes (chronic vs. gestational), the level of glycemic control during pregnancy, the presence of hypertensive disorders, the use of antenatal steroids, and the mode of delivery. Despite the rising incidence of diabetes in Iraqi pregnant women, there has been scant research on its effect on VLBW and VPT infants. Therefore, this prospective, cross-sectional study aims to assess the in-hospital mortality and morbidity among VLBW and VPT infants born to diabetic mothers at Baghdad Teaching Hospital.

Methodology

This prospective, observational study was conducted at the Neonatal Intensive Care Unit (NICU) of Baghdad Teaching Hospital, Baghdad. This NICU serves as a referral tertiary care center to high-risk pregnancies and neonates requiring specialized care. The data collection was carried out within the inpatient department, focusing on neonates with VLBWT (≤1500 grams) and/or gestational age < 32 weeks (VPT).

The study population consisted of neonates admitted to the NICU at Baghdad Teaching Hospital who met the following inclusion criteria: Birth weight ≤1500 grams, Gestational age <32 weeks, Born to mothers with or without diabetes (IDDM or gestational) and the mothers of the included neonates were all inpatients at the time of data collection. Data were collected from medical records and maternal interviews using a structured questionnaire. The questionnaire was designed to capture essential maternal and neonatal data relevant to the study's objectives. The data collected included:

Maternal Information includes; Age, Mode of delivery (normal labor or cesarean section), Type of diabetes (chronic or gestational), Treatment for diabetes (insulin, non-insulin medications, or diet control), Presence of hypertension (chronic, gestational, eclampsia, preeclampsia, HELLP syndrome), Use of antenatal steroids**.**

Neonatal Information includes; Gestational age (in weeks), Birth weight (in grams), APGAR score at 5 minutes, Presence of RDS, Presence of BPD, Need for treatment of PDA, Presence of NEC, Presence of IVH grade 3 or 4 or cystic periventricular leukomalacia (CPVL) and Presence of severe ROP.

For the definition of variables, Chronic Diabetes refers to preexisting type 1 or type 2 diabetes in mothers. Gestational Diabetes is diabetes that develops during pregnancy, typically after the 20th week. Chronic Hypertension is high blood pressure that exists before pregnancy or is diagnosed in early pregnancy (before 20 weeks). Gestational Hypertension occurs after the 20th week of

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pregnancy. Preeclampsia is a serious pregnancy complication marked by high blood pressure and signs of organ damage usually occurs after 20 weeks. RDS is a lung disorder common in premature infants, caused by insufficient surfactant production, making it difficult for the lungs to inflate and leading to breathing problems. BPD is a chronic lung disease affecting premature infants, especially those treated with oxygen or ventilation for RDS. NEC is a serious gastrointestinal condition affecting premature infants, where parts of the intestines become inflamed and may die. Premature birth and low birth weight are major risk factors. ROP is an eye disorder in preterm infants, where abnormal blood vessels grow in the retina, potentially causing retinal detachment and blindness if untreated. Finally, IVH is bleeding in the brain's ventricles, common in very premature infants. It can lead to brain damage and long-term neurological issues, with grades 3 and 4 being the most severe.

The study protocol was reviewed and approved by the ethical committee of Baghdad Teaching Hospital. Since the study involved data collection from medical records and questionnaires administered to inpatients, verbal or written informed consent was obtained from the mothers for the use of their data in this research.

Statistical Analysis: Data were entered into google forms and then were exported into excel sheets. The analysis was done using IBM SPSS version 26. Descriptive statistics were used to summarize the maternal and neonatal characteristics. Categorical variables were expressed as frequencies and percentages, while continuous variables were presented as means and standard deviations. Chi-square tests were employed to assess associations between categorical variables, and correlation coefficients were calculated for continuous variables. A p-value <0.05 was considered statistically significant.

Results

The study included 150 mothers from Baghdad Teaching hospital, whose obstetric history was carefully analyzed to understand the distribution of pregnancies, viable births, and abortions. The analysis of gravida revealed that a significant proportion of mothers 58 (38.7%), had been pregnant five or more times. Meanwhile, 25 (16.7%) had four, and 23 (15.3%) had two pregnancies. Those who had three represented 22 (14.7%) of the group, while another 22 (14.7%) had experienced only one pregnancy. When assessing parity, 53 (35.3%) of the women had given birth to five or more viable pregnancy, 30 (20%) had one, while 23 (15.3%) had either two or three, and 21 (14%) had four viable pregnancies. Notably, 95 (63.3%) hadn't experienced any abortion, 35 (23.5%) mothers had at least one abortion, 9 (6%) had two and 11 (7.3%) had three abortions, **Table 1.**

The maternal age distribution indicated that 60 (40%) of mothers were between 25 to 34 years. Women aged 35 to 44 years constituted 45 (30%), while those aged 18 to 24 years represented 37 (24.7%). A smaller proportion 8 (5.3%) were < 18 years. The cumulative percentage analysis showed that by the age of 34, 105 (70%) of the participants had already had one or more pregnancies.

The mode of delivery was predominantly C/S, 93 (62%). In contrast, 57 (38%) delivered via normal labor. The cumulative percentage indicates that 62% of all deliveries were by C/S, highlighting the significant reliance on surgical intervention.

A detailed examination of the reasons for C/S revealed that the most common indication was a previous cesarean scar in 34 (36.6%). Premature rupture of membranes (PROM) was the second most frequent reason in 25 (26.9%). Other notable reasons included placenta Previa in 10 (10.8%), preeclampsia 9 (9.7%), HELLP syndrome in 6 (6.5%). Multiple pregnancies played a role in the decision to perform a C/S, with twin pregnancies in 7 (7.5%) and triplet pregnancies in 2 (2.2%).

The presence of DM among the mothers was categorized into chronic diabetes, gestational diabetes and those without diabetes. The majority of the mothers 76 (50.7%) did not have any form of diabetes, 46 (30.7%) had gestational diabetes and 28 (18.7%) had chronic diabetes. The cumulative percentage analysis indicated that nearly half of the participants had some form of diabetes, either chronic or gestational, which could have significant implications for both maternal and neonatal outcomes, **Table 1.**

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Of the 150 participants, the majority of the mothers 100 (66.7%) did not have any form of hypertensive disorder, while 35 (23.3%) had some form of hypertension during pregnancy, including 13 (8.7%) had chronic hypertension and 22 (14.7%) had gestational hypertension. However, 10 (6.7%) of the mothers were diagnosed with preeclampsia, and 5 (3.3%) had HELLP syndrome. In terms of neonatal sex distribution, 90 (60%) were male neonates and 60 (40%) female, **Table 1.**

Table 1. Maternal Variables among Study Participants

Characteristic	Category	Frequency	Percentage (%)
Number of Pregnancies (Gravida)	0	-	-
	1	22	14.7
	2	23	15.3
	3	22	14.7
	4	25	16.7
	≥5	58	38.7
Parity (Viable Pregnancies)	0	-	-
	1	30	20.0
	2-3	23	15.3
	4	21	14.0
	5 or more	53	35.3
Abortions	None	95	63.3
	≥1	35	23.3
	2	9	6.0
	3	11	7.3
Age of Mothers	<18	8	5.3
	18-24	37	24.7
	25-34	60	40.0
	35-44	45	30.0
Mode of Delivery	Cesarean Section (C/S)	93	62.0
	Normal Labor	57	38.0
Reason for Cesarean Section	Previous Cesarean Scar	34	36.6
	PROM (Premature Rupture of Membranes)	25	26.9
	Placenta Previa	10	10.8
	Preeclampsia	9	9.7
	HELLP Syndrome	6	6.5
	Twin Pregnancy	7	7.5
	Triplet Pregnancy	2	2.2
Diabetes Mellitus	None	76	50.7
	Gestational	46	30.7
	Chronic	28	18.7
Diabetes Treatment	None	80	53.3
	Non-insulin Medications	31	20.7
	Insulin	22	14.7
	Dietary Modifications	17	11.3
Hypertension	Chronic Hypertension	13	8.7
	Gestational Hypertension	22	14.7
Hypertensive Disorders	None	100	66.7

	Preeclampsia	10	6.7
	HELLP Syndrome	5	3.3

Regarding the treatment modalities for maternal diabetes, the most common approach among the diabetic mothers was no treatment, with 80 (53.3%) receiving no treatment for diabetes. For those who were treated, 31 (20.7%) were managed with non-insulin medications, while 22 (14.7%) were treated with insulin. A smaller proportion, 17 (11.3%) were managed through dietary control, Table 2.

Table 2. The type and treatment modalities of maternal diabetes in the study sample

Type	Frequency	Percent	Treatment	Frequency	Percent
Chronic	28	18.7	Diet	17	11.3
Gestational	46	30.7	Insulin	22	14.7
None	76	50.7	Non-insulin	31	20.7
			None	80	53.3
Total	150	100.0	Total	150	100.0

The gestational age distribution of the neonates at birth ranged from 24 to 32 weeks. The majority of the neonates were born at 31 weeks in 34 (22.7%) followed by 30 weeks 32 (21.3%) and 28 weeks 26 (17.3%). Neonates born at 29 and 32 weeks made up 24 (16.0%) for each. A smaller proportion of neonates were born at 27 weeks 3 (2.0%), 25 weeks 2 (1.3%), and 26 weeks 1(0.7%). Only one neonate (0.7%) was delivered at 24 weeks. **Table 3**.

Table 3. Neonatal Variables among this Study Participants

Characteristic	Category	Frequency	Percentage (%)
Gestational Age at Birth (weeks)	24	1	0.7
	25	2	1.3
	26	1	0.7
	27	3	2.0
	28	26	17.3
	29	24	16.0
	30	32	21.3
	31	34	22.7
	32	25	16.7
	Total	**148**	**98.7**
	Missing	**2**	**1.3**
Sex of Neonates	Male	90	60.0
	Female	60	40.0
Gestational Age (Mean ± SD)	-	-	**29.86 ± 1.625 weeks**
Birth Weight (kg) (Mean ± SD)	-	-	**1.277 ± 0.3356 kg**
APGAR Score at 5 Minutes (Mean ± SD)	-	-	**6.06 ± 1.502**

The gestational age of 148 neonates ranged from a minimum of 24 weeks to a maximum of 32 weeks, with the mean gestational age ±SD of 29.86 ± 1.625 weeks. The birth weight of 150 neonates ranged from 0.7 kg to 2.3 kg, with a mean birth weight ±SD of 1.277 ± 0.3356 kg, **Table 4.**

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Table 4. Mean and standard deviation for neonatal gestational age and birth weights

	N	Minimum	Maximum	Mean	Std. Deviation
Gestational Age in weeks	148	24	32	29.86	1.625
Birth Weight (in Kg)	150	0.7	2.3	1.277	0.3356
Valid N (listwise)	148				

APGAR scores were recorded at 5 minutes for only 144 neonates. The scores ranged from a minimum of 1 to a maximum of 10, with a mean score ±SD of 6.06 ± 1.502. The distribution of APGAR scores at 5 minutes, as visualized in the accompanying histogram chart, shows a peak at scores of 5 and 7, with a significant number of neonates scoring below 7, indicating potential challenges in the immediate postnatal period, **Table 3, Figure 1**.

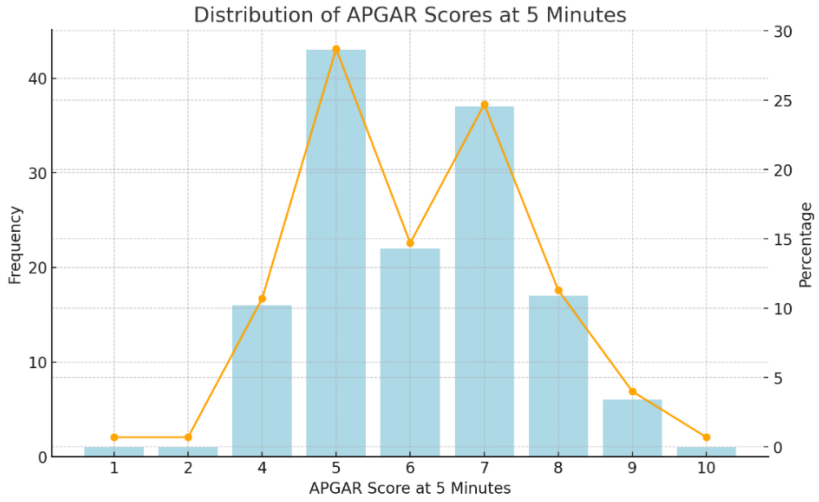

Figure 1: The histogram illustrates the frequency distribution of the APGAR scores.

The most prevalent complication observed was RDS affecting 139 (92.7%) of the neonates, BPD was present in 51 (34%), PDA requiring treatment was identified in 26 (17.3%), NEC in 49 (32.7%), IVH of grade 3 or 4 or CPVL was relatively rare, in only 5 (3.3%) and ROP in 23 (15.3%) of the neonates, **Table 5.**

Table 5. Frequency distribution of Complications associated with very low birth weight and preterm infants

Complication	Category	Frequency	Percent	Valid Percent	Cumulative Percent
RDS	No	11	7.3	7.3	7.3
RDS	Yes	139	92.7	92.7	100
Bronchopulmonary dysplasia	No	99	66	66	66
Bronchopulmonary dysplasia	Yes	51	34	34	100
PDA (need treatment)	No	124	82.7	82.7	82.7
PDA (need treatment)	Yes	26	17.3	17.3	100
Necrotizing enterocolitis	No	101	67.3	67.3	67.3
Necrotizing enterocolitis	Yes	49	32.7	32.7	100
IVH (Grade 3 or 4 or CPVL)	No	145	96.7	96.7	96.7
IVH (Grade 3 or 4 or	Yes	5	3.3	3.3	100

CPVL)					
Severe retinopathy of prematurity	No	127	84.7	84.7	84.7
Severe retinopathy of prematurity	Yes	23	15.3	15.3	100

The relationship between maternal diabetes and neonatal birth weight was analyzed, revealing varying impacts based on the type of diabetes. Neonates born to mothers with chronic diabetes had a mean ±SD of birth weight of 1.35± 0.4069 kg, and birth weights ranging from 0.8 kg to 2.0 kg. For gestational diabetes, the mean ±SD of birth weight was slightly lower at 1.31± 0.3323 kg and a range from 0.7 kg to 2.3 kg. Neonates born to mothers without diabetes had the lowest mean ±SD of birth weight at 1.23 ±0.3057 kg and birth weights ranging from 0.7 kg to 2.1 kg.

The correlation coefficient between maternal diabetes and neonatal APGAR scores at 5 minutes was 0.0401, with a p-value of 0.6330. This indicates a very weak positive correlation, which is not statistically significant, suggesting that maternal diabetes has little to no direct impact on the APGAR scores at 5 minutes.

A Chi-square test was conducted to explore the relationship between the occurrence of RDS and the mode of delivery. The test produced a Chi-square statistic of 1.773, with 2 degrees of freedom and a p-value of 0.4120. This result is not statistically significant, indicating that there is no strong evidence of an association between the mode of delivery and the occurrence of RDS.

A Chi-square test found no significant association between maternal hypertension, antenatal steroid, neonatal sex, and gestational age category and the occurrence of RDS, **Table 6**.

Table 6. Chi-Square Test Summary for RDS Vs. Hypertension, Antenatal Steroid, Neonatal Sex, Gestational Age.

Variable	Chi-Square Statistic	Degrees of Freedom	P-value
Hypertension	2.189488	4	0.700954
Antenatal Steroid	0.124162	1	0.724564
Neonatal Sex	1.475638	1	0.224458
Gestational Age Category	0.743891	2	0.689392

Discussion

One of the most striking results is the elevated incidence of RDS, affecting 92.7% of the neonates. This high prevalence is consistent with the known vulnerability of preterm infants to respiratory complications due to immature lung development and insufficient surfactant production. These results differs from a study by Wondie et al., where the incidence rate of RDS was 10.78 per 100 neonate days, which is higher than rates reported in other studies involving different neonatal groups. Significant predictors of RDS identified were a 5 minute APGAR score < 7, multiple pregnancies, C/S delivery, prematurity, and birth weight less than 1500 grams. The study concluded that these factors significantly increase the risk of RDS in LBWT neonates, highlighting the need for targeted attention and appropriate interventions by healthcare stakeholders to reduce the incidence of RDS in this vulnerable population.

BPD was observed in 34% of the neonates, indicating a significant rate of chronic lung disease among survivors of the initial RDS. The development of BPD is often associated with prolonged mechanical ventilation and oxygen therapy required for managing RDS. This study findings suggest that infants of diabetic mothers may require more intensive respiratory support, potentially increasing the risk of BPD. This aligns with previous studies that have reported higher rates of BPD in preterm infants born to diabetic mothers due to the combined effects of prematurity and metabolic disturbances like Ito et al review study in developed countries**.** (15), which found that risk factors for

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severe BPD included male sex, iatrogenic preterm birth, maternal hypertensive disorders of pregnancy, low gestational age, SGA, mechanical ventilation on the first day of life, and the need for PDA management. For moderate or severe BPD, additional risk factors were PROM, clinical chorioamnionitis, bubbly or cystic appearance on X-ray, and maternal hypertensive disorders.

NEC was diagnosed in 32.7% of the neonates, which is considerably high compared to global incidence rates in similar populations. The pathogenesis of NEC is multifactorial, but maternal diabetes may contribute through mechanisms such as intestinal immaturity, altered microbial colonization, and inflammatory responses influenced by hyperglycemia. A study investigating NEC in premature newborns by analyzing 1,647 metagenomic datasets and fecal metabolites from NEC patients and controls, the researchers found that elevated levels of the short-chain fatty acid formate were present at NEC onset, dissipated during recovery, and correlated with the degree of intestinal injury. A study by Casaburi et al., (16) suggests that targeting the metabolic consequences of gut dysbiosis, specifically formate production, may offer new strategies for preventing NEC in premature infants. The significant occurrence of NEC in this study highlights the need for vigilant gastrointestinal monitoring and early intervention strategies in infants born to diabetic mothers.

PDA requiring treatment was identified in 17.3% of the neonates. While PDA is common in preterm infants due to the immaturity of the cardiovascular system, the influence of maternal diabetes on its incidence and severity warrants further investigation. A national population-based cohort study by Rozé JC et al., (17), examined whether early screening echocardiography for PDA before day 3 of life is associated with in-hospital mortality among EPT infants born at less than 29 weeks gestation. The screened group was more frequently treated for PDA (55.1% vs. 43.1%) and showed a lower in-hospital mortality rate (14.2% vs. 18.5%) as well as a reduced incidence of pulmonary hemorrhage (5.6% vs. 8.9%). No significant differences were observed in rates of NEC, severe BPD, or severe cerebral lesions.

The observed rates of severe IVH or CPVL were relatively low at 3.3%, which may be attributed to advancements in neonatal care practices aimed at minimizing cerebral injury.

Severe ROP was present in 15.3% of the neonates. The interplay between prematurity, oxygen therapy, and maternal diabetes may contribute to the risk of ROP. Hyperglycemia can affect VEGF expression, potentially influencing retinal vascularization. A prospective study by Xu Y et al. (18) evaluated the incidence and severity of ROP among preterm infants. ROP was diagnosed in 503 (17.8%), and 191 (6.8%) of type 1 or worse ROP requiring treatment such as laser therapy or vitrectomy. The mean gestational age of infants with ROP was 29.9 ± 2.1 weeks, and the mean birth weight was 1425 ± 266 g.

Neonates born to mothers with chronic diabetes had the highest mean birth weight (1.35 kg), followed by those with gestational diabetes (1.31 kg), and the lowest in neonates born to non-diabetic mothers (1.23 kg). This finding suggests that maternal diabetes may contribute to increased foetal growth even in the context of preterm birth, likely due to foetal hyperinsulinemia acting as a growth factor. The studies by Pedra et al., Li G et al., Boriboonhirunsarn et al., and Damanti et al (19-22) suggested that in terms of the understanding of GDM and preterm birth, several gaps in our knowledge remain. The association between GDM and preterm birth is likely multifactorial, involving various maternal factors. However, the implications of higher birth weight in VLBW and preterm infants are complex, as larger size does not necessarily correlate with organ maturity and may pose additional challenges in neonatal management.

Interestingly, the correlation between maternal diabetes and neonatal APGAR scores at 5 minutes was weak and not statistically significant ($r = 0.0401$, $p = 0.6330$). This suggests that while maternal diabetes influences certain neonatal outcomes, it may not have a direct effect on the immediate postnatal adaptation as measured by APGAR scores (23). This could be due to effective resuscitation efforts and the ability of neonates to compensate in the immediate period after birth.

In the study by Fuka F et al (24), conducted in Fiji assessed factors associated with adverse neonatal outcomes among 255 women with GDM who gave birth to singleton infants. The study concluded that high rates of adverse neonatal outcomes among Fijian women with GDM highlight the need for targeted interventions focusing on overweight pregnant women, those with a history of delivering large babies, pre-eclampsia, early deliveries before 38 weeks, and late antenatal care initiation to improve pregnancy outcomes.

The male-to-female ratio in this cohort was skewed towards males (60%), which is consistent with Muche AA et al. study (25), which reports higher rates of preterm birth among male infants, However, this study did not find a significant association between neonatal sex and the development of RDS ($\chi^2 = 1.4756$, $p = 0.2245$). Similarly, gestational age categories did not show a significant relationship with RDS occurrence ($\chi^2 = 0.7439$, $p = 0.6894$). This may reflect the uniformly high risk of RDS across the VPT gestational ages included in this study, emphasizing the critical vulnerability of infants born before 32 weeks gestation.

Gestational age is a significant indicator of neonatal outcomes, since being born at an earlier gestational age is linked to a greater likelihood of problems. Within this study, the average gestational age was 29.86 weeks, indicating that most newborns fell into the "very preterm" classification.

A total of 23.3% of the study group had hypertensive disorders of pregnancy, which encompassed pre-eclampsia and gestational hypertension. The existing literature has shown a significant correlation between hypertensive diseases and negative outcomes in newborns, especially in preterm infants. These disorders are known to contribute to intrauterine growth restriction (IUGR) and premature birth (26). The interaction between maternal hypertension and diabetes adds complexity to newborn outcomes, as both disorders are associated with placental insufficiency, leading to fetal hypoxia and inadequate growth (27). Despite the lack of a statistically significant correlation between maternal hypertension and RDS in the present investigation, the simultaneous presence of these disorders is likely to increase the likelihood of illness in this susceptible group as explained by Khan B et al., (26).

Finally, Antenatal steroid treatment is considered a crucial intervention for enhancing newborn outcomes in preterm births, namely by decreasing the occurrence of RDS and IVH (27). Nevertheless, the findings of this study indicate that the positive impacts of steroids may be less significant in pregnancies with diabetes, especially in VLBW newborns. The aforementioned observation is consistent with prior researches that suggests the existence of maternal hyperglycemia can diminish the effectiveness of prenatal corticosteroids by impacting the development of the fetal lungs, as in McDougall et al., (28) and Ninan et al. studies, (29). Therefore, additional study is necessary to assess the most effective approaches for administering prenatal steroids in pregnancies associated with diabetes, taking into account the appropriate timing and dosage to optimize the advantages for the newborn.

Limitations: Although this study included 150 mothers and their infants, the sample size may still be insufficient to detect small but clinically important associations, particularly in subgroup analyses. The findings are based on data from a single hospital, which may limit the generalizability to other settings with different patient populations or healthcare resources. Some variables may be subject to information bias due to the reliance on medical records, and missing data could affect the robustness of the analyses.

Conclusions: This study emphasizes the significant impact of maternal diabetes on the outcomes of VLBW and VPT infants, particularly in relation to complications like RDS, BPD, and NEC. The effectiveness antenatal steroids may be reduced in diabetic pregnancies, highlighting the need for tailored treatment approaches. While mode of delivery did not significantly influence neonatal outcomes, the interaction between maternal diabetes, hypertension, and neonatal complications remains complex.

Recommendations: Improving outcomes for VPT infants born to diabetic mothers requires a comprehensive approach focused on maternal glucose control, personalized neonatal care and effective prenatal interventions. Future research with larger cohorts and long-term follow-up is needed to better understand these associations and improve care for this high-risk group.

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