
Maternal and Neonatal Outcomes in Diabetic and Non-Diabetic Women with Macrosomic Births

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Abstract:

Background: Macrosomia is generally defined as birth weight of least 4000 g. Macrosomia increases the frequency of obstetric complications such as shoulder dystocia, perineal laceration or cesarean section and the risk of brachial plexus palsy, asphyxia and cerebral hemorrhage in newborn.

Objective: The aim of this retrospective study is to examine the maternal and neonatal outcomes of macrosomic babies at Al - Yarmok Teaching Hospital, and to compare the outcomes in infants of diabetic and non-diabetic mothers

Patients and methods: At Al-Yarmouk Teaching Hospital, gynecology and obstetric department, in cooperation with special care baby unit (SCBU) a retrospective analysis was conducted in a one-year period (from November 2009 to November 2010). The study group was all live born, singleton neonates with a birth weight of equal or more than 4000 g. The information was taken from the medical records of the mother and the infant. The data analysis was performed with Medcalc statistical software. Statistical significance was set at $p < 0.05$. The outcomes were compared between the diabetic and non-diabetic groups using Fisher exact test.

Results: During the study period, there were 8254 deliveries. Macrosomic infants were 165, representing 2%. The mean birth weight (standard deviation) of all macrosomic infants was 4363g (325g.) Of the 165 macrosomic infants, 112 (67.9%) born to non-diabetic mothers, while 53 (32.1%) born to diabetic mothers. Seventy two infants of the total group (43.6%) were above 4500g, fifty three of them in the non-diabetic mothers (47.3% of the this group). The diabetic mothers were significantly older than non-diabetic mothers ($p < 0.03$). The mean gestational age at delivery (standard deviation) were 39.58 weeks (SD 0.87), 39.58 weeks (SD 1.11) in the non-diabetic and diabetic mothers respectively, however, the difference was statistically not significant ($p > 0.58$). Seventy percent of the non-diabetic group delivered by caesarean section, and 80% of the diabetic group delivered by caesarean section ($p > 0.14$). After vaginal deliveries, there were four cases of vaginal tear, all of them seen in the non-diabetic mothers. Episiotomy was significantly higher in non-diabetic group ($p = 0.028$). Hypoglycemia was significantly higher in the non-diabetic mothers ($p = 0.02$), while the duration of hospitalization more than three days was significantly higher in the infant of diabetic mothers ($p = 0.05$). Respiratory distress was seen in about quarter of the infants of diabetic mothers, in spite of 15% only of non-diabetic mothers had this complication, but this difference was not significant when evaluated by t-test ($p = 0.19$). Birth trauma including shoulder dystocia, Bells palsy and fracture clavicle were seen in 4 infants, 2 in each group. The heavier infants were delivered by caesarean section more than those below 4500g.

Conclusion: Macrosomic infants represent a risk group for adverse neonatal outcome and maternal morbidities, regardless the diabetic status of the mother. In studied group, the hypoglycemia was higher in the infant of non-diabetic mothers than those of diabetic mothers. Our macrosomic infants tend to be heavier than what found in the literatures.

Key words: Macrosomia, diabetic mothers, non-diabetic mothers.

Introduction

The birth weight is one of the important factors affecting the perinatal morbidity and mortality. Fetal macrosomia refers to an absolute birth weight regardless of gestational age or other demographic variables.^[1]

Macrosomia is generally defined as birth weight of least 4000 g.^[2] Macrosomia increases the frequency of obstetric complications such as shoulder dystocia, perineal laceration or cesarean section and the risk of brachial plexus palsy, asphyxia and cerebral hemorrhage in newborn.^[3]

A number of risk factors for fetal macrosomia have been recognized. The strongest risk factors are maternal diabetes, which results in a two folds increase in the incidence of macrosomia. Many of risk factors, like post maturity, obesity and multiparity, are highly prevalent among parturient, limiting their utility. Even when two or more of these factors are present, the risk of macrosomia is only 32 percent^[4]. Furthermore, 34 percent of macrosomic infants are born to mothers without any risk factors and 38 percent of pregnant women have at least one risk factor^[5].

S Das, et al. examined the outcomes of macrosomic infants in relation to maternal diabetic status, and they found that the serious complications of macrosomia are more likely to occur in macrosomic infants delivered from non-diabetic mothers and they concluded that maternal diabetes should not be the sole determinant in decision making regarding mode of delivery and other perinatal care.^[6]

The aim of this study is to examine the maternal and neonatal outcomes of macrosomic babies at Al - Yarmok Teaching Hospital, and to compare the outcomes in infants of diabetic and non-diabetic mothers.

Patients and methods

At Al-Yarmouk Teaching Hospital, gynecology and obstetrics department, in cooperation with special care baby unit (SCBU) a retrospective analysis was conducted in the period from November 2009 to November 2010. The study group was formed of all live born, singleton neonates with a birth weight of equal or more than 4000 g. The informations were taken from the medical records of the mother and the infant. Macrosomia was defined as a birth weight

equal to or more than 4000 g., regardless the gestational age and maternal diabetic status. (Weighing the infants by secca-Germany, down to 0.01g sensitive)

All the diabetic mothers were known to be diabetic throughout pregnancy and on insulin treatment, while the non-diabetic mothers had more than one readings of normal blood sugar in the antenatal care and near the delivery.

Neonatal morbidities include hypoglycemia, respiratory distress, prolong hospital stay and birth related injuries. Hypoglycemia was defined as blood glucose <50 mg/dl occurring at any time during the hospital stay.^[1] Respiratory distress consisted of tachypnea and/or other signs of respiratory distress.

The maternal morbidities include instrumental deliveries, episiotomy, and different degrees of vaginal tears; all were considered depending on the deliveries notes, which were written by the most senior resident in the managing team.

The data analysis was performed with Medcalc statistical software. Statistical significance was set at $p < 0.05$. The outcomes were compared between the diabetic and non-diabetic groups using Fisher exact test.

Results:

During the study period, there were 8254 deliveries. Macrosomic infants were 165, representing 2%. The birth weight of all macrosomic infants ranged from 4000g.-5500g. with a mean (SD) of 4363(325g). All the macrosomic infants were singleton live births. Of the 165 macrosomic infants, 112(67.9%) born to non-diabetic mothers, while 53(32.1%) born to diabetic mothers. Seventy two infants of the total group (43.6%) were above 4500g. 53 of them in the non-diabetic mothers (47.3% of this group), while this percentage was 36% among diabetic mothers.

The diabetic mothers were significantly older than non-diabetic mothers ($p < 0.03$). The mean gestational age at delivery was 39.58(SD0.87), 39.58(SD 1.11) in the non-diabetic and diabetic mothers respectively, however, the difference was statistically not significant ($p > 0.58$). as shown in table (1).

In the non-diabetic group, seventy six women out of 112 women (68%) delivered by caesarean section, while in the diabetic group, 42 women out of 53 women (79.3%), delivered by caesarean section, again this difference was not significant ($p > 0.14$). After vaginal deliveries, there were four cases of vaginal tear, one of third degree, while the others of the first and second degree. All of them seen in the non-diabetic mothers. Episiotomy was significantly higher in non-diabetic group ($p = 0.028$).

Hypoglycemia was significantly higher in the non-diabetic mothers ($p = 0.02$), while the staying in hospital more than three days was significantly higher in the infant of diabetic mothers ($p = 0.05$). Respiratory distress was seen in about quarter of the infants of diabetic mothers, in spite of 15% only of non-diabetic mothers had this complication, but this difference was not significant when evaluated by t-test ($p = 0.19$). Birth trauma including shoulder dystocia, Bells palsy and fracture clavicle were seen in 4 infants, 2 of non-diabetic mothers and 2 in those of diabetic mothers, again this difference was not significant ($p = 0.58$), as shown in table (2).

Table (3) shows an evaluation of the infants by weight. The heavier infants were delivered by caesarean section more than those below 4500g. and this difference is statistically significant ($P = 0.025$). The difference in neonatal outcome, between the two groups, was statistically not significant and this includes respiratory distress, hypoglycemia and birth related injuries.

Table 2: Neonatal outcome of all macrosomic neonates.

characteristic	Non-diabetic mother (n=112)		Diabetic mother (N=53)		total	P value
	Number	percent	Number	percent		
hypoglycemia	70	62.5	23	43.3	93	0.02
Respiratory distress	17	15.2	13	24.5	30	0.19
Birth injury	2	1.75	2	3.74	4	0.59
death	2	1.8	2	3.8	4	0.58
Hospital stay>3days	18	16.2	14	26.4	32	0.05

Table 1: Demographic characteristic and maternal outcome.

Maternal characteristics	Non-diabetic mothers		Diabetic mothers		P value
	Number	percent	Number	Percent	
Age(years)mean(SD)	27(5)	-	32(6)	-	<0.03
Mean gestational age in weeks(SD)	39.58(0.87)	-	39.58(1.11)	-	0.58
Multigravida	100	89.3	49	92.5	0.58
Birth					
Vaginal delivery	36	32	11	20.7	0.14
Caesarean section	76	68	42	79.3	0.14
Vacuum delivery	3	2.6	0	0	0.55
State of perineum after vaginal delivery					
Episiotomy	30	83.3	6	54.5	0.023
First&second degree tear	3	8.2	0	0	0.55
Third&fourth degree tear	1	2.8	0	0	1
Infant characteristics					
Male	68	60.7	30	56.6	0.65
Birth weight(4000-4499)	59	52.8	34	64.3	0.18
Birth weight(>4500)	53	47.3	19	36.4	0.18

Table-3 Outcomes by weight categories.

characteristic	Weight 4000-4499g (n=93)		Weight >4500g (n=72)		P value
	Number	percent	Number	percent	
Diabetic mother	34	36.5	19	26.4	0.18
Delivery by caesarean section	60	64.5	58	80.3	0.025
Stay in hosp.>72hours	20	21.5	12	16.7	0.5
hypoglycemia	28	30.4	24	33.3	0.73
Respiratory distress	20	21.5	10	13.9	0.22
Birth injury	3	3.22	1	1.38	0.63
death	2	2.15	2	2.8	1

Discussion:

Comparing the neonatal outcomes between diabetic mothers and non-diabetic mothers was the main aim of this study. The differences in neonatal outcome including respiratory distress, birth injury, and hospital stay all were statistically not significant between the two groups.

The difference between the two groups regarding the percentage of women delivered by caesarean section was statistically not significant, these results are not consistent with different studies, where they showed that the macrosomic infants of non-diabetic mothers yet at higher risk, but still those groups of diabetic mothers are at greater risk in compares'. S Das et al. reported a significantly higher percentage of caesarean among diabetic mothers than non-diabetic mothers (66% vs. 30% and the $P<0.001$)^[6], similar difference had been reported by Esker JL et al^[12].

Overt diabetes mellitus during pregnancy is associated with increased risk of adverse perinatal outcomes. Data, regarding the association between hyperglycemia, of less sever degree than that

diagnostic of overt diabetes, with adverse perinatal outcome; these data are accumulating^[7].

In 2008, the hyperglycemia and adverse pregnancy outcome study cooperation group (HAPO) published its study, where they found that there is a continuous association of maternal glucose levels below those diagnostic of diabetes with increased birth weight and increased cord-blood serum C-peptide^[8].

The fact that our study was a retrospective one and the maternal data had been collected from the hospital record, and more than 25%of the women (non-diabetic) had no antenatal care, and we depended on the history and a new reading of blood sugar done before deliveries, so they might have a higher level of blood sugar within what is considered a non-diabetic range, which is considered a risk factor for adverse neonatal outcome^[8].

HAPO study showed that there was no significant increase in the hypoglycemia in macrosomic infants in relation to maternal blood sugar in the non-diabetic mothers, this was opposite to what is seen in this study, where 62.5%of the non-diabetic mothers had hypoglycemia while 43.3%in the diabetic

mothers($p=0.025$). The proper management of diabetic mothers during pregnancy may explain this finding; this may be an accepted explanation since all the diabetic mothers had antenatal care. However, this observation makes the hypoglycemia an important number in the management of macrosomic infants regardless the diabetic state of the mother.

The incidence of birth related injuries is the major concern in the macrosomic infants outcome, we have reported an incidence of 2.4% for the total birth injuries, where we had 4 injuries, one with fracture clavicle, one with transient facial palsy, and two had brachial plexus injuries, so the percentage of the last is 1.4% and this may be consistent with the incidence reported by S Das et al.^[6] A higher incidence reported by Wollschlaeger et al. (2.4%)^[9] While F. H. Ibrahim et al reported 6.855% in a study done in Tehran^[10].

This low incidence of birth injuries can be explained when we see the rate of caesarean section in our patients higher than the above mentioned studies, which also explained the higher incidence of respiratory distress among our patients of the two groups.

The above findings should not be interpreted as an unaccepted increase in the incidence of caesarean sections in our institute in compares with other institutes. In our study 43.6% of the infants were born with a weight equal or more than 4500g., while this percentage was 22% in the study of S Das et al. and definitely, as we have seen in table 3, the rate of caesarean section increase with the body weight. This high percent of infant above 4.500g. may explain the high percentage of hypoglycemia in the non-diabetic group, Neonatal death was 2.4%, a higher percent had been reported by J.T. Mutihir and Ujah^[11], where they reported an incidence of 3.8% among term macrosomic infants and 12.5% in post term macrosomic infants. But still a nearby country reported half this percent, F. Tehrani et al. reported an incidence of 1.2% among one thousands macrosomic infants^[10].

It is worthy to mention that this study is a retrospective one. For this reason the data set available for both mothers and infants was rather limited, and this include many risk factors, further more all diabetic mothers were viewed as having at least gestational diabetes by their care providers, however, it is possible that some mothers counted as not having diabetes in fact had gestational diabetes that was not discovered, Macrosomic infants represent a risk group for adverse neonatal outcome and maternal morbidities, regardless the diabetic status of the mothers. In studied group, the hypoglycemia was higher in the infant of non-diabetic mothers than those of diabetic mothers. Our

macrosomic infants tend to be heavier than what found in the literatures, A prospective study in collaboration between obstetricians and neonatologists is recommended to delineate the risk factors beyond macrosomia and the adverse outcome of it, with specific emphasize on the diabetes (indications of screening and criteria of diagnosis).

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