European Journal of Molecular & Clinical Medicine

ISSN 2515-8260 Volume 09, Issue 03, 2022

ORIGINAL RESEARCH

A Study on Clinical Study of Infants of Diabetic Mother

Suraboina Satishkumar[1], Gajula Ravi[2], Janardhan Reddy Pulluru[3]

[1]CAS Specilist, Area Hospital, Miryalaguda, Nalgonda District, Telangana, India.
[2]Assistant Professor, Department of Pediatrics, Govt Medical College, Siddipet, Telangana, India.
[3]DNB, Resident, Yashoda Hospital, Secunderabad, Telnagana, India.

ABSTRACT

Background:Recently, a number of publications have raised concern about the rising prevalence of diabetes mellitus in Telangana. The International Diabetes Federation has named Saudi Arabia among the top 10 countries with the highest prevalence of diabetes
Objective of the Study: To observe and evaluate the incidence and complications seen in infants of diabetic mothers.
Materials and Methods: It is a prospective observational time bound study conducted Yashoda Hospital, Telangana, India from December 2019 to November 2020. All live babies born to mothers with GDM or pregestational DM were enrolled in study. Maternal history and complications during labour were recorded. APGAR scores assessed. Investigation for glucose estimation, PCV, serum calcium, serum bilirubin was sent. Chest X ray was done in babies with respiratory distress. 2D ECHO, USG abdomen, USG cranium were done in all babies after stablisation.
Results: 70 neonates were born to diabetic mothers. 2 IUD and 6 still born were excluded from study and 62 neonates were evaluated. 2 neonates died.70.96% were term babies and 29 % preterm. 40 infants (64.5%) were born to GDM mothers, 20 (32.3%) to mothers with type 2 DM and 2(3.2%) to type 1 DM. 16.2% were LGA while 12.9% were SGA. Hypocalcemia was seen in 4 neonates (6.7%). Hyperbilirubinemia was seen in 4 (13.3%). Sepsis was seen in 8 neonates. CHDs were seen in 42.9%, most common being ASD/PFO 21.3%. VSD was seen in 10.7%, PDA in 7.1% and septal hypertrophy in 3.5%. One case had pyloric atresia and one had RDS. Association between HbA1c levels and complications like macrosomia, hypoglycemia, congenital anomalies was not significant in our study.
Conclusion: Neonates born to diabetic mother are at a high risk of developing complications like hypoglycemia, hypocalcemia and cardiac defects.
Keywords: Infant of Diabetic Mothers; Complications; Hypoglycemia; Hypocalcemia; Hyperbilirubinemia; CHD.

Corresponding Author: Dr.Janardhan Reddy Pulluru, CAS Specilist, Area Hospital, Miryalaguda, Nalgonda District, Telangana, India.

INTRODUCTION

Recently, a number of publications have raised concern about the rising prevalence of diabetes mellitus in Telangana. The International Diabetes Federation has named Saudi Arabia among the top 10 countries with the highest prevalence of diabetes. This rising trend in the incidence of diabetes has been noticed by other researchers who attributed it to changing socio-economic status naming gender and high income as the significant risk factors. Women were reported to have an overall prevalence that was twice that for men. Our hospital records show that 20%of pregnant patients followed in obstetric clinics are diabetics,

reflecting this high prevalence rate. Population based studies4,5 from different countries have shown that complications among infants of diabetic mothers are high. In these studies, complications reported included congenital malformations, macrosomia, respiratory distress syndrome, hypoglycemia, polythycemia, and hyperbilirubinemia. In these studies, the risk of congenital malformations is reported to range from 2-10 times that of the normal population, while macrosomia is said to occur in 20-30% of infants of diabetic mothers. With these data and the high prevalence of diabetes in the Kingdom, we thought itwould be appropriate to look at our pregnant diabetic women to determine the magnitude of the problemthat diabetes might impose on them and their offspring.Determining the risk of congenital malformations was important in this group because other risk factors suchas obesity and consanguinity are common inTelangana. Therefore, our objective was to determine the outcome of infants born to diabetic mothers and to compare the complications occurring in these babies with those found in infants of non-diabetic mothers.[1-5]

Data regarding the types of complications and their incidence in the infants of diabetic mothers is sparse from the Telanagana, hence, the present study was undertaken to study the complications in the infants of diabetic mothers in our hospital.

Aims and Objective

To observe and evaluate the incidence and complications seen in infants of diabetic mothers.

MATERIALS & METHODS

Source of Data

All Infants born to diabetic mothers in Yashoda Hospital, Secunderabad from December 2019 to November 2020.

Type of Study

Prospective hospital based observational time bound study.

Inclusion Criteria

Infants born to mothers with gestational diabetes or pregestational diabetes mellitus.

Exclusion Criteria

Still born babies.

Methodology of Study

The study was conducted in The Department of Pediatrics, Yashoda Hospital, Hyderabad for a period of one year from December 2019 to November 2020. All live babies of diabetic mothers were admitted for evaluation and management.Written consent was taken from the parents. Ethical clearance was taken from ethics committee. All the diabetic mothers admitted to the labour room Yashoda Hospital were taken into study.

Detailed maternal history including parity, medical history for other chronic diseases, details of type of diabetes and treatment given was taken. Maternal HbA1c,if available, was recorded in the proforma designed for the study.

Statistical Analysis

Maternal and neonatal data were collected in predesigned proforma. Data was entered into Microsoft excel data sheet and was analyzed using SPSS 22 version software. Categorical data was represented in the form of Frequencies and proportions. Continuous data was represented as mean and standard deviation.

RESULTS

Table 1:Baseline maternal characteristics (n=62)

Characteristics		Number	Percentage
Type of delivery	Vaginal delivery	24	38.7%
	LSCS	38	61.3%
	instrumental	0	0
Parity	Primigravida	32	51.6%
	Multigravida	30	48.4%
Type of DM	GDM	40	64.5%
	Type 1 DM	2	3.2%
	Type 2 DM	20	32.3%
Gestation	Term	44	70.96%
	Preterm	18	29.04%

Table 2: Distribution of maternal HbA1c levels (n=46)

HbA1c	<6.5	28	60.9%
	>6.5	18	39.1%

Poor glycemic control was defined as maternal HbA1c levels >6.5.

Table 3: Associated medical disease in mothers (n=62)

Hypothyroidism	14	22.6%
Hypertension	16	25.8%

Table 4: Sex distribution of study population (n = 62)

		Number of cases	%
Gender	Female	22	35.5%
	Male	40	64.5%

Table 5: Weight wise distribution of study population (n = 62)

		Number of cases	%
Birth Weight	<1.5 Kg	2	3.2%
	1.5 to 2.5 Kg	22	35.5%
	2.5 to 4 Kg	34	54.8%
	>4 Kg	4	6.5%

Majority of study population having weight between 2.5 and 4 kg.

Table 6: Weight wise distribution for gestational age (n=62)

	Number of cases	Percentage
LGA	4	16.2
AGA	44	70.9
SGA	8	12.9

Table 7: Symptoms in study population (n=62)

		Number of cases	%
	Asymptomatic	32	51.6%
	Lethargy	8	12.9%
	Refusal to feed	4	6.4%

Symptoms	Jitteriness	2	3.2%
	Jaundice	6	9.7%
	Respiratory distress	12	19.3%

Majority was asymptomatic. Most common symptom was respiratory distress(19.3%). 8 babies were diagnosed to have sepsis.

Table 8: Association betweenmaternalHbA1C and Weight for GA (n=46)

		Wt for GA					
		LGA		**AGA**		**SGA**	
		No.of cases	**%**	**No.of cases**	**%**	**No. of cases**	**%**
HbA1C	<6.5	4	50.0%	20	66.7%	4	50.0%
	>6.5	4	50.0%	10	33.3%	4	50.0%

Poor glycemic control was defined as HbA1c levels >6.5.Among those with LGA, 50% and among SGA subjects 50% had poor glycemic control. There was no significant association between HbA1c and weight for Gestational age.

Table 9: Mean and SD of Hemoglobin and PCV in study population (n=62)

	Mean	**+_SD**	**P value**
Hb 1hr	16.9g/dl	2.4g/dl	
Hb 24hr	17.3g/dl	2.4g/dl	0.036*
PCV 1hr	53.2	5.3	
PCV 24hr	53.8	5.5	0.271

Mean Hb on day 1 was 16.9 ± 2.4 g/dl and at 24 hrs was 17.3 ± 2.4 g/dl. This increase in Hb% at 24 hrs was statistically significant. Mean PCV on day 1 was 53.2 ± 5.3 and at 24 hrs was 53.8 ± 5.5. This decrease in PCV at 24 hrs was not statistically significant.

Table 10: Time of hypoglycaemia among study population (n=20)

		No. Of cases	**%**
Time of Hypoglycaemia	<4 hrs	12	60.0%
	4 to 24 hrs	4	30.0%
	48 to 72 hrs	2	10.0%
	>72 hrs	2	10.0%

In the study, 20 babies (32.3%) had hypoglycemia. Of them 60% had with in <4 hrs, 30% between 4 to 24 hrs and 10% between 48 to 72 hrs. One baby was taken AMA to another hospital and could not complete study.

Table 11: Association between Hypoglycemia and Type of Diabetes (n=60)

	Hypoglycemia			
	Present		**Absent**	
	Count	**%**	**Count**	**%**
GDM	12	30%	28	70%
Type 2 DM	8	40%	12	60%

Table 12: Association between Hypoglycaemia and Weight for Gestational age (n=60)

		Hypoglycaemia			
		Present		Absent	
		Count	%	Count	%
Wt for GA	LGA/SGA	14	77.8%	4	22.2%
	AGA	6	16.6%	36	83.4%

This difference in Hypoglycemia between different weight for gestational age was statistically significant.

Table 13: Association between Hypoglycaemia and maternal HbA1c levels (n=46)

		Hypoglycaemia			
		Present		Absent	
		Count	%	Count	%
HbA1C	<6.5	10	35.7%	18	64.2%
	>6.5	8	44.5%	10	55.5%

There was no significant association between HbA1c and Hypoglycemia.

Table 14: Hypocalcemia among study population (n=60)

		No. Of cases	%
SerumCalcium	<7mg/dl	4	6.7%
	>7mg/dl	56	93.3%

In the study 6.7% had hypocalcemia and 93.3% had normal calcium levels. Mean serum calcium level was 8.7 mg/dl. One baby was taken AMA before 24 hours and serum calcium levels could not be done.

Table 15: Association between maternal HbA1C and Hypocalcaemia (n=44)

		Serum Calcium			
		<7mg/dl		>7mg/dl	
		No. Of cases	%	No. Of cases	%
HbA1C	<6.5	0	0.0%	28	100.0%
	>6.5	4	25.0%	12	75.0%

Among those with hypocalcaemia,all had poor glycemic control and among those without hypocalcaemia, 75% had poor glycemic control. There was no significant association between HbA1c and Hypocalcaemia.

Table 16: Age at presentation of Jaundice among study population (n=60)

		No. Of cases	%
Jaundice	Absent	32	86.7%
	24-48 hrs	0	0
	49-72 hrs	2	3.3%
	73-96 hrs	4	6.7%
	97-120 hrs	2	3.3%

8 patients had jaundice. Out of them 6.7% between 73-96 hrs.

Table 17: Cardiac defects among study population (n=56)

		Number of cases	%
ECHO	Nil	32	57.1%
	PFO	8	14.2%
	VSD	6	10.7%
	ASD	4	7.1%
	PDA	4	7.1%
	Septal hypertrophy	2	3.5%

4 D ECHO could not be done in 6 babies as 4 babies died and one was taken against medical advice. One baby which died had pansystolic murmur on left parasternal area and was suspected to have CHD clinically. Cardiac anomalies were seen in 42.9% of study population. Most common anomaly was VSD (10.7%).

Table18: Association between Cardiac defects and Type of Diabetes (n=54)

		Cardiac Defects			
		Present		Absent	
		Count	%	Count	%
Type of DM	GDM	20	50%	20	50%
	T2 DM	4	28.6%	10	71.4%

There was no significant association between Type of Diabetes and Cardiac Defects.

Table 19: Association between cardiac defects and maternal HbA1c (n=46)

		Cardiac Defects			
		Present		Absent	
		Count	%	Count	%
HbA1C	<6.5	12	42.9%	16	57.1%
	>6.5	4	22.2%	14	77.8%

Out of the babies having cardiac defects, maternal HbA1c records were available in 46 cases. The difference in Cardiac defects between different HbA1c levels was not statistically significant.

Babies were examined for external markers for spinal defect. None of the babies had any markers like tuft of hair, sacral dimple, hence Xray spine was not done. USG cranium was done in all babies after they were clinically stable (n=56). No abnormality was found.

DISCUSSION

Recently, many publications from Saudi Arabia have shed light on the rising prevalenceof diabetes mellitus in the population. Al-Nozha et al,[6] indicated that one subject in 4 above the age of 30 isreported to have diabetes in Saudi Arabia. These reports have highlighted the magnitude of the problem of diabetes in the Saudi community and its impact on society.[7] The group of women in the reproductive age is one of the groups of the society where the burden of diabetes exerts its toll on both the mothers and their babies.

Population studies from different parts of the worldhave emphasized the significant perinatal and neonatal morbidities associated with diabetic pregnancies. Our2 groups of infants showed no significant difference inthe route of delivery, Apgar score, cord pH, and growth parameters.[8,9] In particular, we refer to the occurrence ofsimilar rates of cesarean section between diabetic andnon-diabetic pregnancies, which contradicts reports from other

studies.Weindling,[6] and Yang et al,[10]in 2 different papers reported increased morbidity and mortality in infants ofdiabetic mothers. DeBoer et al,[11] examining the memory performance in infants of diabetic mothers, drewattention to the fact that these infants ran a 20 timeshigher risk of CNS malformations, anencephaly risk 13times higher, and spina bifida risk 20 times higher. Therisk of caudal dysplasia is said to be 250 times higher in infants of diabetic mothers.[12,13]

Unfortunately, gestational diabeticmothers in our institution present to the clinic bythe end of the first trimester or after, thus, missingthe essential early glycemic control during the criticalperiod at which congenital malformations develop.Several studies have tried to address the methods forearly detection and identification of women withgestational diabetes.[14] Risk factors have been usedto identify gestational diabetics before or early inpregnancy because several studies have indicated thatglycemic control during embryogenesis is the mainfactor in the origin of malformations.[15] The importanceof primary care centers and preconception clinics is nowwell-recognized, but education and counselling familieswith risk factors for diabetes may yield better results inearly identification of gestational diabetics. Since neural tube defects are seen more in babies of diabetic mothers,a point can be made for encouraging early provision offolic acid and health education at the primary care levelfor these mothers.[16]

Total of 70 babies were born to diabetic mothers out of which 2 were IUD and 7 were still born babies, hence excluded from the study. In our study a total of 62 cases were included. 70.96% were term babies and 29 % preterm.

Glycemic control

Glycemic control was assessed by the HbA1C levels. A good glycemic level was taken as less than 6.5%. Poor glycemic control was seen in 39.1%.

Association of poor glycemic control with hypoglycemia, large for gestational age or cardiac defects was not significant in our study. This could be attributed to the different cut off value used in the above studies compared to ours. Also, HbA1C levels could not done in all the diabetic mothers due to late presentation to our institute.

Macrosomia

In our study 6.5% were macrosomic which is lesser than what is seen in the above studies. Possible reason for this could be poor maternal nutrition status and more incidence of anemia in rural areas.

Cardiovascular malformations

In our study 42.9% of cases had some cardiovascular malformation. Majority of these infants (83.3%) were born to mothers with geastational diabetes. The commonest defect was ASD/PFO seen in 21.3% followed by VSD in 10.7%. The difference in Cardiac defects between different HbA1c levels was not statistically significant in our study. This could be because the HbA1c levels for majority of the mothers was not done in the first trimester (60.8%). The glycemic control during organogenesis was not available to compare the incidence of cardiac defects in different glycemic levels.

Hypoglycemia

Hypoglycemia was seen in 32.3% of the cases in our study. Majority of cases in our study had hypoglycemia within first 4 hours of life (60 %).

Hypocalcemia6.7% of cases had hypocalcemia. Both these cases had HbA1c levels of >6.5%.

Hyperbilirubinemia was seen in 13.3%, none requiring exchange transfusion.

CONCLUSION

As this study shows, neonates born to diabetic mother are at a high risk of developing complications like hypoglycemia, hypocalcemia and cardiac defects. So, the babies should be closely monitored for these complications and managed accordingly.

Acknowledgment

The author is Thankful to Department of Pediatrics for providing all the facilities to carry out this work.

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