Research Article

Peri-natal Morbidity in Offspring of Diabetic Mother in Basra

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Abstract

The maternal and neonatal data of 76 infants of diabetic mothers were studied to determine the frequency of possible complications in these infants. The study was carried out in the maternity and children hospital in Basra for the period from May 2000 till June 2001. Diabetic mothers were classified according to White's classification and most of them belong to gestational diabetes (32.8%) and class C (34.2%).

Macrosomia with hypoglycemia , respiratory distress syndrome and jaundice were the most common complications occur in infants of diabetic mothers, whose mothers were poorly controlled (78.1%, 71.8%, 56.25) respectively and only 6.2% were without complications, while (38.6%)of diabetic mother with good control were without complications. There was significant difference between both groups in relation to complications ($p < 0.01$), but no significant difference related to the type of diabetes ($p > 0.05$).

So attempts to maintain diabetic control as close to euglycemic level to prevent these complications.

Key words: Morbidity, Offspring ,Diabetic Mother

INTRODUCTION

Diabetes is one of the commonest metabolic disorders that affect the health of the mother and their infants. [1]About 3-10% of all pregnancies are complicated by diabetes. [2, 3] It has associated with maternal and peri-natal morbidity and mortality. [4]

The major morbidities associated with infants of diabetic mothers include respiratory distress, growth restrictions, polycythaemias, hypoglycemia, congenital malformations, hypocalcaemia, and hypomagnesaemia. However associated macrosomia and increased prevalence of caesarean sections contribute to higher mortality. [5,6] The cause of increased perinatal morbidity and mortality is not known but has attributed to increased insulin levels leading to hyperanabolism [4,7] A uniform classification of diabetic pregnancies is still needed for both epidemiological and clinical purposes. Most European centers apply White's classification modified by Pedersen. [8]

The purpose of the present study was undertaken to review the broad spectrum of morbidity in group of infants' of diabetic mothers , with further goal of determining an effect of maternal diabetes on the neonatal complications.

PATIENTS AND METHODS

A prospective study was carried out between May 2000 & June 2001 to determine the frequency of complications among infants of diabetic mothers (IDM). Seventy six IDM whose mothers were admitted to maternity and children hospital in Basra were included and detailed history were reviewed regarding: the duration of diabetes, past obstetric history. Then diabetic mothers were classified according to Whites' classification of diabetes during pregnancy. [8] It is based on duration of diabetes and the presence of late vascular complications.

Whites group A: Diabetes existing prior to or detected during pregnancy, need only diet.

Whites group A/B: Diabetes appearing before or during pregnancy, insulin treatment necessary during pregnancy.

Whites group B: Diabetes pre-existing and necessitating insulin treatment before conception, onset of diabetes after maternal age of 20 years, and or duration of diabetes shorter than 10 years.

Whites group C: Duration of 10-19 years and/or onset of diabetes between 10-19 years of maternal age, insulin dependent diabetes mellitus (characterize by absence of angiopathy).

Whites group D: onset of insulin dependent diabetes before the age of 10 years and/or duration exceeding 20 years.

Whites group F: severe proliferative diabetic retinopathy and/or diabetic nephropathy before or during pregnancy.

Also diabetic mothers were divided into four groups according to their parity (0, 1, 2, 3 & more) deliveries,

Detailed physical examination of all newborn was performed including APGAR score and gestational age assessed by physical criteria for maturity. [9] Anthropometric measurements of the newborns were recorded. The baby was considered large for gestational age (LGA) when infant's birth weight was greater than 90th percentile for age; also known as macrosomia. [10] Macrosomia refers to excessive intrauterine growth beyond a specific threshold regardless of gestational age. This condition usually is defined as a birth weight greater than (4000 or 4500) gram.

Blood glucose was monitored at birth for all enrolled neonate, post-natal hypoglycemia was defined as serum glucose of less than 30mg/dl in the 1st six hours of life. [11] The diagnosis of hyaline membrane disease was based on clinical signs (grunting, retractions, and tachypnea) and typical x-ray findings. Maternal diabetes was considered controlled if: maintained plasma glucose during fasting (< 120 mg /dl) and postprandial plasma glucose ≤ 160 mg/dl).

RESULTS

Table (1) shows the distribution of diabetic mothers regarding their age, parity, and duration of diabetes. It was found that 84.2% of diabetic mothers belong to age group between (20-30) years, while 13.1% of them aged over 30 years; and 2.6% below 20. Also 65.7% of mothers had three or more deliveries. And according to whites' classification of diabetes in pregnancy 32.8% of mothers had gestational diabetes, 18.4% class A, 14.4% class B while 34.2% class C.

Table (2) (A,B) shows neonatal complications which include hypoglycemia, macrosomia , R.D.S, asphyxia , Jaundice , polycythemia , birth trauma and anemia in relation to classification of maternal diabetes. Hypoglycemia and macrosomia reported in 32% of mothers with gestational diabetes, 28.6% class A, 36.4% class B, and 75.7% class C. Respiratory distress syndrome (R.D.S) and prematurity recorded in 32% of mothers with gestational diabetes (28% , 36% , 38.5%) in class A, class B, and class C respectively. While asphyxia reported in 8% of gestational diabetes , 21.4% in class A , 18.2% in class B , no case was recorded in class C, Jaundice 24% in gestational diabetes, 35.7% in class A , 27.3% in class B and 7.7% in class C.Polycythemia 8% in gestational diabetes , 7.1% in class A , 9.1% in class B , 7.7% in class C, while birth trauma in form of Erbs' palsy was found in gestational and class B diabetes (4% , 9.1%) respectively, anemia was found only in gestational diabetes 8% , also the Table shows no complication was found in 32% in gestational, 35.7% in class A, 36.4% in class B , 7.7% in class C. But statistically no significant difference was found between neonates with and without complications ($p > 0.05$).

Table (3) (A,B) shows a bout (32) 42.1% of mothers were poorly controlled and (44) 57.9%; were good control. About 78.11% of newborns were macrosomia with hypoglycemia in poorly controlled mothers while 11.3% in good control mothers and without complication was found in 6.2% in poor control and 38.6% in good control . The difference between poor and good control diabetic mothers in relation to neonatal complications was statistically significant ($p < 0.01$).

Table (1) The distribution of diabetic mother regarding their age, parity and duration of diabetes

Age (years)	NO.	%
< 20	2	2.6
20-30	64	84.2
> 30	10	13.1
Parity		
0	8	10.5
1	7	9.2
2	11	14.4
3	50	65.7
Duration of diabetes		
Gestational	25	32.8
Class A	14	18.4
Class B	11	14.4
Class C	26	34.2
Total	76	100

DISCUSSION

Women with diabetes in pregnancy (type 1, type 2 and gestational) are at increased risk for adverse pregnancy outcomes. Adequate glycemic control before and during pregnancy is crucial to improving outcome.

Table 2 (A) Neonatal complications in relation to classification of diabetic mothers

Neonatal complications	No.	Gestational no.25		Class A no.14		Class B no.11		Class C no.26	
		no.	%	no.	%	no.	%	no.	%
Macrosomia and hypoglycemia	31	8	32	4	28	4	36.4	15	75.7
R.D.S and prematurity	26	8	32	4	28	4	36.4	10	38.5
Asphyxia	7	2	8	3	21.4	2	18.2	-	-
Jaundice n	23	6	24	5	35	3	27.2	2	7.7
Polycythemia	6	2	8	1	7	1	9.1	-	-
Birth trauma	2	1	4	-	-	1	9.1	-	-
Anemia	2	2	8	-	-	-	-	-	-
No complication	19	8	32	5	35.7	4	36.4	2	7.7

Table 2 (B)

	Gestational	Class A	Class B	Class C	Total
With complication	17	9	7	24	57
Without complication	8	5	4	2	19
Total	25	14	11	26	76

X^2= 6.61 P > 0.05

Table 3 (A) Relation between neonatal complication and control of diabetic mothers

Neonatal complications	NO.	Poor control NO.(32)		Good control NO.(44)	
		No.	%	No.	%
Macrosomia and hypoglycemiu	31	26	78.1	5	11.3
R.D.s and prematurity	26	23	71.8	3	6.8
Asphaxia	7	7	21.8	-	-
Jaundice	23	18	56.2	5	4.3
Polycythemia	6	5	15.6	1	2.2
Birth trauma	2	2	6.2	-	-
Anemia	2	2	6.2	-	-
No complication	19	2	6.2	17	38.6

Table 3(B)

	Poor control	Good control	Total
With complication	30 (52.6%)	27(47.3%)	57
Without complication	2 (10.5%)	17 (89.5%)	19
Total	32 (42.1%)	44 (57.9%)	76

X^2= 10.4 P<0.01

Their fetal mortality rate is greater than that of non-diabetic mothers, especially after 32 week of gestation. Fetal loss throughout pregnancy is associated with poorly controlled maternal diabetes and congenital anomalies. The morbidity and mortality of infants born to mother with diabetes has been progressively decreasing over recent years.[12] In current study about 84% (n.64) of the diabetic mother their ages ranged between (20-30), 65.7% (n.50) of them had three or more delivery and according to whites classification most of them belonged to gestational 32.8% (n.25) and class C 34.2% (n.26). Macrosomia is a major complication in IDM contributing to birth injury and asphyxia[1], in the present study 36% of IDM were macrosomic, other researchers report a varying results (45%, 28%), in study carried out in Karachi [13] and Islamabad [14] respectively. Low frequency of macrosomia probably related to good glycemic control. Hypoglycemia was the most common cause of morbidity reported with macrosomia in current study followed by respiratory distress syndrome 34% and jaundice 30%.

Studies show hypoglycemia and respiratory distress syndrome most common in infants' of diabetic mothers, due to endogenous hyperinslinemia and suppression of endogenous glucose production lead to hypoglycemia as well as RDS due to fetal hyper-insulinemia inhibits synthesis of surfactant, although this theory is not universally accepted. [15]

Complications such as neonatal hypoglycemia and respiratory distress linked to fetal hyper-insulinism. [16]Neonatal complications in current study as hypoglycemia and macrosomia , R.D.S. , Asphyxia , Jaundice , polycythermia , birth trauma and anemia were (78.1% , 71.8% , 21.1% , 56.2% , 15.6% , 6.2% , 6.2%) respectively in poorly controlled mothers with diabetes and only (6.2%) without complication , while (38.6%) of infants of good control diabetic mothers without complications and the difference between both groups significant ($P< 0.01$) ,similar results were observed by Mimouni et al " Fetal-neonatal complications are directly related to inadequate glycemic control during pregnancy" .[17] Many maternal and fetal complications are associated with poor maternal glycemic control during pregnancy[18]

Conclusions and recommendations

Our finding indicate that an earlier and more aggressive approach to the achievement of physiologic blood-glucose levels in the pregnant women with diabetes may obviate some of the complications found in infants' of diabetic mothers.

So strict metabolic control before conception and through-out pregnancy has beneficial effects on perinatal morbidity and mortality.

REFERENCES

1. Meur S, Mann NP. Infant outcomes following diabetic pregnancies. Paediatr Child Health 2007; 17:217-222.
2. Chmait R, Moore T. Endocrine disorders in pregnancy. In: Taeusch HW. Avery's Diseases of the Newborn. Philadelphia: Saunders Elsevier; 2005. P.71-86.
3. Gomella TL. Infant of a diabetic mother. In: Gomella TL, Conningham, Eyal FG,. Neonatology: a Lange Clinical manual.6th ed. New jersey: prentice ; 2009. p. 534-40.
4. Butle NF: Carbohydrate and lipid metabolism in pregnancy: normal compared with gestational diabetes mellitus. Am J Clin Nutr 2000, 71(5):12565-12615.
5. Otolorun EO, Famuyiwa oo, Bello AF, Da-Wodu AH, Adelusi B: Reproductive performance following active management of diabetic pregnancies at University College Hospital, Ibadan, Nigeria. Afr J Med Sci 1985, 14(3-4):155-60.
6. Engelgau MM, Herman NH, Smith PJ, German RR, Aubert RE: The epidemiology of diabetes and pregnancy in US. 1988. Diabetic care 1995, 18(7):1029-1033
7. Ferrara A, Hedderson MM, Selby JV: Prevalance of gestational diabetes mellitus detected by National Diabetes Data group or the carfactor and cousin plasma glucose threshold. Diabetes Care 2002, 25(9):1625-1630
8. Pedersen J. The pregnant diabetic and her newborn. Problems and management .2nd ed. Baltimore: Williams and Wilkins, 1977.
9. Ballard LL, Khoury JC, Wedig K,et al: new Ballard Score expanded to include extremely premature infants .J. Pediatr 1991;119:417-423.
10. Xu H, Simonet F, Luo ZC. Optimal birth weight percentile cut-offs in defining small- or large-for-gestational-age. Acta Paediatr 2010; 99:550.
11. Harris DL, Weston PJ, Harding JE. Incidence of neonatal hypoglycemia in babies identified as at risk. *J Pediatr*. 2012 Nov. 161(5):787-91
12. Waldemar A. Carlo. Infant of diabetic mother. In;Kliegman R M, Stanton B F, St Geme J W, Schor N F and Behrman R E, Nelson text of pediatrics 20 ed.2015,chapter 107.1: p897
13. Alam M, Raza JS, Sherali AR, Akhtar SM. Neonatal complications in infants born to diabetic mothers. J Coll Physicians Surg Pak 2006; 16:212-5.
14. Najmi RS. Distribution of birth weights of hospital born Pakistani infants. J Pak Med Assoc 2000; 50:121-4.
15. Bourbon JR, et al fetal lung development in diabetic pregnancy .Pediatri Res 1985;19:263-267
16. Sosenko JM, Kitzmiller JL, Fluckiger R, Loo SW, Younger DM, et al. Umbilical cord glycosylated hemoglobin in infants of diabetic mothers: relationships to neonatal hypoglycemia, macrosomia, and cord serum C-peptide. Diabetes Care.1982; 5: 566-570.
17. Mimouni F, Tsang RC. Pregnancy outcome in insulin-dependent diabetes: temporal relationships with metabolic control during specific pregnancy periods. 1988 ;Am J Perinatol 5: 334-338
18. Heyburn P, Sampson M, Stanley K: Association between outcome of pregnancy and glycaemic control in early pregnancy in type 1 diabetes: population-based study.BMJ 325:1275–1276, 2002