Frequency of Metabolic Complications in Infants Born to Diabetic Mothers at KRL Hospital, Islamabad

Kiran Mushtaq Toor 1, Sughra Wahid 2, Kiran Azeem 3
1 Senior Registrar, Pediatric Department, Foundation University Medical College, Islamabad
2 Head Department of Pediatrics, KRL Hospital Islamabad.
3 Senior Registrar, Pediatric Department, Benazir Bhutto Hospital, Rawalpindi.

Abstract
Objective: To determine the frequency of metabolic complications in infants of diabetic mothers (IDMs)

Patients & Methods: This descriptive study was conducted at KRL Hospital Islamabad. Infants born to diabetic mothers (n=80) were enrolled in the study and kept in neonatal unit for first 24 hours of life. Serial blood glucose monitoring was done using glucose sticks. Serum calcium and magnesium levels were done from lab at 6 and 24 hours of age.

Results: Out of total 80 IDMs, 52.5% were male while 47.5% were female. Mean gestational age was 37.58 ±1.35 SD weeks. Birth weight was between 2.5 to 3.99 kg in majority (73.8%). The most frequent metabolic complication noticed was hypoglycemia that occurred in 32(40%) babies. Hypocalcemia was documented in 10(12.5%) and hypomagnesemia in (5%).

Conclusion: Metabolic complications are the commonly occurring complications in IDMs. Their monitoring and early treatment is very important; so that the overall outcome in these babies can be improved and many future complications could be avoided that are likely to occur as consequences of severe metabolic derangements.

Key Words: Complications, Gestational diabetes, Hypoglycemia, Hypocalcemia, Infant, Macrosomia, Newborn.

Introduction
Diabetes in pregnancy has long been associated with maternal and fetal mortality and morbidity. 1 Perinatal mortality was as high as 60-65% before the development of specialized maternal, fetal and neonatal care units.2 Since then there has been many fold decrease in both mortality and morbidity.4 However infants born to diabetic mothers are still at high risk as compared to those born to non-diabetic mothers.5 Currently 0.2-0.5% of all pregnancies are affected with diabetes and almost 80% constitute gestational diabetes.4

In a study conducted at Jinnah Hospital, Lahore incidence of diabetes was found to be 4.4/1000 which is in accordance with WHO data.3 Poor metabolic control in mother and exposure of fetus to maternal hyperglycemia is basic mechanism responsible for wide range of perinatal, natal and postnatal complications.5-8

Metabolic complications are the important group of complications and include hypoglycemia, hypocalcemia, hyperbilirubinemia and hypomagnesemia.3,8 Incidence of different complications are hypoglycemia (35.5%), hypocalcemia (15%), hyperbilirubinemia (30%) and hypomagnesemia (4.5%).4 Hypoglycemia has the highest incidence among these.3 Hypocalcemia occurs more in babies with history of birth asphyxia and hypomagnesemia usually occurs secondary to hypocalcemia. There is also increased risk of hyperbilirubinemia because of polycythemia and immature hepatic bilirubin metabolism.2 Although outcome in diabetic pregnancies have improved significantly in western world but in countries like Pakistan, not a much change in statistics has been observed.4 Studies have proven that babies born to Asian especially Pakistani diabetic mothers have worst outcome compared with diabetic Caucasian mothers.9 In addition prevalence of diabetes is high in non Caucasian women.10 Increasing prevalence of gestational diabetes all over the world is another concern.11,12

With this background we designed a study to identify the frequency of metabolic complications in infants of diabetic mothers, which if diagnosed early will lead to their early treatment and might help in reducing mortality and morbidity of these infants in our part of world.

Patients and Methods
This descriptive study was conducted in Neonatology Unit of Paediatric Department KRL Hospital, Islamabad from 01-08-2010 to 31-01-2011. Using non-probability purposive sampling technique, a total of 80 infants born to diabetic mothers at KRL hospital, Islamabad were included in the study. Infants having congenital malformation, chromosomal abnormalities suspected on examination, death before confirmation of complications and gestational age less than 30 weeks were excluded from the study. An informed consent was taken from mothers after
explaining the benefits of the study and ensuring that there were no risk factors involved. All the births, whether vaginal delivery or c-section, were attended by doctor trained in neonatal resuscitation and all neonates were kept in Neonatal Unit for 24 hours. Relevant information was taken and laboratory investigations were done. Blood sugar levels were done under aseptic condition. Blood samples were obtained from the heel of foot by prick method and checked on glucometer at 1, 2, 4, 8, 12, 24 hours of age as a routine in nursery for IDMs. For determining serum calcium and magnesium levels 2-3cc blood sample was drawn under aseptic conditions at 6 and 24 hours of life. Non-oxalated samples were sent to Biochemistry Laboratory of KRL Hospital. Serum calcium estimation was carried out on chemistry analyzer. All the collected data was entered in SPSS version 16 and was analyzed through this program. The variables included gender, birth weight, gestational age and metabolic complications. The variables like birth weight and gestational age were presented by calculating mean ± Standard Deviation (S.D). Metabolic complications (Hypoglycemia, Hypocalcemia, and Hypomagnesemia) were expressed as frequencies and percentages. Data was stratified to explain the effect modifiers.

Result
Out of total 80 IDMs 42 (52.5%) were male and 38 (47.5%) were female. Majority 65 (81.25%) was born between 37 to 39 weeks, 09 (11.25%) were born after 39 weeks and 06 (7.5%) before completing 37 weeks of gestation. The Mean gestational age was 37.58 ± 1.35 SD (Table 1). The Mean birth weight of these infants was 3.34 ± 0.714 kg SD. Among these, 8 (10.0%) were less than 2.5 kg, 59 (73.8%) were between 2.5 Kg to 3.99 kg and 13 (16.2%) were 4 kg or more in weight. Majority (73.8%) of IDMs were 2.5 to 3.99 kg (Table 2). When assessed on centile charts for birth weight for gestational age, 42 (52.5%) babies were found appropriate for gestational age (AGA), 07 (8.75%) were small for gestational age (SGA) and 31 (38.75%) were large for gestational age (LGA) (figure 1). All the infants included in the study were monitored for the presence or absence of different metabolic complications. Hypoglycemia was the most frequent metabolic complication; documented in 32 (40%) babies. Hypocalcemia was found to occur in 10 (12.5%) babies. Hypomagnesemia was documented in 04 (5 %) babies (table 3).

Table 1: Distribution of Infants born according to Gestational age (n 80)

<table>
<thead>
<tr>
<th>Gestational Age</th>
<th>No. of Patients</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 37 Weeks</td>
<td>06</td>
<td>07.5 %</td>
</tr>
<tr>
<td>37-39 Weeks</td>
<td>65</td>
<td>81.25 %</td>
</tr>
<tr>
<td>&gt; 39 Weeks</td>
<td>09</td>
<td>11.25 %</td>
</tr>
</tbody>
</table>

Table 2: Distribution of Patients According to Birth Weight (n 80)

<table>
<thead>
<tr>
<th>Birth Weight (kg)</th>
<th>No. of Patients</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;2.5</td>
<td>8</td>
<td>10.0 %</td>
</tr>
<tr>
<td>2.5 to 3.99</td>
<td>59</td>
<td>73.8 %</td>
</tr>
<tr>
<td>4 to &gt;4</td>
<td>13</td>
<td>16.2 %</td>
</tr>
</tbody>
</table>

Table 3: Frequency of Complications in infants born to Diabetic Mothers (n 80)

<table>
<thead>
<tr>
<th>Complications</th>
<th>No. of Patients</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hypoglycemia</td>
<td>32</td>
<td>40.0 %</td>
</tr>
<tr>
<td>Hypocalcemia</td>
<td>10</td>
<td>12.5 %</td>
</tr>
<tr>
<td>Hypomagnesemia</td>
<td>4</td>
<td>05</td>
</tr>
</tbody>
</table>

AGA: Appropriate for Gestational Age SGA: Small for Gestational Age LGA: Large for Gestational Age

Figure 1 Birth weight distribution according to gestational age

Discussion
In the present study babies born to diabetic mothers and admitted in the Neonatology section, at KRL Hospital were studied for frequency of metabolic complications occurring in first 24 hrs. Our study population was demographically similar to those of other NNU in large academic tertiary care centers. In our study there was slight male predominance constituting 52.5% male and mean gestational age was 37.58±1.35 SD weeks. These results were coherent to a study conducted in a tertiary care teaching hospital in Puna, India and also with another study in a special care baby unit in Nigeria. Mean birth weight of infants in our study was 3.34 ± 0.714 kg that correlates with results of another study.
Pregnancy is a diabetogenic state where Insulin sensitivity decreases with increasing gestational age, thus increasing the risk for developing diabetes during pregnancy in previously non diabetic women; and is known as gestational diabetes (GDM). With an increase in the incidence of both gestational and pregestational diabetes all over the world, number of IDMs is also increasing.\textsuperscript{15-20} Fortunately, advances in obstetrics and neonatology have improved outcome in these babies.\textsuperscript{3,4,12} The most frequent metabolic problem recorded in the IDMs included in our study was hypoglycemia (40%). The high rate of hypoglycemia in our IDMs is similar to findings reported by other authors.\textsuperscript{3,4} A rapid decline in plasma glucose concentration is characteristic of the IDM. Maternal hyperglycemia leads to fetal hyperglycemia, stimulating the fetal pancreas to synthesize excessive insulin. With separation of the placenta at birth, there is a sudden interruption of glucose infusion to the neonate but hyperinsulinemia persists. High rates of neonatal hypoglycemia may also reflect poor maternal glycemic control.\textsuperscript{23}

Hypocalcemia was the other commonly occurring metabolic complication in this study. Similar findings have been reported in other studies.\textsuperscript{3,4,6,13} Tsang et al proposed the hypothesis that hyperparathyroidism of diabetic mothers might suppress the fetal parathyroid function and lead to hypocalcaemia of the newborn.\textsuperscript{15} In our study hypocalcemia occurred in 12.5\% cases comparable to the result presented in another study i.e. 15\%.\textsuperscript{7} Other metabolic complication which occurred in our study was hypomagnesemia that occurred in only 4 IDMs (5\%); and this is comparable to another study where it was documented in 4.5 \% of IDMs notably one of their patients had hypomagnesemia.\textsuperscript{8}

In our country mortality and morbidity is still high among IDMs due to poor antenatal follow up, non compliance to therapy, lack of awareness about the disease and its effects on fetus, non booked deliveries and lack of adequate neonatal services. Metabolic complications are among the most important neonatal complications. In addition to being important contributors to early neonatal morbidity, the metabolic complications can lead to long term consequences. Early recognition and timely management can help reduce the severity and long term morbidity associated with these complications.\textsuperscript{1,2,18,23}

**Conclusion**

Infant of diabetic mothers are at risk of developing many fetal, perinatal and postnatal complications leading to both short and long term morbidity. Diabetic pregnancies not only need control of maternal diabetes but also careful fetal monitoring, good perinatal and neonatal care so that overall outcome in these babies can be improved and many future complications could be avoided that are likely to occur as consequences of severe metabolic derangements.

**Conflict of Interest**

This study has no conflict of interest to declare by any author.

**References**


