A Study of Complications of Infants of Diabetic Mothers in Babylon Teaching Hospital for Maternity and Pediatrics

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Abstract

Background: Infants born to diabetic mothers are liable for a wide range of systemic & metabolic complications.

Objectives: The aim of this study was to do early detection and early managements of signs and symptoms and complications that happened in infants of diabetic mothers. Also to show the outcome of infants of diabetic mothers.

Materials and Method: Medical history, physical examination, and investigations (biochemical & radiological) were done on 100 infants of diabetic mothers over about 5 months period.

Results: We found that 78% of cases delivered by caesarean section, and 55% of them have history of affected baby, 27% history of miscarriage & 9% chronic sibling morbidity & these results might be due to poor glycemic control, bad antenatal care, or maternal & social neglect. Macrosomia was 42%. Congenital anomalies include congenital heart disease 16%, Birth trauma occurs in 5% in form of fracture clavicle & brachial plexus injury. Hypoglycemia presented in 85%. Perinatal mortality, birth injuries, systemic, hematologic & metabolic complications are more encountered in infants born to diabetic mothers.

Conclusion: Infants of diabetic mothers have a lot of risky complications and they need screening even in asymptomatic cases.

Keywords: Complication, infant, diabetic mother.

Introduction

Infants of diabetic mother are those born to a mother who has persistently elevated blood sugar during pregnancy.(1)

Diabetes has long been associated to maternal and perinatal morbidity and mortality(2,3). Since the discovery of insulin; infants of diabetic mothers have experienced an almost 30 fold decrease in mortality and morbidity.(3) Of mothers with preexisting diabetes, 35% had type 1 diabetes mellitus, and 65% had type 2 diabetes mellitus.(4)

Maternal hyperglycemia causes fetal hyperglycemia, which contributed to that complications on infants of diabetic mother.(5)

Hyperglycemic hyperinsulinemic state leads to fetal macrosomia which causes birth asphyxia, cardiomyopathy, respiratory distress syndrome, polycythemia and iron abnormality which in turn lead to poor neuro developmental outcome.(6)

Chronic fetal hyperglycemia and hyperinsulinemia increase the fetal basal metabolic rate and oxygen consumption leading to a relative hypoxic state . The fetus responds by increasing oxygen-carrying capacity through increased erythropoietin production, potentially leading to polycythemia.(7)
Prior to birth, elevated insulin levels inhibit the maturational effect of cortisol on the lung, including the production of surfactant from type 2 pneumocytes. This puts the fetus at risk for developing respiratory distress syndrome.(8)

Other comorbidities include miscarriages, birth defects(9), metabolic disturbances such as hyperglycemia, hypoglycemia, and hypoxia.(10) Growth Restriction occurs in pregnancy because of underlying vascular disease(11). Hyperinsulinemia results in excessive fetal growth. All organs are involved except the brain and kidney.(12)

Birth injuries e.g. shoulder dystocia, brachial plexus injury, and cephalhematoma are also common.(13) Hypoglycemia especially occurs in early hours of life which may be asymptomatic or symptomatic like irritability, lethargy, poor feeding, and seizure.(14)

Those infants are also liable for pulmonary disease e.g. RDS and primary pulmonary hypertension (15), hyperbilirubinemia, polycythemia, hypocalcaemia with or without hypomagnesaemia believed to be secondary to parathyroid hormone suppression.(16)

Cardiomyopathy and inter ventricular hypertrophy may occur in these infants and detected by echocardiography.(17)

The aim of this study was to do early detection and early managements of signs and symptoms and complications that happened in infants of diabetic mothers. Also to show the outcome of infants of diabetic mothers.

**Materials and Method**

From (3754) neonates admitted to Babylon maternity and pediatrics teaching hospital at period from 1st. April 2009 to 17th. August 2010 we found 100 neonates of pregnant diabetic mothers. We took history from those mothers regarding type of diabetes, its treatment, parity, age, history of affected neonates or miscarriage, and calculated gestational age, also we looked for type of delivery and its events.

We studied in neonates of diabetic mothers, the early moments of life regarding APGAR score, resuscitation, examinations, early investigations needed accordingly and managements.

We look for biochemical and radiographic abnormalities in those neonates as follows:

Serum blood glucose which taken by peripheral venous blood examined by spectrophotometer or by glucometer digital measuring total serum bilirubin taken by heel prick test read by bilirubinometer, packed cell volume taken from peripheral venous sample, serum calcium by non-tourniquet venous sample, blood culture taken via cleaning the punctured area with alcohol and take venous sample for suspected cases of sepsis. Chest X-ray, echocardiograph, electrocardiograph, abdominal ultrasound and brain ultrasound & CT scan of brain as needed.

**Results**

64% of mothers have gestational diabetes, 36% as pre-existing DM, 27% are primigravida & 35% have age less than thirty years, 78% neonate delivered by caesarean section, male neonates 58% & females 42%.

History of affected baby 55% as we regard macrosomia as congenital malformation & history of miscarriage 27%. Sibling with history of chronic morbidity 9%.

Regarding hospital staying: 1st day discharge 16%, 2nd day discharge 22%, 3rd day discharge 46%, & 4th day discharge 16%.

Perinatal Mortality rate in these one hundred cases are 4% due to (two with complex congenital malformation, one with still birth, & one from respiratory failure), morbidity rate 85% as medical & biochemical abnormalities need intervention only 11% are apparently normal & from those 11% are nine mother with strict glycemic control.

The APGAR score 30% have less than 4 score in 1st minute & increase to more than 4 score at five & ten minutes as 78% & 93% respectively.

In 1st day of life 85% have respiratory rate more than 60 breath/minute while at the 4th day the respiratory rate less than 60 is 68%. The grunting present in 85% in 1st day & become 20% at 4th day of life.

The oxygen saturation improve in 9% of patients whom complain of hypoxia at 1st. day to reach 4% at the 4th. day of life.

The heart rate > 160 beats/minute in 1st day was 10% & only 2% still tachycardia at the end of the 3rd. day of life.
Hypoglycemia improve from the 1st day to the 4th day as 86% to 4% respectively.

The hematocrit > 65% present only in 9% & only 3 patients need partial blood exchange transfusion.

The respiratory complications was about 33% as hyaline membrane disease & transient tachypnea of newborn 45%, 2% complicated to respiratory failure, 1% pneumothorax, 1% eventration of diaphragm (Figure 1).

![Figure 1: Percentages of respiratory complications proportions](image1)

In relation to the cardiac complications seen in 16% as following 6% have murmur in 1st four day of life, and 7% have heart failure documented by chest X ray and echocardiograph, 3% have VSD, 1% PDA, 1% ASD, cardio myopathy in 2% (Figure 2).

![Figure 2: Percentages of cardiac complications](image2)

Regarding intestinal complications: 2% have Intestinal obstruction, 1% imperforated anus, 1% had diaphragmatic hernia.

The neurological abnormalities seen in 24% as following: 20% as birth asphyxia, 2% intracranial hemorrhage, 2% neural tube defect, 1% facial palsy as in Figure 3.

The skeletal complications as: 1% congenital dysplasia of the hip, 1% absent left hand & 5% has shoulder dislocation with or without clavicular fractures (Figure 3).
Genito-renal abnormalities as 2% undescended testes, 1% hypospadias, 1% single kidney.

Neonatal jaundice present in 40%, one fifth of them in 1st day & about half appear in the 2nd day of life & 12 patients (12%) need blood exchange transfusion. The body weight from 2-3.5 kg about 48%, ≥4.6 kg about 52%, as in Figure 4.

Discussion

In our study, we found 78% of cases delivered by caesarean section which is higher than the results found by Cousins which is 45% & this might be due to bad obstetric history, fetal macrosomia, failure of induction of labor, or obstetrical miscalculation (18).

We found 55% have history of affected baby, 27% history of miscarriage & 9% chronic sibling morbidity & these results might be due to poor glycemic control, bad antenatal care, or maternal & social neglect.

Macrosomia is 42% but in Thomas R. Moore (15-45%) & to Charles F. Potter (26%). This might be due to good glycemic control in their study.(19)

Perinatal mortality was 4% which is highly different to results in study of Charles F. Potter which was about 30-50% & specially to infant with gestational diabetes, this might be due to small number of my study as in figure 5.(20)
Congenital anomalies include congenital heart disease 16% which is closer to 16% by Moore & slightly lower than Charles F. Potter 24% & hypertrophic cardiomyopathy 7%. Birth trauma occurs in 5% in form of fracture clavicle & brachial plexus injury which is relatively similar to the result of Thomas R. Moore about 4% this might due to macrosomia, or need of assisted vaginal delivery. (19)

Hypoglycemia present in 85% which higher than the result of Moore where the result about 62% (19).

Respiratory distress syndrome about 33% which is slightly higher to 26% of Thomas R. Moore & it is statistically significant, this might due to increased incidence of cesarean section or prematurity & this could be supported by about 40% is the percent of prematurity by pediatric examination in this study. (19)

Jaundice was seen in 40% of cases while 25.5% in Moore could be caused by hemolysis or polycythemia. (19)

Polycythemia seen in about 9% which is closest to 5-10% of the result in Thomas R. Moore & this could be the result of fetal hypoxia as in figure 6. (19)

Hypocalcemia was seen in 10% in compare to 6% result of Thomas R. Moore. Preterm by clinical examinations are about 40% while show 29% by Charles F. Potter. (7)

**Conclusion**

There is good relation between strict glycemic control & near normal neonates, so fetal life without hyperglycemic state & without subsequent hyperinsulinemic state lessen complications & vice versa. It is important to screen for neonatal hypoglycemia even in asymptomatic patients because a lot of patient have asymptomatic hypoglycemia. Neonates of diabetic mothers have a lot of risky complications to be screened for. Good dietary techniques & doing caesarean section decrease the risk of birth trauma (in our study we show about 80% of affected neonates with perinatal injury were due to normal vaginal delivery). Most teratogenic complications occur in infant born to mother with diabetes that is poorly controlled.
Ethical Clearance: The study was conducted in accordance with the ethical principles that have their origin in the Declaration of Helsinki. The study protocol and the subject information and consent from were reviewed and approved by a local Ethics Committee.

Conflicts of Interest: None of the authors have any conflicts of interest relevant to what is written.

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