

The frequency of hypoglycemia in macrosomic neonates in Amarah governorate, Iraq

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ABSTRACT

Background: Neonatal macrosomia is defined as a birth weight of more than 4000 g. Significant maternal and neonatal complications can result from the birth of macrosomic infants like hypoglycemia and birth injuries.

Objectives: To determine the frequency of hypoglycemia in neonates with macrosomia in Amarah, Iraq

Methods: The study involved 146 macrosomic newborn neonates delivered in 2 maternity hospitals in Amarah, Iraq during a period from June 2011 to June 2014.

Results: Hypoglycemia was observed in 16% of neonates affected by macrosomia. Maternal diabetes was the most common cause of fetal macrosomia (28%). Our results were compared with those from other parts of the world.

Conclusion Macrosomia is associated with increase rate of

neonatal hypoglycemia especially among infants of diabetic mothers.

Keywords: Macrosomia, Neonate, Hypoglycemia.

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The term macrosomia is used to describe a newborn with an excessive birth weight. A diagnosis of fetal macrosomia can be made only by measuring birth weight after delivery; therefore, the condition is confirmed only retrospectively, i.e., after delivery of the neonate. Fetal macrosomia is encountered in up to 10% of deliveries. Fetal macrosomia has been defined in several different ways, including birth weight of 4000-4500 g (8 lb 13 oz to 9 lb 15 oz) or greater than 90% for gestational age after correcting for neonatal sex and ethnicity. Based on these definitions, macrosomia affects 1-10% of all pregnancies¹.

Fetal macrosomia is difficult to predict, and clinical and ultrasonographic estimates of fetal weight are prone to error. Elective cesarean section for suspected macrosomia results in a high number of unnecessary procedures, and early induction of labor to limit fetal growth may result in a substantial increase in the cesarean section rate because of failed inductions. Pregnancies complicated by fetal macrosomia are best managed expectantly².

Causes of fetal macrosomia includes³; Maternal diabetes: If the mother had diabetes before pregnancy (pre-gestational diabetes) or develop diabetes during pregnancy (gestational diabetes), fetal macrosomia is more likely. A history of fetal macrosomia: If the mother previously given birth to a baby diagnosed with fetal macrosomia, she is at increased risk of having another baby who has the condition. Maternal obesity: Fetal macrosomia is more likely if the mother obese⁴. Excessive weight gain during pregnancy: Gaining too much weight during pregnancy increases the risk of fetal macrosomia. Previous pregnancies: The risk of fetal macrosomia increases with each pregnancy. Up to the fifth pregnancy, the average birth weight for each successive pregnancy typically increases by up to about 4 ounces (120 grams). Male infants, typically

weigh slightly more than female infants. Most babies who weigh more than 9 pounds, 15 ounces (4,500 grams) are male. Overdue pregnancy: If pregnancy continues by more than two weeks past date, the baby is at increased risk of fetal macrosomia. Maternal age: Women older than 35 are more likely to have a baby diagnosed with fetal macrosomia, and rare congenital syndromes e.g. Beckwith Weidemann syndrome.

Hypoglycemia is present when serum glucose levels are significantly lower than the range in postnatal age-matched normal infants. In healthy term infants, serum glucose values are rarely less than 35 mg/dL between 1 and 3 hr of life, less than 40 mg/dL from 3 to 24 hr, and less than 45 mg/dL (2.5 mmol/L) after 24 hr. Both premature and full-term infants are at risk for serious neurodevelopmental deficits from equally low glucose levels. This risk is related to the depth and duration of the hypoglycemia⁵.

Severe glucose deficiency leads to cerebral energy failure, impaired cardiac performance, muscle weakness, glycogen depletion, and diminished glucose production. Thus, maintenance of glucose delivery to all organs is an essential physiological function⁶.

There are no established lower limits defining neonatal hypoglycemia of the healthy infant, it is suggested that values down to 1.7 mmol/l should be accepted as normal during the first day of life. Parenteral glucose should be administered to all infants with blood glucose levels < 1.4 mmol/l. The main goal is to prevent neonatal hypoglycemia. Early and exclusive breastfeeding and the maintenance of normal body temperature are usually sufficient preventive measures in healthy infants⁷.

Method. Cross-sectional study was conducted in Amara hospitals (Al-Sader and Al-Zahrawy), during the period from June 2011 till June 2014, including the newly delivered

babies who weight more than 4kg. Data was collected using a special formula, constructed by researcher and based on standard criteria that include patients name, age, sex, gestational age, congenital deformity, random blood sugar and maternal diabetic history).

The study sample includes 146 neonates who admitted to neonatal intensive care unit in Amara hospitals and by weighting all neonate immediately after birth and if more than 4000 gm was included in the study and then immediately random blood sugar done.

The analysis of data was carried out using the available Statistical packages for social science, version 16.0 (SPSS-16.0). Data were presented in form of table of number and percentage. Chi-square test (χ^2 -test) was used for testing the significance of association between variable under study. The outcome was macrosomic neonate with hypoglycemia compared to body weight, outcome of delivery and maternal history of diabetes mellitus. Statistical significance was considered whenever the p-value was equal or less than 0.05.

Results: The study sample includes 146 neonates who were admitted to the neonatal intensive care unit in Amara hospitals .The study shows that the frequency of macrosomia is 3.5 % (146 out of 4128 who were admitted to the neonatal intensive care units during the study period).

Among the total 146 macrosomic neonate, 123(84%) had normal blood glucose level (above 40 mg/dl) while only 23(16%) patients were hypoglycemic (less than 40 mg/dl). As shown in table 1 there is no statistical significant sex difference among the studied group (P value = 0.83).

Table 1: Sex distribution of the studied sample.

Sex	Blood glucose						P value
	Normal (n)	%	Hypo glyceemic (n)	%	Total (n)	%	
Male	72	83	14	17	86	59	0.83
Female	51	85	9	15	60	41	
Total	123	84	23	16	146	100	

Regarding body weight, 16 out of 114 babies with weight range of 4-5 kg were hypoglycemic while 7 out of 32 babies of more than 5kg body weight were hypoglycemic. There is no statistical significance (P value = 0.28) as shown in table 2.

The present study showed that only one baby has congenital anomalies (0.7%) (Large testis and micro-penis), while two babies had Erb's palsy only one of them was hypoglycemic, with significant association is present (p value 0.014) as shown in table 3.

Maternal history of diabetes mellitus during pregnancy was found in 44 neonates (28%), of which 18(44%) were 21 (15%) of hypoglycemic neonate delivered to a non hypo

glycemic and 23(56%) were euglycemic, while there is diabetic mothers (P value 0.001), as shown in table 4.

Table 2: Distribution of sample according to body weight of neonate.

Body weight	Blood glucose						P value
	Normal (n)	%	Hypo glyceemic (n)	%	Total (n)	%	
4-5 kg	98	86	16	14	114	78	0.28
More than 5kg	25	78	7	22	32	22	
Total	123	84	23	16	146	100	

Table 3: Distribution of the sample according to outcome of delivery.

	Blood glucose						P value
	Normal (n)	%	Hypo glyceemic (n)	%	Total (n)	%	
Congenital anomalies	1	100	0	0	1	100	0.014
Erbs palsy	1	50	1	50	2		
Normal baby	121	85	22	15	143		
Total	123	84	23	16	146	100	

Table 4: Distribution of sample according to the maternal history of diabetes mellitus.

Maternal history	Blood glucose of neonate						P value
	Normal	%	Hypo glyceemic	%	total	%	
Diabetic mothers	23	56	18	44	41	28	0.001
Non diabetic mothers	100	95	5	5	105	72	
Total	123	84	23	16	146	100	

Discussion. The definitions of macrosomia include birth weight greater than 4000-4500 g or greater than 90% for the newborn adjusted for race, sex, and gestational age. Based on these definitions, macrosomia occurs in 1-10% of all deliveries⁸.

The frequency of neonatal macrosomia in our study was 3.5% and this nearly consistent with another study that found 2 %⁹, and disagrees with study done by Modanlou HD, et al, where the result was 1.3%¹⁰. But there was

another study showed higher incidence up to 10% done by Martin JA.¹, and by Tanya Trevors¹¹. This may be attributed to different study population.

Concerning the weight of the newborn we found that the higher percentage was between 4-5kg in 78% of cases. The same result was reported by another author¹². The frequency of hypoglycemia is 1.5- fold increased with increasing weight (14 % among 4-5 kg versus 22% among more than 5 kg group). Akin et al also found a 2-fold increased rate of neonatal hypoglycemia in macrosomic pregnancies¹³. We found a relationship between the sex of the infant and the birth weight, in our study the macrosomia was more dominant in male with 59%, this is consistent with study done by mayo clinic staff, showed that most babies who weigh more than (4,500 grams) are male^{5,13}.

Hypoglycemia was found in 15.8% of macrosomic neonates, where as 84.2% were normoglycemic and this study disagree with study done by Author: Allahyar Jazayeri ,which showed 50% are hypoglycemic, Neonatal risks associated with macrosomia include hypoglycemia (50%), hematological disturbances (ie, polycythemia), and electrolyte disturbances (up to 50%)⁶. But there was another study showed less incidence (8.8%) of hypoglycemia done by Tanya Trevors, (the prevalence of neonatal hypoglycemia was affecting 8.8% (n=144/1650) of all newborns, and 18.1% (n=34/192) of gestational diabetic mother deliveries¹¹.

There is a positive correlation between maternal blood glucose levels, increased birth weight, and neonatal adiposity¹⁴. This relationship is probably due to fetal hyperinsulinism secondary to maternal hyperglycemia. Maternal diabetes rate among macrosomic deliveries was about 28%, of which the rate of gestational diabetes was 20%, this result was nearly similar to study done by Tanya Trevors, where the result was 16.6%¹¹. Another study showed a higher rate of 39 %¹⁵.

The current study reported an increased incidence of neonatal hypoglycemia in macrosomic neonates in diabetic mothers (44%), more than non-diabetic mothers (5%) (P value 0.001). This high percentage of hypoglycemia in infant of diabetic mother was supported by study done by William W. Hay, Jr, University of Colorado School of Medicine, (Approximately 30% to 40% of infants of diabetic mother have low blood sugar)¹⁶. Similarly, Eskof et al and Mahin NA et al. reported a high incidence of neonatal hypoglycemia in macrosomic neonates of diabetic mothers^{15,17}.

Regarding congenital anomalies in neonate born with macrosomia was 2.1% and these result agree with study done in 2011 by Waller DK.(Infants with congenital anomalies were more likely than infants without birth defects to have a birth weight > or =4,500 g)¹⁸.

In conclusion, there is a significant percentage of newborn delivered with over weight (macrosomic) have hypoglycemia (15.8%).For this reason every newborn baby has weight more than 4 kg should be checked blood sugar because of high risk of hypoglycemia which can be result in high rate of morbidity and mortality.

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