Original Research Article

Study on clinical profile of neonates born to diabetic mothers in level III NICU

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Abstract

Introduction: Due to raise of diabetes most of the infant of a diabetic mother (IDM) are at an increased risk of long term morbidities. With this knowledge, a study was conducted to find the clinical profile of IDMs and to know the incidence of congenital anomalies. **Methodology:** It was a prospective study, conducted in the department of Paediatrics, Gandhi Medical College from January 2018 to June 2019. An informed consent was taken from all the participants. Newly born babies to gestational diabetes (GD) and Pregestational diabetes (PD) mothers, were included. Mothers with heart, renal complications were not considered. GD was diagnosed using Carpenter and Couston Criteria and PD based on serial estimation of fasting glucose. The babies were evaluated by the specialist. Immediately, glucose level in the cord blood was measured and later at regular intervals using glucometric reagent strip method; mean was considered. Chi-square was used to find the significance; $P<0.05$ was considered to be statistically significant. **Results:** Total 140 diabetic women were recruited, 73% were diagnosed to be GD. Thirty four underwent normal vaginal delivery. Hypoglycaemia is the predominant (53%) metabolic abnormality. GD was diagnosed in 56% of the neonates; statistically there was significant difference. Hyperbilirubinemia (61%; 85) was the predominant haematological abnormality CVS abnormality was diagnosed in 8, 80% (112) of GD neonates were improved; statistically the difference was significant. **Conclusion:** GD is the major contributor among the pregnant women with diabetes. IDM are at high risk, due to congenital abnormalities. Hence, it is always ideal that they are delivered and managed at tertiary care centre so that intensive monitoring as well as therapy can be provided.

Keyword: Diabetes, Gestational, Fetal, Study

Introduction

Diabetes is the most common medical complication in pregnancy which may be pregestational or gestational diabetes[1,2]. Due to raise of diabetes in general population, most of the infant of a diabetic mother (IDM) are at an increased risk for periconceptional, neonatal and long term morbidities. Adding to this, several short term and long term complications are reported[3].

The causes of fetal and neonatal sequelae of maternal diabetes are multifactorial; these complications can effect of maternal glycemic control on the fetus. Advances in maternal and fetal care have improved the situation where most of the pregnant women with diabetes can deliver a healthy baby[4]. However, the current knowledge regarding the nature of immediate complications especially hypoglycaemia, with respect to the timing and relation to intrapartum and cord blood glucose levels remains significantly inadequate.

In India, where most pregnant women are brought to hospitals for the first time in labour, there is an important need to know if the immediate neonatal complications especially hypoglycemia in IDMs could be predicted by simple bed-side tests like intrapartum or cord blood glucose levels.

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This knowledge can help in in categorisation and management of risky new-borns.

With this knowledge, a study was conducted to find the clinical profile of neonates born to diabetic mothers and to know the incidence of congenital anomalies like cardiac anomalies and CNS anomalies.

Methodology

It was a prospective study, conducted in the department of Paediatrics, Gandhi Medical College. Study was conducted from January 2018 to June 2019, 18 months. Study protocol was approved by the institutional ethical committee. An informed consent was taken from all the participants.

All the newly born babies to gestational diabetes (GD) and Pregestational diabetes (PD), both gender and those submitted informed consent were included in this research. Those born to mothers with heart, renal complications, pregnancy induced hypertension, still born babies were not considered.

Data regarding the diabetic status of the mother was obtained from antenatal records, categorised to PD and GD. GD was diagnosed based on Carpenter and Couston Criteria after an oral glucose tolerance test[5]; here fasting, 1 hour, 2 and 3 hour after taking glucose values were measured and the individual is diagnosed based on minimum rise in 2 values. The glycemic status of PD was diagnosed based on the serial estimation of fasting glucose and the mean value was considered.

All the mother's antenatal history and other associated obstetrical, medical problems were noted. Whenever a woman with diabetes went

into established labour or lower segment caesarean section (LSCS), and the intrapartum blood glucose levels was measured. All the deliveries were attended by paediatrician.

The babies were evaluated by the specialist to avoid bias and glucose level in the cord blood was measured immediately at the time of delivery. The baby was shifted to the NICU and blood glucose levels monitored at regular intervals (0, 1, 2, 3, 6, 12, 24, 36 and 48hrs). Standard heal prick using glucometric reagent strip method with the same glucometer for uniformity. The babies weight was recorded using digital weighing scale and grouped as small for gestational age (SGA), appropriate for gestational age (AGA) or large for gestational age (LGA) depending on the birth weight and gestational age (GA) according to growth charts[6].

Chest x-ray and arterial blood gas analysis was done if baby had significant respiratory distress and 2D-echocardiography was done if cardiac disease was suspected by the pediatrician. Other investigations like Serum electrolytes, indirect ophthalmoscopy for retinopathy of prematurity, neurosonogram, sepsis screen, and USG Abdomen were done if relevant. The baby was treated as per standard NICU guidelines of the hospital and shifted to mothers' side when stable. A follow-up examination of the infant was done at the age of 6weeks when the babies were brought for routine immunisation, the infant was then thoroughly evaluated and the findings were recorded.

Statistical Methods

Descriptive statistical analysis was used in this research. Results on continuous measurements were presented on Mean ± SD. Chi-square and Fisher exact test was used to find the significance of study parameters; P<0.05 was considered to be statistically significant.

Results

Total 140 (100) diabetic women were recruited in this research. In this 73% (101) were diagnosed to be GD and 28% (39) were PD. Thirty four (24.2%) underwent normal vaginal delivery, 8.6% (12) assisted vaginal delivery and 67.2%. when the neonates gender was considered, 58% (81) were male and 42% (59) were female and according to the GA, 22.8% (32) were preterm and the remaining 77% (108) were full term babies.

In this research, hypoglycaemia is the predominant (53%; 74) metabolic abnormality observed in the neonates followed by hypocalcemia (26%) and hypomagnesemia (7%). GD was diagnosed in 56% of the neonates and PD in 44%; statistically there was significant difference among the GD and PD neonates with metabolic abnormality, respectively (Table 1).

Table 1: Distribution of metabolic abnormalities in the neonates; n (%)

Abnormality	GD	PD	Total	P value
Hypoglycemia	59 (42)	15 (10.7)	74 (53)	<0.001
Hypocalcemia	15 (10.7)	21 (15)	36 (26)	<0.001
Hypomagnesemia	4 (2.8)	6 (4.2)	10 (7)	<0.05
Total	78 (56)	42 (44)	140 (100)	-

Hyperbilirubinemia (61%; 85) was the predominant haematological abnormality in this research followed by polycythemia (39%; 55); statistically there was significant difference in the haematological abnormality between GD and PD neonates (Table 2).

Table 2: Distribution of hematological abnormality and diabetic status in the neonates; n (%)

Abnormality	GD	PD	Total
Hyperbilirubinemia	70 (50)	15 (11)	85 (61)
Polycythemia	44 (31)	11 (8)	55 (39)
Total	114 (81)	26 (19)	140 (100)
Statistical analysis	P<0.01; statistically significant.		

CVS abnormality was diagnosed in 8, 6 in GD and 2 in PD neonates. Out of 4 CNS abnormality, 3 and 1 were diagnosed respectively in GD and PD; statistically the difference was significant. Congenital heart disease was diagnosed in 8 neonates and in 10 neonates, birth injuries was identified.

There were total 8 (5.7%) deaths which was 4.3% (6) in PD and 1.4% (2) in GD neonates; 80% (112) of GD neonates were improved; statistically the difference was significant (Table 3).

Table 3: Distribution of deaths and diabetic status in the neonates; n (%)

Abnormality	GD	PD	Total
Death	2 (1.4)	6 (4.3)	8 (5.7)
Improved	112 (80)	19 (13.7)	132 (94)
Total	114 (81)	25 (18)	140 (100)
Statistical analysis	P<0.01; statistically significant.		

Discussion

The prevalence of new-onset diabetes is increasing among the youngsters and the infants of these are predisposed to increased morbidity and mortality[7]. Due to improved antepartum surveillance, better metabolic control and improved neonatal care there is a significant improvement in the outcome of diabetic pregnancy; whereas in this country, the IDM still face major issues[8].

Among the 140 (100%) pregnant women in this research, 73% (101) were diagnosed to be GD and 28% (39) were PD; the GD PD ratio was 2.6. The ratio was reported to be 6 in an Indian study, reported by Deorari et al[9]. Barkat et al[10]. mentioned that, out of 213 (100%) study members, 80% (213) were diagnosed to be GD and GD PD ratio was 3.9. Akhlaghi et al[11]. reported that, out of 100 study members, 27% were GD and 73% were PD and the ratio was 0.4.

In this research there was a higher rate of LCSC (67%), followed by spontaneous vaginal delivery (24%) and instrument assisted vaginal delivery (8%). Almost similar findings were reported in the literature also[9,10]. But instrument assisted vaginal delivery was reported to be nil by Akhlaghi et al[11]. The apparently higher rate of LSCS in our study seems to be in accordance with the similar trend noted all over the world in recent years especially in high risk pregnancies. The relatively less number of instrumental and high risk vaginal deliveries may be one of the primary contributors toward the less noted incidence of birth trauma in our study.

In this report, 87% of neonates were AGA followed by SGA (7.1%) and LGA (5.8%). In study by Shashidhar et al[12]. it was reported to be 82%, 14% and 4% respectively AGA, LGA and SGA. The lower percentage compared to others may be attributed to the intensive glycemic control of mother and fetal growth monitoring during the antenatal period. It is also probably related to the high percentage of comorbid conditions during pregnancy. Similar to our findings, in the available reports also, there was decrease rate of prematurity in IDMs;

as more number of mothers are being left to term and spontaneous labour with the availability of better neonatal care.

In this research, hypoglycaemia was the predominant (53%) metabolic abnormality followed by hypocalcemia (26%) and hypomagnesemia (7%). GD was diagnosed in 56% of the neonates and PD in 44%; statistically there was significant difference among the GD and PD neonates with metabolic abnormality, respectively (Table 1). Sudarshan et al[13]. and Girish Gopal et al[14]. reported similar high incidence of hyperbilirubinemia. This may be one of the most important factors in prolonging the stay in NICU, thereby exposing the infant to other hazards like sepsis. Incidence of hypoglycemia in neonates vary with the definition of hypoglycemia used, the population of interest, and neonatal feeding patterns. A clinically useful threshold for neonatal hypoglycemia has not been determined[15]. This may account for wide range seen in various studies. Hypoglycemia was recorded in 52.8% of the neonates in the study group which is high comparable to many other studies. Similar to our findings, there was significant hypoglcemic correlation was reported by Mahmood CB et al[16]. and Nili Firouzeh et al[17].

Congenital cardiac abnormality (CCA) was reported to be 5.7% in this research. However, it was reported to be 11.6% by Girsh gopal et al.[14], and 10% by Allam et al[18]. In our study incidence of CCA's were comparable to other studies. Ostium secundum was the most common (50%) among these neonates. Incidence of congenital malformations was significantly higher in GD members; statistically the difference was significant ($p<0.001$). As is previously recognised, IDMs may be subjected to greater scrutiny and may therefore be more likely to have asymptomatic cardiovascular malformations recognised[19]. In contrast to other studies, in our study only acyanotic CCAs were documented and interestingly no baby had evidence of hypertrophic cardiomyopathy as described by few.

Study follow up is not part of our objective. We followed for a short period, where the recovery rate was identified to be 90%. Almost similar findgs were reported in the literature also. Similar better outcome for asymptomatic neonatal hypoglycemia has been reported by Singh et al[20].

Conclusion

GD is the major contributor among the pregnant women with diabetes. Our report confirms that IDM are at high risk, due to congenital abnormalities. Hence, it is always ideal that they are delivered and managed at tertiary care centre so that intensive monitoring as well as therapy can be provided.

Limitations of the study

Utility of glucometer to measure the neonatal glucose and non availability of HbA1c results of the mothers are the major limitations of this research. In addition, effects of feeds on the glucose concentration of the neonates was not considered.

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