

Comparison between Complications of Infants of Diabetic Mothers in Treated & Non-Treated Mothers in Babylon Teaching Hospital for Maternity and Pediatrics.

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Abstract

Background: Infants of diabetic mother are those born to mother who has persistently elevated blood sugar during pregnancy. It causes fetal hyperglycemia, which contributed to many complications happen on those infants.

This study aims To show the outcome of infants of diabetic mothers.

Methods: the study included 100 infant born to diabetic mothers in the period between 1st. April 2015 to 17th. August 2016 . multiple clinical, biochemical and radiographic assessments was done to them to discover any complication. The results then are compared between infants of treated to non-treated mothers using SPSS software.

Results: the study found that infants of non-treated diabetic mothers show higher percentage of complications in comparison to those treated mothers like Hypoglycemia 83%, hypocalcemia 5% and no hypomagnesemia in treated mothers group while in untreated mothers show 94% hypoglycemia, 29% hypocalcemia and hypomagnesemia 17%. Also the study found higher percentage of respiratory, cardiac, neurological and genito-renal complication in neonates of non-treated infants compared to treated one.

Conclusion: Higher clinical & biochemical complications are seen in neonates of non- treated mothers or poorly control diabetes. Most teratogenic complications occur in infants born to mothers with diabetes that is poorly controlled.

Keywords: infant of diabetic mother, hypoglycemia, hypocalcemia, hypomagnesemia.

Introduction

Infants of diabetic mother are those born to 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 that happen 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 neurodevelopmental 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 of developing respiratory distress syndrome. A birth at a gestational age normal lung function is expected [8].

Other comorbidities include miscarriages, birth defects [9], metabolic disturbance 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 involved except the brain and kidney [12].

Birth injuries include shoulder dystocia, brachial plexus injury , and cephalhematoma [13]. Hypoglycemia specially 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 such as RDS and primary pulmonary hypertension [15] ,hyperbilirubinemia , polycythemia and 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 are detected by echocardiography [17,18].

Aim of the study

1. making an early detection and managements of signs and symptoms and complications that happened in infants of diabetic mother
2. showing the outcome of infants of diabetic mothers .

Patients and methods

Statistical analysis tests the difference between two proportions is used to determine the significant level of difference in infants of diabetic mothers whether their mothers were treated or not.

This is a cross sectional study conducted on (3754) neonates admitted to Babylon maternity and pediatrics teaching hospital at period from 1st. April 2015 to 17th. August 2016 we found 100 neonates of pregnant diabetic mothers .

We took history from those mothers regarding the type of diabetes ,its treatment, parity ,age ,history of affected or miscarriage ,and calculated gestational age ,also we looked for the type of delivery and its events.

We studied in neonates of diabetic mothers early moments of life regarding APGAR Score, resuscitation , examinations , early investigations needed accordingly and we looked for biochemical and radiographic abnormalities in those neonates.

Results

64% of mothers had gestational diabetes and 36% had per-existing diabetes. Only 17% were not treated and 83% treated for diabetes specifically (40% were treated by diet only & 43% were treated with insulin and diet). Also there are 27% primigravida.

Also there is 78% neonate delivered by caesarean section & the male neonate 58% & female 42%.

The neonates of treated mothers showed gestational age difference assessment between prenatal & postnatal calculations as 77 neonates (92%) were assessed as full term on prenatal calculations whereas 52 neonates(62%) are full term by postnatal examinations .The type of diabetes showed 50 mothers (60%) had gestational diabetes whereas 33 mothers (39%) had pre-existing diabetes . The mothers age less than thirty year was detected in 19 mother (22%) as in figure(1).

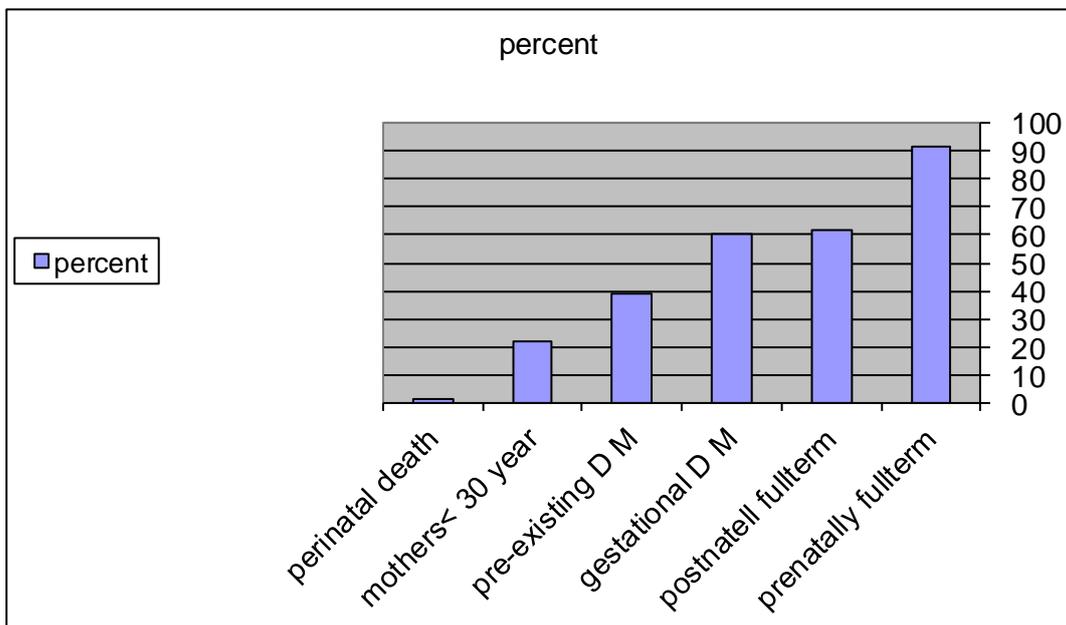


Figure (1) shows the percent of maternal related effects on neonates of treated mothers.

The neonates of non- treated mothers showed difference in gestational age calculations at prenatal assessment & postnatal examinations as 15 neonates (88%) were regard as full term by prenatal assessment whereas only 8 neonates (47%) regard as full term by postnatal examinations .in this group 14 mothers (83%) diagnosed as having gestational diabetes & only 3 mothers have had pre-existing diabetes whom refuse treatment. There is 16 mothers in this group <30 year of age as in figure (2).

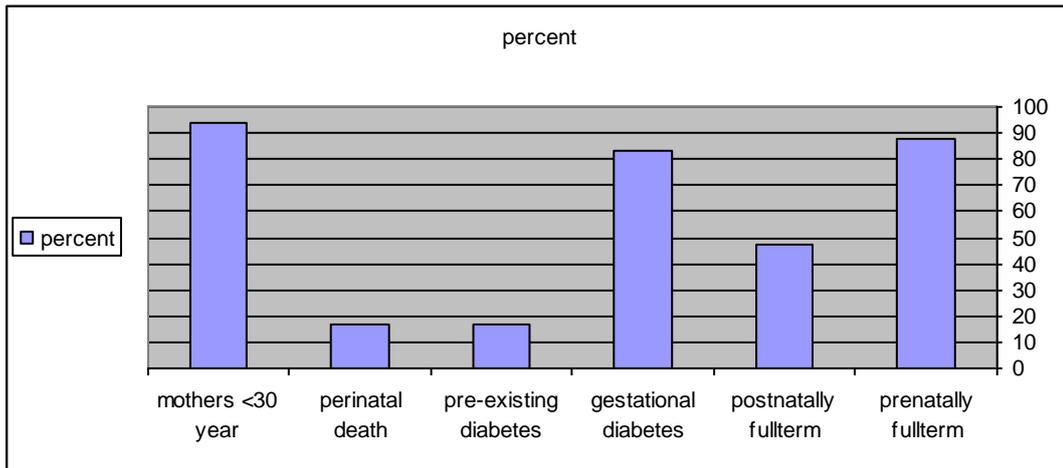


Figure (2) shows the percent of maternal related effects on neonates of non-treated mothers.

The neonates of treated mothers showed APGAR score > 4 in 1st , 5th ,10th minute of life 65 neonates(78%) , 73 neonate(90%) ,& 79 neonates(97%) respectively.

In neonates of non- treated mothers APGAR score >4 at 1st ,5th ,10th are 5 cases (28%) , 12cases (70%) ,& 14cases (82%) respectively as in figure (3).

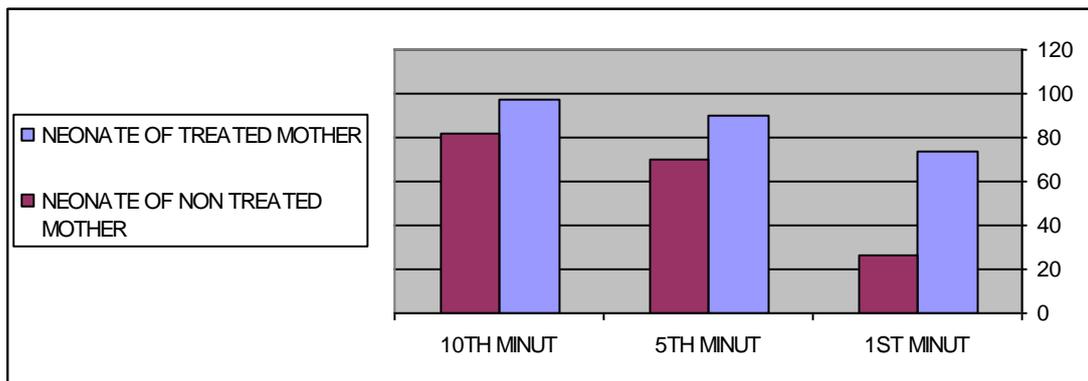


Figure (3) shows the differences between neonates of treated

figure 3: comparison between infants of diabetic mothers treated & not treated mothers by APGAR score .

Hypoglycemia in neonates of treated mothers at 1st day was seen in 69 neonates (83%) & no one of this group persisted hypoglycemia at 4th day of life, hypocalcaemia seen in 5 neonates (6%), no hypomagnesaemia seen in this group , packed cell volume > 65% was seen in 5 neonate (6%) & jaundice in1st day of life seen in 6 neonates (7%) & in the 3rd of life and it was seen in 28 neonates (33%) as in figure (4).

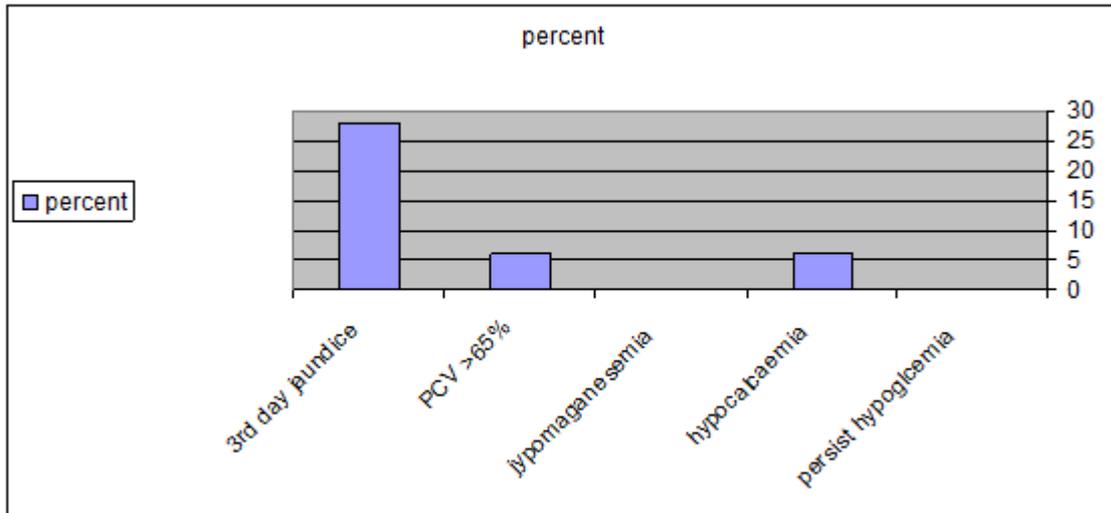


Figure (4) shows the percent of biochemical abnormalities in neonates of treated diabetic mothers.

Hypoglycemia in neonates of non- treated diabetes at the 1st day of life was seen in 16 neonates (94%) & at the 4th day of life it was seen in 4 neonates (23%).

Hypocalcaemia in neonates of non-treated diabetes seen in 5 neonates (29%) & hypomagnesemia was seen in 3 neonates (17%).

Hematocrit > 65% in neonates of non- treated diabetes was seen in 4 neonates (23%), jaundice was seen in this group 2 neonates (11%) in this group at 1st day of life & in 12 neonates (70%) at the 3rd day of life as in figure(5).

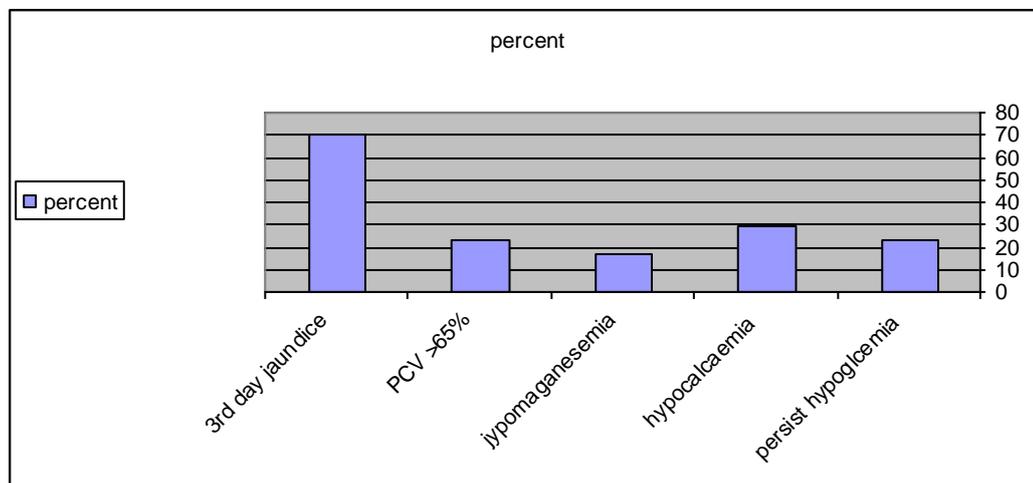


Figure (5) shows percent of biochemical abnormalities in neonates of non-treated diabetic mothers.

Respiratory complication was noticed in 61 neonates (73%) as 21 with hyaline membrane disease & 40 neonates with transient tachypnea of newborn whereas the respiratory complications of neonates of non- treated diabetes seen in 16 neonates (94%) as hyaline membrane disease with complications in 7 neonates (41%) & transient tachypnea of newborn in 9 neonates (52%) .

Cardiac complications was seen in 8 neonate ($\approx 10\%$) whereas the cardiac complications in neonates of non- treated diabetes was seen in 5 neonates (29%) .

Neurological complications seen in 14 neonate (17%) , whereas the neurological complications in neonates of non- treated mothers seen in 11 neonates(54%) .

Gastro –intestinal complications seen in 2neonates ($\approx 2\%$) whereas the gastro intestinal complications in neonates of non- treated group seen in 2 neonates (11%) .

Genito-renal complications was seen in 2 neonates ($\approx 2\%$) whereas the renal complications in neonates of non- treated diabetes were seen in 2 (11%) .

Skeletal complications were seen in 3neonates of treated mothers, whereas the skeletal complications was seen neonates of non- treated diabetes was seen in 4 neonates as in figure(6).

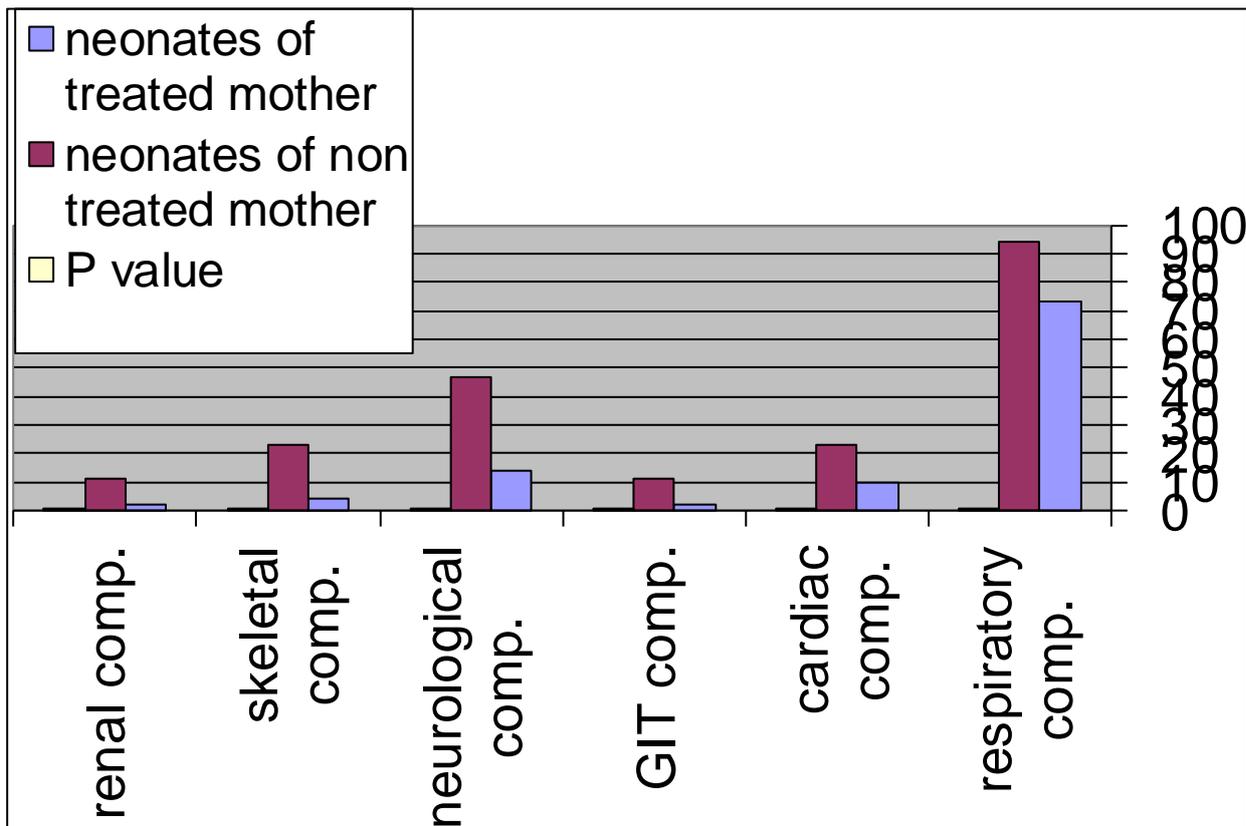


Figure (6) shows the percent of systemic complications in neonates of treated & non treated groups.

Discussion

36% of mothers have insulin dependent diabetes mellitus & 64% have gestation diabetes which is different from Thomas R .Moore who found 90% are gestational diabetes [19].

Perinatal mortality is 4% which is highly different to results in study of Charles F. Potter [20] which was about 30-50% especially to infants with gestational diabetes. This might be due to small number of my study. The morbidity in our study is about 85% as medical & biochemical abnormality & only 11% are apparently normal (from them only 9 cases were on strict glycemc control).

Congenital anomalies include congenital heart disease 16% which is closer to 16% by Thomas R. Moore & slightly lower than Charles F. potter (24%) [19].

Hypoglycemia present in 85% which is higher than the result of Thomas R. Moore where the result is 62% [19].

Jaundice was seen in 40% of cases while 25.5% in Thomas R. Moore. Jaundice could be caused by hemolysis or as the result of polycythemia [19].

Polycythemia seen in about 9% which is closer to 5-10% in Thomas R. Moore & this could be the result of fetal hypoxia [19]. Hypocalcemia seen in 10% in compare to 6% of Thomas R. Moore [19].

Preterm by clinical examinations are about 40% while 29% by Charles F. Potter [8].

We do not find any study comparing between neonates of non- treated and neonates of treated diabetic mothers and this is because diabetes in general is associated with wide range of morbidity and mortality especially during pregnancy that make the priority of treatment superior to all concepts , lack of statistical analysis in developing countries and poor antenatal care .

Regarding prenatal assessment of maturity there were 15 pregnancy (88%) of non-treated group calculated as full term whereas 77 pregnancy (92%) of treated group calculated as full term &in regard to postnatal assessment we found 8 neonates (47%) in neonates of non- treated mothers whereas 52 neonates (62%) of treated mothers ; both results are statistically not significant P value of both >0.05 .

Regarding the type of diabetes ; there is 14 mothers (83%) of non- treated group had gestational diabetes & 50 mothers (60%) of treated group had gestational diabetes & this is statistically not significant P value (0.08). The mothers age of non- treated group whom < 30 year were sixteen (94%) & in treated group were 19(22%) &this is statistically significant p value (0.0001) which is might be due to higher pregnancy rate in females less than 30 year .

The perinatal death in neonates of non- treated mothers was 3 (17%) whereas in neonates of treated mothers was one (1%) & this statistically significant p value 0.001 which is might be due to poor glycemic control which increase hyperinsulinemic state which paradoxically affect health of fetus & newborns. There was no significant statistical difference in the APGAR score of > 4 between the treated &non-treated groups. 4th day hypoglycemia in neonates of non- treated mothers persisted in 4 neonates (23%) and not seen in other group and this is statistically significant p value 0.0001 &this might be due to persistent hyperglycemic state in fetal life of non- treated group leads to B –cell hyperplasia resulting in hyperinsulinemic state in neonatal period.

Hypocalcaemia in neonates of non- treated mothers seen in 5 neonates(29%) and also seen in 5 neonates (6%) of treated mothers and this is statistically significant p value 0.003 .

Hypomagnesaemia was seen in 3 neonates(17%) of non- treated mothers and not seen in neonates of treated mothers.

Polycythemia in neonates of non- treated mothers seen in 4 neonates (23%) and in neonates of treated mothers seen in 5 neonate(6%)and this is statistically significant p value (0.0216)and might be due to insulin is anabolic hormone that increase most organ of body involving blood forming organs .

Jaundice at the 3rd day of life seen in 12neonates (70%) of non- treated group while in 28 neonates (33%) in treated group & this statistically significant P value 0.0047 which might be due to higher degree of physiological polycythemia in neonates of non- treated group.

Respiratory complications seen in 16 neonates (94%) of non- treated mothers whereas seen in 61 neonates (73%) of treated mothers & this is statistically not significant P value 0.06 .

Neurological complications (birth asphyxia) seen in 8 neonates (47%) of non-treated mothers whereas seen in 12 neonates (14%) of neonates of treated mothers, this is statistically significant P value 0.0022 because of increased risk for birth injury.

Skeletal abnormalities seen in 4 neonates (23%) of non- treated mothers & 3 neonates (4%) of treated mothers which is statistically significant P value 0.003 this is might be due to difficult labor in macrosomic neonates of non- treated mothers .

Cardiac abnormalities seen in 5 neonates (29%) of non- treated mothers & in 8 neonates (10%)of treated mothers which is statistically not significant P value > 0.05 .

Gastrointestinal abnormalities seen in 2 neonates (11%) of non- treated mothers whereas seen in 2 neonates (2%) of treated mothers which statistically not significant P value >0.05 .

Genito- renal complications seen in 2neonates (11%) of non- treated mothers & in 2 neonates (2%) of treated mothers which statistically not significant P value > 0.05 .

Conclusions

1. There is good relation between strict glycemetic control & near normal neonate , so fetal life without hyperglycemia state & without subsequent hyperinsulinemic state lessen the complications & vice versa .
2. It is important to screen for neonatal hypoglycemia even in asymptomatic patients because a lot of patient are asymptomatic hypoglycemia.
3. Every neonate of diabetic mothers have a lot of risky complications need to be screen .
4. Good dietary technique & doing caesarean section decrease the risk of birth trauma (in our study we show about 80%)of affected neonate with perinatal injury due to normal vaginal delivery.
5. Higher clinical & biochemical complications seen in neonates of non- treated mothers or poorly control diabetes .
6. Most teratogenic complications occur in infant born to mothers with diabetes that is poorly controlled.

Conflict of Interests.

There are non-conflicts of interest

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الخلاصة

المقدمة: ان رضيع الام السكري هو الذي يولد للام التي لديها ارتفاع دائمي في نسبة السكر في الدم خلال فترة الحمل. تسبب هذه الحالة ارتفاع نسبة السكر في دم الجنين وبالتالي العديد من المضاعفات للطفل حديث الولادة. تهدف هذه الدراسة لمعرفة المحصلة النهائية لرضيع الام السكري

طرق العمل: شملت الدراسة 100 رضيع الام السكري 1-4-2015 الى 17-8-2016. وقد اجريت عدة تقييمات وفحوصات سريرية و كيميائية وشعاعية لاكتشاف المضاعفات. ثم تم مقارنة النتائج بين رضيع الام السكري التي استلمت علاج مع التي لم تستلم علاج باستخدام برنامج SPSS .

النتائج: وجدت الدراسة ان رضيع الام السكري التي لم تستلم علاج اظهروا نسبة اكبر من المضاعفات بالمقارنة مع رضيع الام السكري اللواتي استلمن علاج مثل انخفاض السكري في الدم 83% انخفاض الكالسيوم في الدم 4% ولم يسجل انخفاض المغنسيوم في الدم بينما ان الرضيع للام السكري بدون علاج كانت نسبة انخفاض السكر في الدم 94% انخفاض الكالسيوم 29% وانخفاض المغنسيوم 17%. كذلك وجدت الدراسة نسبة اعلى للمضاعفات في الجهاز التنفسي، القلب، العصبي و الجهاز البولي والتناسلي بين الرضيع الام السكر التي لم تستلم علاج بالمقارنة مع التي استلمت علاج.

الاستنتاجات: ان رضيع الام السكري التي لم تستلم علاج لديه نسبة اعلى من المضاعفات السريرية والكيميائية وان معظم المضاعفات المسخية تحدث في هؤلاء الرضع.

الكلمات الدالة: رضيع الام السكري, انخفاض الجلوكوز في الدم, انخفاض الكالسيوم في الدم, انخفاض المغنسيوم في الدم