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Anthropometry, Morbidity, Mortality among the Infants of Diabetic Mothers in a Tertiary Care Hospital, Vijayawada.

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ABSTRACT

Aim: To quantify the anthropometry, morbidity pattern, and mortality among infants of diabetic mothers.

Method: A cross-sectional observational study was conducted at the Department of Pediatrics at Siddhartha Medical College in Vijayawada. The study includes total 260 neonates among 60 neonates born to mothers with gestational diabetes mellitus or overt diabetes mellitus. Data related to the mode of delivery, gestational age, birth weight, associated morbidities, investigations, and outcomes were collected.

Results: Of the 60 neonates studied, 48 (80%) were born to mothers with Gestational Diabetes Mellitus, and 12 (20%) were born to mothers with Overt Diabetes Mellitus. Babies born to diabetic mothers have a significantly higher mean birth weight (3.05kg) than babies born to non-diabetic mothers (2.767kg) [p=0.001]. 81.6% of diabetic mothers are born with normal birth weight. The most common morbidity in neonates born to gestational diabetes mellitus (GDM) mothers compared to overt diabetes mellitus (DM) mothers was hypoglycemia in 20 cases (33.33%), hypocalcemia in 6 cases (10%), hyperbilirubinemia in 17 cases (28.33%), polycythemia in 3 cases (5%), birth asphyxia in 3 cases (5%), respiratory distress in 16 cases (26.6%), and congenital heart diseases in 15 babies (25%). In total, 5.67 percent of the 260 population had congenital anomalies. Three babies died out of a total of 60, with two born to gestational diabetes mothers and one born to a pre-gestational diabetes mother.

Conclusion: The study shows disproportionate growth in the Infants of diabetic Mothers as evidenced by higher mean birth weight and mean ponderal index, morbidity and mortality were more common in the infants of GDM mothers when compared to overt DM mothers with good glycemic control. Metabolic problems and respiratory complications were common in the LGA of IDMs, and they need close monitoring.

Keywords: diabetes mellitus, gestational diabetes mellitus, Anthropometry, Morbidity and Mortality.

Introduction

Diabetes has long been associated with maternal and perinatal morbidity and mortality [1]. Pregestational or gestational diabetes may be present in pregnant women. About 80% of cases are of gestational diabetes, which may be an extreme expression of metabolic alterations during pregnancy or a risk factor for type 2 diabetes mellitus [2, 3]. Globally, there are differences in the prevalence of gestational diabetes mellitus (GDM), with India having the greatest rate at 16.55 percent [4]. There is a 47 percent chance that babies born to diabetic mothers will experience significant hypoglycemia, as well as a 22 percent chance of hypocalcemia, a 19 percent chance of hyperbilirubinemia, a 34 percent chance of polycythemia, a 6 to 9 percent chance of respiratory distress syndrome and a 28 percent chance of macrosomia [5, 6].

Infants of diabetic mothers (IDM) are more likely to experience respiratory discomfort, polycythemia, hypoglycemia, congenital abnormalities, hypocalcemia, and hypomagnesemia, among other morbidities. However, related macrosomia and a rise in cesarean deliveries are factors in greater mortality [7, 8]. The elevated rate of perinatal mortality among Infants of diabetic mothers continues to be a reason to terminate pregnancies. Although the reason for the rise in perinatal illness and death is unclear, it has been linked to hypermetabolism, which is brought on by elevated insulin levels [9]. The perinatal outcome is associated with up to 42.9 % mortality in mothers with poor glycemic control. Although stillbirth rates have dropped dramatically in the last 20 years, rates of cesarean section and large for gestational age birth weight have remained high, and in some cases have remained unchanged, among women with GDM [10, 11]. Despite the implementation of preventive insulin therapy, Diabetes management advances, and improved health care have reduced the incidence of adverse perinatal outcomes in diabetic mothers' infants.

Given the high morbidity and mortality associated with this condition, this study was carried out at Government General Hospital, Siddhartha Medical College, Vijayawada, and AP, to identify neonatal complications in Infants of diabetic mothers.

Materials and Methods

Study Design: Prospective Hospital based observational cross-sectional study.

Study period: January 2020 to December 2020

Study area: Department of Paediatrics & Department of Obstetrics**,** Government General Hospital, Siddhartha Medical College, Vijayawada, AP.

Sampling method: Purposive sampling

Sample size(n)= Z^2 X p X q / d^2

Where Z=1.96, p = prevalence

q=1 –prevalence

d is the confidence interval taken-0.05.

The sample size calculated was (N): 260.

Sampling technique: Purposive sampling technique among consecutive cases.

Processing of data and analysis

Neonates of Diabetic Mothers born in the department of obstetrics and gynecology at the government general hospital, Vijayawada from January 2020 to December 2020 were included after getting informed consent. Weight is recorded at birth, and a thorough physical examination is performed. Maternal data were collected, including age, parity, type, and duration of diabetes, treatment received, co-morbid illness, and any other complications during pregnancy and mode of delivery. After 24 hours the neonate's birth weight, head circumference, chest circumference and length were measured.

All infants of diabetic mothers admitted into the Unit within the period were consecutively recruited into the study. Informed consent was obtained from the mothers/caregivers and they all gave consent for infant participation in the study. Babies of mothers with pregestational diabetes mellitus (Type 1 and Type 2) and GDM were included. Maternal data were reviewed retrospectively. Information obtained included: a) Characteristics of the mothers: age, parity, type and duration of diabetes, treatment received, presence or absence of other illnesses, pregnancy complications, mode of delivery, maternal outcome and b) characteristics of the babies: gestational age, birth weight, diagnosis, results of investigations, treatment received, duration of hospital stay and outcome. For each IDM, an infant of a non-diabetic mother admitted into the unit within the same period, matched for gestational age, and birth weight was recruited as control. Sometimes, one infant was used as a control for more than one IDM (infants of diabetic mothers). Patients were classified into large for gestational age (LGA), appropriate for gestational age (AGA), Anthropometric Outcome, Chest circumference, head circumference, length among babies and head to chest circumference ratio.

Investigations included blood samples, full blood counts, serum bilirubin, and random blood sugars. Some of these were only completed in certain situations. Hyperbilirubinemia was characterized as serum levels of indirect bilirubin higher than 12 mg/dl and/or any hyperbilirubinemia needing treatment (phototherapy and/or exchange blood transfusion) as well as hypoglycemia, polycythemia, and peripheral venous hematocrit levels larger than 0.65. Values of total blood calcium less than 6 mg/dL were considered hypocalcaemia. Due to the expense and lack of pediatric echocardiography and asphyxiated studies care resources in the hospital at the time of the study, routine ultrasound for the infants was not possible.

Statistical analysis: Data was collected by the performer. Continuous variables such as demographics and laboratory parameters are presented as mean± standard deviation. Numbers and percentages were used to express categorical variables. The unpaired t-test was used to

assess differences in quantitative variables between groups. The chi-square test was used to analyze categorical variables, while multivariate analysis was used to test dependent variables and the t-test was used to test continuous variables. In all statistical tests, a p-value of less than 0.05 was used to indicate a significant difference. The Statistical analysis was done using SPSS version 21.0. The statistical level of significance was set at a p-value of 0.05 or less.

Results

The age range of the mothers of IDMs was 26-45 years with a mean of 33.15 ± 4.17 years. All the mothers received antenatal care in the Department of Obstetrics and Gynaecology at Government General Hospital because of a bad obstetric history or because they were diabetics. The total number of babies studied was 260. Among them, 60 (23.07%) babies were born to diabetic mothers, while the remaining 200 (76.92%) babies were born to non-diabetic mothers. The study included 60 Infants of diabetic mothers, 48 (80%) of whom were born to mothers with GDM and 12 (20%) to mothers with Pre-Gestational/Overt Diabetes Mellitus. There were 31 males and 29 females among babies born to diabetic mothers. There were 118 males and 82 females among babies born to non-diabetic mothers. There is no gender preference (p = 0.752) between babies born to diabetic and non-diabetic mothers. Gestational age ranged from 30-41 weeks with a mean of 37.84 weeks. In terms of gestational age all Infants of diabetic mothers are born full-term at 37-40 weeks (100%).The Distribution of infants of diabetic mothers and non-diabetic mothers' results was shown in table-1.

Table-1: Distribution of infants of diabetic mothers and non-diabetic mothers

Characteristics		Male	Female	P value
Gender distribution of Neonates				
Diabetic mothers (n=60)	Pre-gestational Diabetes (n=12)	6	6	0.75
	Gestational Diabetes (n=48)	25	23	
Non-diabetic mothers (n=200)		118	82	

Out of 60 diabetic mothers, 13 cases had only one abortion, four had two abortions, two had three abortions and three neonatal deaths, five had one IUD (unexplained fetal loss) one had two IUDs, and 32 had no loss. Out of 200 non-diabetic mothers, 31 had only one abortion, 8 had two abortions, 2 had three abortions and two neonatal deaths, none had an IUD, and 157 had no loss. 20 babies were born to diabetic mothers as firstborn, 19 babies as second born, 11 babies as third born, 8 babies as fourth born, and 2 babies as fifth born. Among babies born to non-diabetic mothers, 83 babies were the firstborn, 78 babies were the second born, 31 babies were the third born, 5 were the fourth born, and 3 were the fifth born. The incidence of LGA (large for gestational age) babies is higher in diabetic mothers compared to non-diabetic mothers. The mean Ponderal index (PI) of babies born to diabetic mothers is higher (0.11) than that of babies

born to non-GDM mothers with a p-value of 0.0029. The mean Ponderal index of LGA babies born to diabetic mothers is not significantly higher than the mean Ponderal index of LGA babies born to non-diabetic mothers. Approximately 81.6 percent of diabetic mothers' infants are born with normal birth weight. Macrosomia is a major issue among these infants, accounting for 1.66 percent, which is highly statistically significant (Table-2).

LBW (LBW= low birth weight), on the other hand, accounts for only 15% of the total. 4.14 kg was the average birth weight (2.0-6.0 kg). With a p-value of 0.001, the mean birth weight of babies born to diabetic mothers is higher (0.283) than that of babies born to non-diabetic mothers. With a p-value of 0.365, the mean chest circumference of babies born to diabetic mothers is greater (2.05) than that of babies born to non-diabetic mothers. There is no statistically significant difference in head circumference between diabetic and non-diabetic babies. The mean length of babies born to diabetic and non-diabetic mothers differs significantly. The difference in head-chest circumference between diabetic and non-diabetic mothers is significant.

Table 2 Characteristics of infants of diabetic mothers and non-diabetic mothers

Characteristics	Diabetic Mothers (n=60)	Non Diabetic mothers (n=200)	P value
Distribution of Fetal and Neonatal Loss among Diabetic Mothers			
IUD1	5 (8.33%)	-	0.578
IUD2	1 (1.66%)	-	
One abortion	13 (21.66%)	31 (15.55%)	
Two abortion	4 (6.67%)	8 (4%)	
Three abortion	2 (3.33%)	2 (1%)	
Death	3 (5%)	2 (1%)	
No Loss	32 (53.33%)	157 (78.5%)	
Mode of Delivery			
Cesarean	53 (75.71%)	103 (51.5%)	-
Normal	7 (24.28%)	97 (48.5%)	
Distribution of neonates according to birth order			
1^{st}	20 (33.33%)	83 (41.5%)	-
2^{nd}	19 (31.67%)	78 (39%)	
3^{rd}	11 (18.33%)	31 (15.5%)	
4^{th}	8 (13.33%)	5 (2.5%)	
5^{th}	2 (6.67%)	3 (1.5%)	
Distribution of Neonates Based on Gestational Age and Birth Weight			
LGA	12 (20%)	11 (5.5%)	
Non-LGA	48 (80%)	189 (94.5%)	
Anthropometric Outcome	2.6±0.356	2.49 ±0.286	**0.0029***

Distribution of infants of diabetic mothers according to birth weight			
VLBW (1.001 - ≤ 1.5 Kg)	-		
LBW (1.501 - ≤ 2.5 Kg)	9 (15%)		
Normal birth weight (2.5 - ≤ 4 Kg)	49 (81.66%)		
Macrosomia (≥ 4 Kg)	1 (1.66%)		
Mean Birth wt.	3.05± 0.51	2.76 ± 0.46	**0.001***
Chest circumference	32.0± 2.47	30 ± 2.45	0.365
Head circumference	32.88 ± 1.64	32.44 ± 1.41	0.856
Length among babies	47.73 ± 3.26	48.01 ± 3.05	**0.024***
Head to chest circumference	1.54 ± 1.07	2.50 ± 1.47	**0.002***

LGA=large for gestational age; VLBW=very low birth weight; LBW= low birth weight.

Table-3 shows the Morbidity of infants of diabetic mothers. The most common morbidity in neonates born to GDM mothers compared to overt DM mothers was hypoglycemia (35.42%), hyperbilirubinemia (27.08%), polycythemia (6.25%), hypocalcemia (25%) and the remaining 36 (75%) neonates from GDM had normal cardiac findings. Hypoglycemia (25%), hyperbilirubinemia (33.33%), polycythemia (6.25%), hypocalcemia (16.67%) and the remaining 9 neonates from pregnant mothers with overt diabetes had normal cardiac findings. When compared to infants of GDM mothers and overt DM mothers, P values (0.05) were significant for hypoglycemia and polycythemia.

Table-3: Morbidity of infant of diabetic mothers.

Characteristics	**GDM (n= 48)**	**Overt DM (n=12)**	**P value**
Hypoglycemia	17 (35.42%)	3 (25%)	0.047
Hypocalcemia	4 (8.33%)	2 (16.67%)	0.25
Hyperbilirubinemia	13 (27.08%)	4 (33.33%)	0.18
Polycythemia	3 (6.25%)	-	0.015
ASD	4 (8.33%)	1 (8.33%)	1.00
PDA	4 (8.33%)	1 (8.33%)	1.00

ASD =Autism Spectrum Disorder; PDA = Patent Ductus Arteriosus

Only one baby born to a diabetic mother was found to have a congenital anomaly in this study. The infant was born with imperforate anus, cerebellar hypoplasia and lissencephaly. There were no anomalies found in the remaining babies in the study. Two babies died as a result of cyanotic congenital heart disease, and one died as a result of severe birth asphyxia.

Discussion

According to this research, 60 (23.07%) of the infants were delivered to mothers who had diabetes, while the other 200 (76.92%) were delivered by non diabetic mothers. This

demonstrates that diabetes continues to have a major impact on perinatal and newborn death in our society. The research also revealed that IDM mortality rates were modest but still greater than those of non-IDMs. Neonatal morbidity still poses a serious problem among this population, even though maternal mortality has decreased [13, 14].

In this research, IDMs had a significant incidence of macrosomia. This result is comparable to those from North India [4] and western Rajasthan [16]. Macrosomia continues to be a significant morbidity because it raises the chance of later-life severe delivery injuries, obesity, and diabetes [17]. The majority of writers concur that maternal glucose control plays a role in macrosomia, despite the possibility that some differences in incidence may be linked to the classification [18, 19].

Since only blood glucose levels during prenatal appointments were recorded and glycosylated hemoglobin (HbA1C) levels weren't frequently checked, it was challenging to determine the degree of glycemic control in our mothers. The prevalence of macrosomia is decreased in facilities with coordinated diabetes-in-pregnancy programs that emphasize excellent maternal glycaemic management [13]. Therefore, the elevated rates of macrosomia in this research might be a result of the mothers' poor glycemic management.

This study's caesarian section (CS) rate was very high, and even among the controls, emergency CS rates were higher than planned CS rates [20]. The high prevalence of macrosomia in the IDMs and their matched controls is linked to the high rate of operative deliveries, comparable to the other research [13]. However, our results differed from those of other studies [21, 22], where elective CS rates were much greater than crises [23]. As a result, a woman who has been scheduled for a discretionary CS frequently arrives when an emergency CS is required.

The most prevalent newborn issue identified in the IDMs was hypoglycemia, which occurred in noticeably greater percentages than in the non-IDMs. The high incidence of hypoglycemia in our IDMs is consistent with observations made by other writers [24, 25] and has been recognized as a sign of the mother's poor glycemic control. The IDM is characterized by a sharp drop in plasma glucose concentration, particularly in those with inadequately managed maternal diabetes [24–26].

Fetal hyperglycemia is brought on by maternal hyperglycemia, which prompts the fetus's pancreas to produce an abnormal amount of insulin. When the placenta separates at delivery, the neonate experiences an abrupt cessation of glucose infusion without a proportionate impact on hyperinsulinemia [26]. As a result, hypoglycemia starts to manifest within hours of delivery. The mean blood glucose levels were reduced and the high rates of neonatal hypoglycemia may also be an indication of poor maternal glycaemic regulation, although there were no accurate records of the peripartum glucose levels in our mothers.

The other typical biochemical issue in this research was hypocalcemia. Other writers have also identified it as an issue with IDMs [27, 28]. The theory put forth by Tsang et al. [29] suggested that the hyperparathyroidism of diabetic mothers may inhibit fetal parathyroid function and cause hypocalcemia in the neonate. In contrast to another African research where it happened in only 29% of cases. Our IDMs had significant rates of jaundice, its unclear why these

two things conflict. Infants of diabetic mothers are known to experience hyperbilirubinemia, which has been shown to happen more frequently in macrosomic babies of diabetic mothers [30, 31].

Hyperbilirubinemia occurred in about half of our macrosomic IDMs but, this association was not statistically significant. There were no obvious congenital malformations in our study. The incidence of major congenital malformations has been reported to be 2-5 times greater in IDMs than in other infants with cardiac malformations recorded as the most common [13, 32, 33]. The unavailability of routine echocardiography in this study may have missed out on cases of asymptomatic congenital cardiac malformations. This may also be because they studied outcomes in pregnant women whilst we studied only babies admitted into our unit, thereby also possibly excluding malformations that were not compatible with life.

Infants of mothers with gestational diabetes and those with pregestational diabetes did not exhibit any appreciable differences in morbidity trends, according to the research. This serves as a reminder of the importance of screening all pregnant women for diabetes as well as the proactive and preemptive treatment of diabetic mothers' offspring regardless of the type of maternal diabetes. Though there was a numerically insignificant variation, the mortality rate was reduced among non-IDMs. This demonstrates that live-born IDMs without significant congenital malformations have a high chance of surviving with the right treatment.

Conclusions

The study shows disproportionate growth in the Infants of diabetic Mothers as evidenced by higher mean birth weight and mean Ponderal index, morbidity and mortality were more common in the infants of GDM mothers when compared to overt DM mothers with good glycemic control. Metabolic problems and respiratory complications were common in the LGA of IDMs, and they need close monitoring. Opening maternal-infant hospitals all over the nation with standardized procedures for the avoidance and treatment of pregnancy-related diabetes will significantly help to lessen the prevalence of this condition.

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Competing interests

The authors declare that they have no competing interests.

References

1. Goodman JR. Diabetes Mellitus in Pregnancy. Neo Reviews. 2023;24(3):e144-57.
2. McIntyre HD, Catalano P, Zhang C, Desoye G, Mathiesen ER, Damm P. Gestational diabetes mellitus. Nature reviews Disease primers. 2019;5(1):47.
3. Msollo SS, Martin HD, Mwanri AW, Petrucka P. Prevalence of hyperglycemia in pregnancy and influence of body fat on development of hyperglycemia in pregnancy among pregnant women in urban areas of Arusha region, Tanzania. BMC pregnancy and childbirth. 2019;19(1):1-9.

4. Siddiqui S, Waghdhare S, Panda M, Sinha S, Singh P, Dubey S, Jha S. Regional prevalence of gestational diabetes mellitus in North India. Journal of Diabetology. 2019;10(1):25.
5. Barnes-Powell L. Infants of diabetic mothers: the effects of hyperglycemia on the fetus and neonate. Neonatal network. 2007;26(5):283-90.
6. Alemu BT, Olayinka O, Baydoun HA, Hoch M, Akpinar-Elci M. Neonatal hypoglycemia in diabetic mothers: A systematic review. Current Pediatric Research. 2017;21(1).
7. Barnes-Powell L. Infants of diabetic mothers: the effects of hyperglycemia on the fetus and neonate. Neonatal network. 2007;26(5):283-90.
8. Jain S, Rajdev S, Burle S. Recent Advances in the Management of Infant of Diabetic Mother. Journal of Neonatology. 2003;17(2):28-37.
9. Driscoll SG, Benirschke K, Curtis GW. Neonatal deaths among infants of diabetic mothers: postmortem findings in ninety-five infants. American journal of diseases of children. 1960;100(6):818-35.
10. Allotey J, Stallings E, Bonet M, Yap M, Chatterjee S, Kew T, Debenham L, Llavall AC, Dixit A, Zhou D, Balaji R. Clinical manifestations, risk factors, and maternal and perinatal outcomes of coronavirus disease 2019 in pregnancy: living systematic review and meta-analysis. bmj. 2020;370.
11. Bang RA, Bang AT, Reddy MH, Deshmukh MD, Baitule SB, Filippi V. Maternal morbidity during labour and the puerperium in rural homes and the need for medical attention: a prospective observational study in Gadchiroli, India. BJOG: An international journal of Obstetrics & Gynaecology. 2004;111(3):231-8.
12. Jovanovic L. The role of continuous glucose monitoring in gestational diabetes mellitus. Diabetes Technology & Therapeutics. 2000;2(1):67-71.
13. Opara PI, Jaja T, Onubogu UC. Morbidity and mortality amongst infants of diabetic mothers admitted into a special care baby unit in Port Harcourt, Nigeria. Italian journal of pediatrics. 2010;36(1):1-6.
14. Clark RH, Thomas P, Peabody J. Extrauterine growth restriction remains a serious problem in prematurely born neonates. Pediatrics. 2003;111(5):986-90.
15. Wang Z, Kanguru L, Hussein J, Fitzmaurice A, Ritchie K. Incidence of adverse outcomes associated with gestational diabetes mellitus in low-and middle-income countries. International Journal of Gynecology & Obstetrics. 2013;121(1):14-9.
16. Kalra P, Kachhwaha CP, Singh HV. Prevalence of gestational diabetes mellitus and its outcome in western Rajasthan. Indian journal of endocrinology and metabolism. 2013;17(4):677.
17. Cheng YK, Lao TT. Fetal and maternal complications in macrosomic pregnancies. Research and Reports in Neonatology. 2014;4:65.
18. Sarkar S, Watman J, Seigel WM, Schaeffer HA. A prospective controlled study of neonatal morbidities in infants born at 36 weeks or more gestation to Women with diet-

controlled gestational diabetes (GDM-class Al). Journal of perinatology. 2003;23(3):223-8.

19. Kheir AE, Berair R, Gulfan IG, Karrar MZ, Mohammed ZA. Morbidity and mortality amongst infants of diabetic mothers admitted into Soba university hospital, Khartoum, Sudan. Sudanese journal of paediatrics. 2012;12(1):49.
20. Montoya-Williams D, Lemas DJ, Spiryda L, Patel K, Neu J, Carson TL. What are optimal cesarean section rates in the US and how do we get there? A review of evidence-based recommendations and interventions. Journal of Women's Health. 2017;26(12):1285-91.
21. Pettitt DJ, Ospina P, Kolaczynski JW, Jovanovic L. Comparison of an insulin analog, insulin aspart, and regular human insulin with no insulin in gestational diabetes mellitus. Diabetes care. 2003;26(1):183-6.
22. Mecacci F, Carignani L, Cioni R, Bartoli E, Parretti E, La Torre P, Scarselli G, Mello G. Maternal metabolic control and perinatal outcome in women with gestational diabetes treated with regular or lispro insulin: comparison with non-diabetic pregnant women. European Journal of Obstetrics & Gynecology and Reproductive Biology. 2003;111(1):19-24.
23. Chen L, Evans T, Anand S, Boufford JI, Brown H, Chowdhury M, Cueto M, Dare L, Dussault G, Elzinga G, Fee E. Human resources for health: overcoming the crisis. The lancet. 2004;364(9449):1984-90.
24. Almhanna MG, Easa ZO, Alatwani SH. Morbidity and mortality among infants of diabetic mothers admitted to a neonatal care unit in Karbala pediatric teaching hospital. Journal of Medicine & Life. 2022;15(8).
25. Begum T, Begum GA, Chowdhury MA, Ahmed W, Badrudddoza M. Neonatal Outcomes of Large-for-Gestational Age Infants with or without Gestational Diabetes Mellitus. Chattagram Maa-O-Shishu Hospital Medical College Journal. 2017;16(2):25-30.
26. Cowett RM. The metabolic sequelae in the infant of the diabetic mother. Controversies in Diabetes and Pregnancy. 1988:149-71.
27. Radwan MA, El Mansori NA, Elfergani MA, Halies FR, Lawgali MA. Neonatal Morbidity Pattern among Infants Born to Diabetic Mothers at Jamhouria Hospital, Benghazi-Libya. Asian Journal of Pediatric Research. 2021;7(4):38-55.
28. Radwan MA, El Mansori NA, Elfergani MA, Halies FR, Lawgali MA. Neonatal Morbidity Pattern among Infants Born to Diabetic Mothers at Jamhouria Hospital, Benghazi-Libya. Asian Journal of Pediatric Research. 2021;7(4):38-55..
29. Tsang RC, Kleinman LI, Sutherland JM, Light IJ. Hypocalcemia in pediatric neurologic emergencies 221 infants of diabetic mothers: Studies in calcium, phosphorus and magnesium metabolism and parathormone responsiveness. J. Pediatr. 1972;80:384-95.
30. Peevy KJ, Landaw SA, Gross SJ. Hyperbilirubinemia in infants of diabetic mothers. Pediatrics. 1980;66(3):417-9.

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31. Cordero L, Treuer SH, Landon MB, Gabbe SG. Management of infants of diabetic mothers. Archives of pediatrics & adolescent medicine. 1998;152(3):249-54.
32. Reece EA, Leguizamón G, Wiznitzer A. Gestational diabetes: the need for a common ground. The Lancet. 2009;373(9677):1789-97.
33. Reece EA. The fetal and maternal consequences of gestational diabetes mellitus. The journal of maternal-fetal & neonatal medicine. 2010;23(3):199-203.