

# The Frequency of Metabolic Complications in Infant of a Diabetic Mother

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## ABSTRACT

**Introduction:** Diabetes mellitus is the most common metabolic disorder complicating pregnancy. About 1-14% of all pregnancies are complicated by diabetes mellitus. Metabolic complications are frequently occurring complication in infants of diabetic mother. **Objective:** To determine the frequency of metabolic complications in infant of diabetic mother. **Study Design:** Cross sectional study. **Duration of Study:** January 2016 to June 2016. **Setting:** Department of Pediatric Medicine Unit-1, Allied Hospital, Faisalabad. **Sample size:** The total sample size is 295 cases. **Sampling Technique:** Non probability purposive sampling. **Methodology:** After taking permission from ethical committee of the hospital total 295 patients who fulfilled the inclusion and exclusion criteria were enrolled in the study. Informed consent was obtained from parents. Demographic details like name, age, gestational age at birth and gender was obtained. Neonates were assessed for presence of metabolic complications by drawing 3 ml venous blood and sending it to pathology lab for blood glucose levels, serum calcium and magnesium. Hypocalcaemia, hypomagnesaemia, and hypoglycemia were assessed as per operational definition. **Results:** In our study, out of 295 cases, mean age was calculated as  $14.09 \pm 4.75$  days, 46.44%(n=137) were male while 53.56%(n=158) were females. Frequency of metabolic complications in infant of diabetic mother was recorded as 18.31%(n=54), 7.11%(n=21) had hypomagnesaemia and 39.66%(n=117) had hypoglycemia. **Conclusion:** We concluded that the frequency of hypoglycemia is more common in infant of diabetic mother. However, early diagnoses and start of early treatment may help in reduction of mortality and morbidity of these patients.

**Keywords:** Infants of diabetic mother, metabolic complications, hypoglycemia, hypocalcemia, hypomagnesaemia.

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## INTRODUCTION

Diabetes is a metabolic disorder that occurs frequently in pregnant women. Approximately 3-10% of pregnancies are complicated by diabetes. Although there is significant improvement in obstetrics and pediatric care but morbidity and mortality is still high in pregnancies complicated by diabetes. Factors worsening the morbidity and mortality of babies born to diabetic mothers are ignorance, poverty, poor metabolic control and lack of obstetric and neonatal care.<sup>1</sup> Gestational diabetes mellitus mostly progress to type 2 diabetes and is increasing worldwide. Adverse maternal outcome was present in 24% cases and adverse fetal outcome was observed in 34% cases.<sup>2</sup> Treatment of infant of diabetic mother should be ideally started before birth by fetal maturity, biophysical profile, doppler velocity. Delivery should be planned in hospitals where good obstetric and paediatric care is available all the time. Women with gestational diabetes should be advised about proper diet, glucose monitoring and insulin therapy if needed. Asymptomatic infants should be monitored for blood glucose level within 1 hours of birth and later on 1 hourly for 6 – 8 hours and advised oral feed in the form of breast or formula milk. If there is feed intolerance the intravenous infusion of glucose at rate of 4-8 mg/kg/min should be initiated.<sup>3</sup>

IDM develop hypoglycemia due to maternal and fetal hyperglycemia inducing hyperinsulinemia. Maternal circulation

provides increase energy supply to fetus resulting in macrosomia leading to increased risk of birth trauma during delivery. Other complications include cardiomyopathy, microcolon, hirschsprung disease, polycythemia, renal vein thrombosis, hyaline membrane disease, hyperbilirubinemia.<sup>4</sup> Maternal pregestational type 2 diabetes is associated with high risk of birth defects.<sup>5</sup> The spectrum of congenital anomalies vary from natural tube defects and congenital heart defects to anotia, omphalocoele, bilateral renal agenesis and caudal regression.<sup>6</sup> Metabolic complications are frequently occurring complication in infants of diabetic mother and include hypoglycemia, hypocalcaemia and hypomagnesaemia. Hypoglycemia is most frequent occurring in 35.5% and hypocalcaemia in 15% and hypomagnesaemia in 4.5%.<sup>7</sup>

The purpose of this study is to diagnose and start early treatment of infant of diabetic mothers which will help in reduction of mortality and morbidity of these patients.

## METHODOLOGY

**Study Design:** Cross sectional study.

**Setting:** Department of Pediatric Medicine Unit-1, Allied Hospital, Faisalabad.

**Duration of study:** January 2016 to June 2016.

**Sample size:** Sample size of 295 cases calculated with 95% confidence level, 2.5% margin of error and taking expected percentage of 4.5%.<sup>7</sup>

**Sampling technique:** Non probability purposive sampling technique

**Inclusion Criteria:** Neonates (first 28 days after birth) male and female born to mother having diabetes (as per operational definition).

**Exclusion Criteria:** Neonates with gross congenital malformations like skeletal, visceral, dysmorphism, cleft palate and lip (on clinical examination). Neonates presenting with birth asphyxia on history.

Neonates with jaundice (yellow skin, eyes and palm) caused by septicemia or bacterial pneumonia (on clinical examination).

**Data Collection Procedure:**

After taking permission from ethical committee of hospital total 295 patients who fulfilled the inclusion and exclusion criteria were enrolled in study. Patients presenting with history of infant of diabetic mother to neonatal unit of Allied hospital Faisalabad were enrolled in this study. Informed consent was obtained from parents. Demographic details like name, age, gestational age at birth and gender was obtained. Antenatal record of mother was assessed for gestational diabetes mellitus. Neonates were assessed for presence of metabolic complications by drawing 3 ml venous blood and sending it to pathology lab of Allied hospital Faisalabad for blood glucose levels, serum calcium and magnesium and it was reported by pathologist. Hypocalcaemia, hypomagnesaemia, and hypoglycemia were assessed as per operational definition. All information was recorded on study proforma (attached).

All the data was entered and analyzed by using SPSS v-20. Mean and standard deviation was calculated for all variables like age, serum calcium concentration, magnesium level, plasma glucose level and gestational age. Frequency and percentage was calculated for gender and metabolic complications i.e. hypoglycemia, hypocalcaemia, hypomagnesaemia. Data was stratified for age, gestational age at birth (37-40, 40-42weeks) and gender (male / female). Post-stratification Chi-square test was applied. P-value  $\leq 0.05$  was taken as significant.

**RESULTS**

Age distribution of the patients was done, it shows that 60.68%(n=179) were between 1-15 days while 39.32%(n=116) were between 16-28 days of life, mean<sub>±</sub>sd was calculated as 14.09<sub>±</sub>4.75 days. (Table 1)

**Table 1: Age Distribution (n=295)**

Age(in days)	No. of patients	%
1-15	179	60.68
16-28	116	39.32
<b>Total</b>	<b>295</b>	<b>100</b>
<b>Mean<sub>±</sub>SD</b>	<b>14.09<sub>±</sub>4.75</b>	

Gender distribution shows that 46.44%(n=137) were male while 53.56%(n=158) were females. (Table 2)

**Table 2: Gender Distribution (n=295)**

Gender	No. of patients	%
Male	137	46.44
Female	158	53.56
<b>Total</b>	<b>295</b>	<b>100</b>

Gestational age was calculated as 42.03%(n=124) were between 37-40 weeks while 57.97%(n=171) were between 40-42 weeks of gestation, mean<sub>±</sub>sd was calculated as 39.86<sub>±</sub>1.12 weeks. (Table 3)

**Table 3: Gestational Age (n=295)**

Gestational age (in weeks)	No. of patients	%
37-40	124	42.03
40-42	171	57.97
<b>Total</b>	<b>295</b>	<b>100</b>
<b>Mean<sub>±</sub>SD</b>	<b>39.86<sub>±</sub>1.12</b>	

Mean values of study variables were calculated as 8.73<sub>±</sub>0.80 mg/dL for serum calcium, 1.95<sub>±</sub>0.32 mg/dL for magnesium and 48.62<sub>±</sub>8.79 mg/dL for plasma glucose levels. (Table 4)

**Table 4: Mean values of study variables (n=295)**

Variables	Mean	SD
Serum calcium	8.73	0.80
Magnesium	1.95	0.32
Plasma glucose level	48.62	8.79

Frequency of metabolic complications in infant of diabetic mother was recorded as 18.31%(n=54), 7.11%(n=21) had hypomagnesaemia and 39.66%(n=117) had hypoglycemia. (Table 5)

**Table 5: Frequency of metabolic complications in infant of diabetic mother (n=295)**

Metabolic complications	No. of patients	%
Hypocalcemia	54	18.31
Hypomagnesaemia	21	7.11
Hypoglycemia	117	39.66

The data was stratified for age, gestational age at birth (37-40, 40-42weeks) and gender (male / female). Post-stratification Chi-

square test was applied. P-value  $\leq 0.05$  was taken as significant. (Table 6-8)

**Table 6: Stratification for Age**

Metabolic complications		Age (in days)		P value
		1-15	16-28	
Hypocalcemia	Yes	22	32	0.000
	No	157	84	
Hypomagnesaemia	Yes	14	7	0.55
	No	165	109	
Hypoglycemia	Yes	66	51	0.22
	No	113	65	

**Table 7: Stratification for Gender**

Metabolic complications		Gender		P value
		Male	Female	
Hypocalcemia	Yes	24	30	0.74
	No	113	128	
Hypomagnesaemia	Yes	11	10	0.57
	No	126	148	
Hypoglycemia	Yes	45	72	0.02
	No	92	86	

**Table 8: Stratification for Gestational age**

Metabolic complications		Gestational age (weeks)		P value
		37-40	40-42	
Hypocalcemia	Yes	37	17	0.000
	No	87	164	
Hypomagnesaemia	Yes	12	9	0.14
	No	112	162	
Hypoglycemia	Yes	77	40	0.000
	No	47	131	

## DISCUSSION

Diabetes mellitus is the most common metabolic disorder complicating pregnancy. About 1-14% of all pregnancies are complicated by diabetes mellitus. Metabolic complications are frequently occurring complication in infants of diabetic mother and include hypoglycemia, hypocalcaemia and hypomagnesaemia. This study was planned to diagnose and start early treatment of infant of diabetic mothers which may help in reduction of mortality and morbidity of these patients.

In our study, out of 295 cases, mean age was calculated as  $14.09 \pm 4.75$  days, 46.44% (n=137) were male while 53.56% (n=158) were females, mean gestational age was  $39.86 \pm 1.12$  weeks, mean serum calcium was  $8.73 \pm 0.80$  mg/dL, magnesium was  $1.95 \pm 0.32$  mg/dL and plasma glucose level was calculated as  $48.62 \pm 8.79$  mg/dL. Frequency of metabolic complications in infant of diabetic mother was recorded as 18.31% (n=54), 7.11% (n=21) had hypomagnesaemia and 39.66% (n=117) had hypoglycemia.

The findings of our study correspond to a study reveal that hypoglycemia is most frequent occurring in 35.5% and hypocalcaemia in 15% and hypomagnesaemia in 4.5%.<sup>7</sup>

Another local study<sup>8</sup> reveal that hypoglycemia is the leading morbidity & occurred in 34 (36%) of these new-borns, hypocalcemia (5 babies - 5%) & Hypomagnesaemia (5 babies - 5%) were other morbidities present, our findings are in agreement regarding frequency of hypoglycemia and hypomagnesaemia while hypocalcemia was recorded higher than the above study.

Another local study<sup>9</sup> recorded 23.8% of the neonates with hypoglycemia and hypocalcemia was recorded in 16.6% of the cases which shows that hypoglycemia is the more frequent metabolic complications of neonates of diabetic mothers.

The higher frequency of hypoglycemia indicates that IDMs require close blood glucose monitoring after delivery and frequently need glucose supplementation, including parental glucose infusion. In our experience, the hyper-insulinemic state typically lasts two to four days. In neonates requiring glucose supplementation, the maintenance of normal plasma glucose levels while supplemental glucose is being weaned is evidence of resolving hyperinsulinism. Further testing should be undertaken to define the cause of persistent hypoglycemia in infants who continue to require glucose infusions at rates exceeding 8 to 10 mg/kg per minute to maintain normal plasma glucose levels beyond the first week of life.

Though we did not include pre-term infants in our study but the IDMs who are preterm or small for gestational age (SGA) also are at increased risk for hypoglycemia because glycogen stores are reduced, and hyperinsulinemia impairs the ability to mobilize hepatic glycogen.<sup>10</sup> In these infants, hypoglycemia may last longer than two to four days and may require more prolonged and higher rates of glucose infusion.

Although there are no data on the caloric needs of IDMs once glycemic control is established, it appears that the caloric needs of IDMs are similar to those of infants of non-diabetic mothers, and that subsequent weight loss and gain is self-regulated by the infant. However, offspring of diabetic mothers appear to be at risk for excess weight gain during childhood.

## CONCLUSION

We concluded that the frequency of hypoglycemia is more common followed by hypocalcemia and hypomagnesaemia in infant of diabetic mother. However, early diagnoses and start of early treatment may help in reduction of mortality and morbidity of these patients.

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## AUTHORSHIP AND CONTRIBUTION DECLARATION

AUTHORS	Contribution to The Paper	Signatures
<b>Dr. Wasif Iqbal</b> Medical Officer, Pediatrics Unit-1 Allied Hospital, Faisalabad	Contribution to conception and design, Acquisition of data, Analysis and interpretation of data	
<b>Dr. Muhammad Shamaoon</b> Assistant Professor, Pediatrics Unit-1 Allied Hospital, Faisalabad	Contributed in conception, analysis and interpretation of data and give his expert view of manuscript designing	
<b>Dr. Maryam Masood</b> Women Medical Officer Children Hospital, Faisalabad	Data Collection, Helping in writing of discussion & references	
<b>Prof. Dr. Muhammad Asghar Butt</b> Professor, Head of the Department of Pediatrics Unit-1 Allied Hospital, Faisalabad	Supervised the study and contributed in conception and shares its expert research opinion	