

ASSOCIATION OF SERUM CALCIUM LEVEL IN INFANT OF GESTATIONAL
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ABSTRACT

Background: Diabetes has long been associated with maternal and perinatal morbidity and mortality. Abnormal fetal metabolism during pregnancy which is complicated by maternal diabetes mellitus results in multiple neonatal sequelae. **Objectives:** To investigate the association of serum calcium level in infant of diabetic and pre diabetic mother. **Method:** To determine neonatal complications of gestational DM and compare them with Pregestational DM. A cross sectional study was performed in the department of Biochemistry and Molecule biology, BIRDEM, from July, 2016 – June 2017. Total 105 infants of diabetic mothers were taken to determine and compare the clinical outcome of infants. Among them 47 were born to Pregestational and 58 were born to gestational diabetes mellitus. Maternal history and birth history was taken. Blood glucose, S. calcium, magnesium, bilirubin level were estimated in all neonate by standard laboratory method. **Result:** Among 105 infants 62.9% were male and 37.1% were female. Most of the neonates 97.9% IPGDM were delivered by cesarean section. Reduced blood glucose, S. Ca²⁺ were found 25.5%, 36.2% in IPGDM and 19%, 12.1% in IGDM respectively. Occurrence of hypocalcemia were significantly higher (p=0.015 and p= 0.001 respectively) in infant of mother with PGDM. **Conclusion:** From this study we can conclude that newborn infants of diabetic mothers present with 15-30% decreased value of calcium in the first 24 hours after birth.

KEYWORDS: Perinatal morbidity, mortality, serum calcium.**INTRODUCTION**

Pregnancy associated with diabetes mellitus is a significant medical problem not only affecting maternal health but also increases the risk of fetal and neonatal complication.^[1] Diabetes Mellitus in pregnancy may be Pregestational and gestational DM. Pregestational diabetes mellitus include type 1 or type 2 diabetes mellitus developed and diagnosed before pregnancy (ADA, 2000). On the other hand Gestational diabetes mellitus (GDM) is known as impaired glucose tolerance with onset or first recognition during pregnancy.^[2] Usually initiation of GDM is in middle and late gestational period and continues to term.

The infant of diabetic mother (IDM) have a special concern and constitute one of the common health problems in neonatal care unit. There were more than 100,000 IDM born yearly in United States.^[3] About 1 in 7 births being affected by gestational diabetes mellitus (GDM). The infant of diabetic mother is at risk of

transient hyperinsulinism, which prevents at birth the normal activation of metabolic pathways producing glucose and ketone bodies and causes increased glucose consumption by tissues. The neonatal hypoglycemia is seen in infants born to women with GDM or PGDM is due to fetal/neonatal hyperinsulinemia. Chronic maternal hyperglycemia can cause insulin responses, thus the severity of the hypoglycemia is thought to vary with maternal glucose control in the latter half of pregnancy and during labor. Hypoglycemia is defined as blood glucose level less than 2.6 mmol/L. Symptoms of hypoglycemia are non-specific, such as lethargy, apathy, limpness, apnea, cyanosis, weak or high pitched cry, poor feeding, vomiting, tremors, irritability, seizures, coma.

Hypocalcemia is the most common metabolic abnormalities in neonate of diabetic mother. Hypocalcemia is defined as serum calcium level <7 mg/dl.^[4] In addition infant of diabetic mother have

higher serum calcium in utero and this may also suppress parathyroid gland.^[5] At birth, IDMs demonstrate a negligible rise in parathyroid hormone, resulting in a temporary hypoparathyroidism.^[6] This hypoparathyroidism is related to maternal and fetal hypomagnesemia, both of which then contribute to neonatal hypocalcemia.^[7] Risk of developing hypocalcemia include acidosis, which release intracellular phosphorus, use of sodium bicarbonate to buffer acidosis, stress induced calcitonin release, preterm delivery with limited parathyroid hormone release, and sustained calcitonin production despite hypocalcemia, and end organ resistance to 1, 25-(OH)₂ cholecalciferol, the most active form of vitamin D.^[8] The degree of hypocalcaemia is associated with the severity of diabetes in mother. About 25% of IDMs may present with serum calcium level <7mg/dl and this may remain asymptomatic and is usually detectable during second and third day of birth. The signs and symptoms of hypocalcaemia are hypoglycemia including sweating, tachypnea, irritability and seizures.^[4]

OBJECTIVE

To investigate the association of serum calcium level in infant of gestational diabetic and pre gestational diabetic mother.

METHODOLOGY

Type of study

Cross sectional study.

Place of study

Department of Biochemistry and Molecular Biology, BIRDEM, Dhaka.

Period of study

July 2016-June 2017.

Study sample

About 105 infants aged within 72 hours of birth were selected from admitted patient of department of Obstetrics and Gynecology and department of pediatrics, BIRDEM, Dhaka.

Selection criteria

Inclusion criteria

- Infants of diabetic mother (PGDM & GDM)
- Age within 72 hours of birth
- Either sex

Exclusion criteria

- Diabetic mother associated with other disease such as preeclampsia, eclampsia and other endocrine disorders affecting fetal outcome
- Multiple pregnancy
- Infant on artificial nutrition or calcium therapy.
- Septicemia

Sampling technique

Purposive.

Data collection technique

According to inclusion criteria parents of all IDMs were encouraged for voluntary participation from SCABU and Obstetrics and Gynecology department. A structural questionnaire was filled up for each IDM after taking informed written consent from their guardian. Detail socioeconomic, maternal medical, drug, obstetrical and neonatal birth history and were recorded. Neonatal hematological report, maternal FBS and HbA1c were collected. Laboratory tests including blood glucose and S.Ca²⁺ were estimated in the laboratory of BIRDEM-2 General Hospital, Dhaka.

Statistical analysis

For comparison of characteristics, mean with standard deviation of plasma glucose, serum calcium were determined. Independent student's t-test was done for comparison between IPGDM and IGDM. Chi-square test was done to see any association of gestational age between IPGDM and IGDM. All statistical tests were considered significant at the level of (p≤0.05) was considered as test of significance. Statistical analysis was performed with the help of software SPSS (statistical package for social science) for windows, 17 version.

The study was a cross sectional study which was conducted in the department of biochemistry of BIRDEM General Hospital from July 2016 to July 2017. The total numbers of participants were 105. Among them, 55.2% infant of GDM mother and 44.8% were of PGDM mother. 62.9% were male and 37.1% were female.

RESULTS

Table I: Frequency distribution of study population (n=105).

	Variable	Frequency	Percentage
IDM	IGDM	58	55.2
	IPGDM	47	44.8
Total		105	100

- n=number of study subject
- IDM= Infant of diabetic mother
- IPGDM= Infant of pregestational diabetic mother
- IGDM= Infant of gestational diabetic mother.

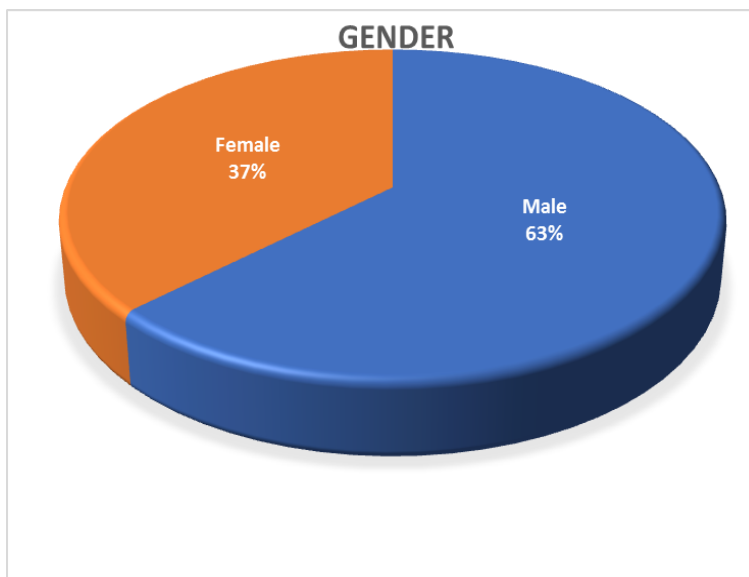


Fig. 1: Gender distribution of study population

Demographic characteristics of study population

The demographic characteristics of the study participants were shown in table II. Among the IDMs 63.8% male and 36.2% female were from PGDM; 62.1% male and 37.9% female were from GDM. All 105 infants were

delivered by caesarian section except one from each group. 97.9% of PGDM mother used to take insulin and 2.1% were on diet whereas 20.7% of GDM mother used to take insulin and 79.3% were on diet.

Table II: Demographic characteristics infant of PGDM &GDM mother of study population (n=105).

Variable		IPGDM		IGDM	
		Frequency	Percentage (%)	Frequency	Percentage (%)
Mode of delivery	C/S	46	97.9	57	93.8
	NVD	1	2.1	1	1.7
Maternal Mode of treatment	Insulin	46	97.9	12	20.7
	Diet	1	2.1	46	79.3
Total		47	100	58	100

n=no of study population, C/S=caesarean section, NVD=normal vaginal delivery.

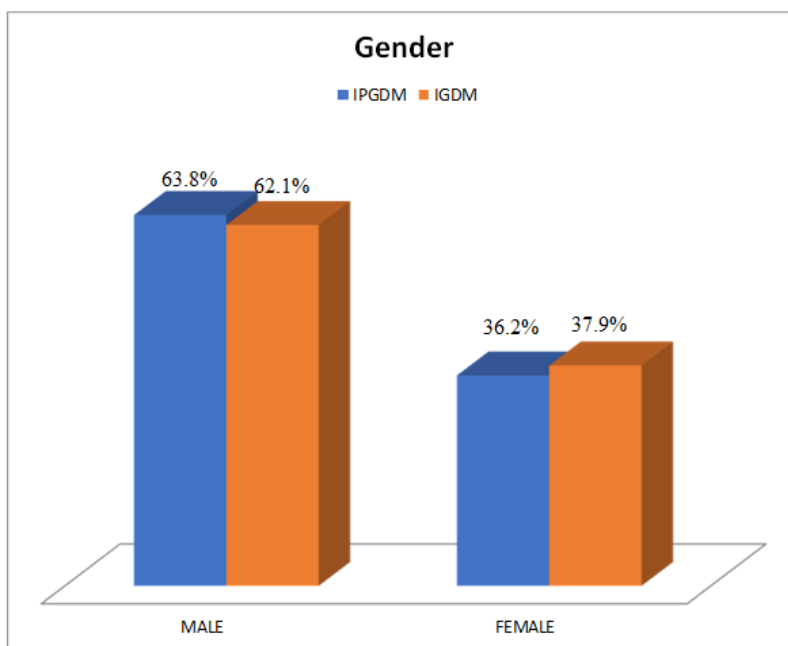


Fig. 2: Gender distribution between IPGDM &IGDM.

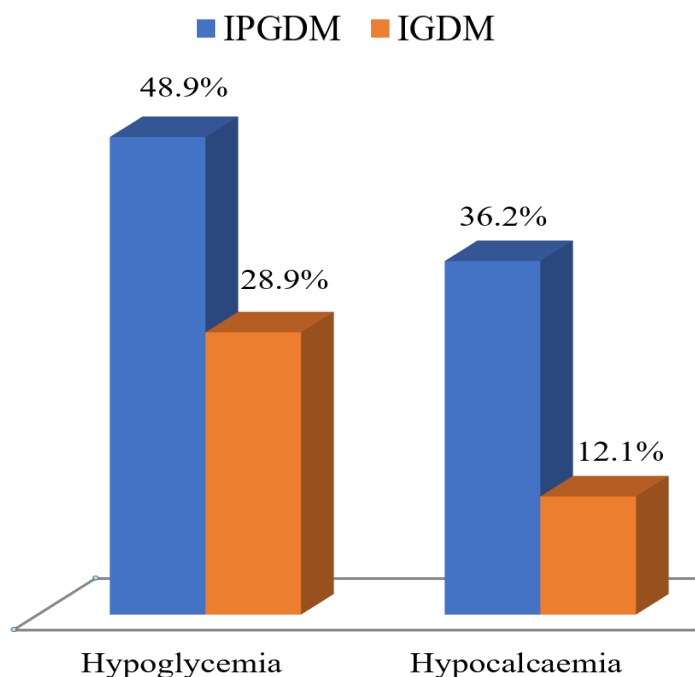


Fig. 3: Frequency distribution of biochemical status of IPDM and IGDM.

Table III: Distribution of birth weight of infant of diabetic mothers.

Variable	IPGDM		IGDM	
	Frequency	Percentage	Frequency	Percentage
1.5-2.49	26	55.3%	27	46.6%
2.5-2.99	09	19.1%	15	25.9%
3.0-3.49	07	14.9%	05	8.6%
3.5-4.0	01	2.1%	03	5.2%
>4.0	04	8.5%	08	13.8%

Data showed in Table III, the distribution of birth weight in infant of diabetic mothers. Here, we found that, 55.3% and 46.6% IPGDM and IGDM were considered as low

birth weight. Of all the study subjects 8.5% IPGDM and 13.8% IGDM were macrosomic. The rate of macrosomia is higher in IGDM than IPGDM.

Table IV: Association of blood glucose, serum calcium, magnesium & bilirubin with IDMs.

Variables	IPGDM	IGDM	X2	p-value
RBS(mmol/L)				
Normal	24(35.8%)	43(64.2%)	5.98	0.024
Low(<2.6)	23(60.5%)	15(39.5%)		
Calcium(mg/dl)				
Normal(7-	30(37.0%)	58(63.0%)	8.55	0.005
Low	17(70.8%)	7(29.2%)		

*Statistical analysis was done by chi-square test to compare among IPGDM & IGDM.

*=significant (*p<0.05, **p<0.01, ***p<0.001)

Table IV showed the association of RBS and serum Calcium level in infant of diabetic mother (IPGDM & IGDM). Blood glucose, serum calcium was significantly lower in IPGDM Than IGDM (60.5% Vs 39.5%, $\chi^2=5.98$, p=0.024), (70.8% Vs 29.2%, $\chi^2=8.55$, p=0.005).

DISCUSSION

In our study, it has been found that, 55.2% had gestational diabetic mother and 44.8% had Pregestational diabetic mother. Mode of delivery of infant of diabetic

mother according to Mahmood and Kayes, (2008) showed that, 82.6% IDMs were delivered by caesarean section.^[9] Another study showed that 80.8% IDMs were delivered via caesarean section. Mohsin, (1999) in her study found that the rate of caesarean section 80% in IDMs.^[10] In a previous study, 33.3% IGDM and 46.5% IPGDM were delivered via LUCS.^[11] In our study we found that 89.4% IPGDM and 81.0% IGDM were delivered via caesarian section either as emergency or elective and only 10.6% IPGDM and 19% IGDM was

delivered by normal vaginal delivery that was similar to previous studies.

In the present study out of 105 infants, 29.8% IPGDM and 46.6% IGDM were preterm and 70.2% IPGDM and 53.4% IGDM were term baby. A study by Akhaghi and Hamadi, (2004) done in Iran, showed that pre term delivery was more frequent in IPGDM than IGDM (18.5% IGDM and 10.9% IPGDM)^[11] A recent study by Gopal, (2014) showed that 88.40% neonate was born at term where as 11.60% were born at preterm which is quite dissimilar to our study. This difference might be due to that, in our study the IDMs were delivered by elective caesarian section to avoid the maternal and fetal complications.

Hypoglycemia was found as one of the most common morbidity of IDMs. We found in our study that 21.9% IDMs were hypoglycemic among which 25.5% were IPGDM and 19% were IGDM. The occurrence of hypoglycemia in IPGDM was higher than IGDM but the difference was not statistically significant ($p=0.49$). Gopal, (2014) also found hypoglycemia in 73.91% IDMs and the incidence of hypoglycemia was significantly higher in neonates born to mother with GDM than PGDM.^[12] Another study found that 21.9% IPGDM and 18.5% IGDM developed transient hypoglycemia.^[11] A study by NILI et al., (2004) showed that 42% and 22.9% IPGDM and IGDM were hypoglycemic respectively, which was quite similar to that of our study.^[13]

Hypocalcemia is a common metabolic problem in this study. According to our study mean serum calcium was 7.44 ± 1.45 in IPGDM and 8.02 ± 0.93 in IGDM. Another study found that mean serum calcium was 8.2 ± 1.2 and 8.2 ± 1.0 in IPGDM and IGDM respectively.^[14] Among all IDMs 22.85% developed hypocalcemia, out of these 36.2% IPGDM and 12.1% IGDM had hypocalcemia. Study showed incidence of hypocalcemia was higher in IPGDM than IGDM and that was statistically significant ($p= 0.015$). Other studies done by Gopal et al., (2014) and Das and Ankola, (2012) had found higher rate of hypocalcemia in infant of Pregestational diabetic mother than infant of gestational diabetic mother and the rate was statistically significant ($p<0.05$).^[12,14] Another study by Mahmood and Kayes, (2008) in Bangladesh, showed that, 19.2% IDMs developed hypocalcemia. 16% IGDM and 23% IPGDM developed hypocalcemia and the difference was not statistically significant ($p>0.05$).^[9]

CONCLUSION

In conclusion we can say that infant of diabetic mother have higher serum calcium in utero and this may also suppress parathyroid gland. Newborn infants of diabetic mothers present with 15-30% decreased value of calcium in the first 24 hours after birth.

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