Effect of formula and breast milk feeding on random blood sugar values in healthy full term babies in the first 48 hours after birth

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Abstract:

Background : Abnormal low blood glucose levels can cause long term neurological injury such as cerebral palsy in infancy.

Objective: study the effect of the type of feeding (breast or artificial) on neonatal hypoglycemia.

Method: One hundred full term healthy babies all of them product of cesarean section (for easy follow up) were included in this study divided into two groups their blood glucose checked in the 1st 48 hours of their life at fixed times using special device GLUCUTREND® 2.

Results: forty eight full term babies were in group 1 on milk formula, 52 babies were in group 2 on breast milk. In both groups no statistical significance found between male & female or all. Also we noticed an increase in the random blood sugar with time in both groups. Of 100 babies 6 only showed manifestation of hypoglycemia (jitteriness). Also no statistical significance found in random blood sugar in both groups. We found the range at which hypoglycemia showed manifestation (jitteriness) around 35-40mg/dl in the 1st 10 hours after birth taking in consideration that sometimes no standard level for hypoglycemia can showed the manifestation but it depend on symptoms & signs.

Conclusions & recommendations: hypoglycemia in neonates and its complications can be avoided by the early starting of feeding whatever its type.

Keywords: formula milk, Breast milk, Blood sugar new Borneo

Introduction:

Hypoglycemia was defined as a glucose concentration less than two standard deviation below the mean for a particular population . In the preterm baby it is < 1.1 mmol/L during the first week of life while in full term it is <1.7 mmol/L in the first 72 hours of life with a value of <2.2 mmol/L after 72 hours of age [1]. There are many causes behind neonatal hypoglycemia, for example: hyperinsulinism or mal-adaptive hypoglycemia is most often caused by over secretion of insulin from the pancreas triggered by stress, fasting or disorders of the adrenals or pituitary gland, liver or pancreas . In infant of diabetic mothers, it is not uncommon for the infant to remain in a hyperinsulinaemic state after loosing maternal glucose supply. Fetal glucose levels correspond to maternal levels as glucose crosses the placenta . Insulin production in the fetus begins early in gestation, insulin does not cross the placenta. When the newborn is deprived of maternal glucose, the pancreas continue to produce insulin at the same fetal level and newborn glucose rapidly depleted. This condition usually transient and is treated either with early initiation of carbohydrate feeding or, at times intravenous dextrose provided at a rate of 4-8 mg/kg/min but until the infant metabolic adaptation is able to supply adequate amounts of glucose . On the other hand, hypoglycemia persisting or occurring after one week of life requires an evaluation [2]. Persistent severe hypoglycemia-mal-adaptive hypoglycemia can usually be separated from pathological hypoglycemia by the amount of glucose need to maintain a normal blood sugar. Once a baby needs more than 7.5 mg/kg/min of glucose a pathological cause becomes more likely, which imply that inborn error of metabolism of glycogen storage disease [3].

Investigation currently done are blood sugar, serum electrolytes, urine for non glucose reducing substances / ketone and septic screen [4].

Treatment of neonatal hypoglycemia includes :

1- Establish early regular breast feeding (minimum 5 feds in the 1st 24 hours) with insurance of neutral thermal environment .
2- Symptomatic cases, we give a bolus of 2-4 cc / kg I.V. 10% dextrose [5]. In asymptomatic cases we do not give bolus as it may cause rebound hypoglycemia
3- Start glucose infusion with 10% dextrose at 6mg / kg / min preferably using an infusion pump Blood glucose checking after 30 minutes[6] .
4- Hydrocortisone 5 mg /kg / dose IV. 12 hourly, collect sample for insulin and cotrisol before the hydrocortisone [7].
5- Consider glucagons, 0.1 mg / kg / dose I. V. /I.M. as temporary measure to raise blood glucose or when IV. access is difficult [8].
6- Consider diazoxide 10 mg / kg / day 8 hourly [9]. Treatment of the underlying cause as inborn error of metabolism, hypothermia etc

Aim of the study

To see the effect of type of feeding (breast or artificial) on random blood sugar) values in healthy full term newborn babies during the first 48 hours after delivery .

Materials & Methods

This study was carried out in the period extending from beginning of February to the end of July 2004 in four maternity hospitals: Al- Yarmouk, Medical city, Al-Elweya, Al-Habeebya and Al-Zahraa (private hospital)

One hundred newborn babies included in this study, those who are liable for hypoglycemia were excluded from the study i.e. infant of diabetic mother, premature delivery ,cold injury, etc.....

Most of the cases in this study were delivered by cesarean section and the reason for this is they had to stay in the hospital for at least 3 days so follow up is secured. The 100 newborn babies were from 98 mothers with one mother having twin . They were classified into two groups :

Group 1 : 48 newborn were put on formula milk (Dialac and Guigose)

Group 2 : 52 newborn were put on breast milk..

History was taking from the mothers during prenatal period as gestational diabetes or hypertension, nataly for fetal distress, premature delivery, prolonged labor, post natal for cold injury, respiratory distress.

Checking the newborn for congenital anomalies , coarse features and then specific check up for signs of hypoglycemia as jitteriness irritability ,drowsiness, lethargy and cyanosis.

Using a blood glucose monitor device called Glucutrend 2, a type of an ACCU-CHEC system devices, random blood sugar was measured for :

1- The mother 30 minutes after delivery
2- The umbilical cord blood
3- The babies after the first feeding, 10 hours ,20 hours and 44 hours after birth.

During the 1st 48 hours after birth we continued to monitor the signs of hypoglycemia i.e. jitteriness, drowsiness, irritability, lethargy and cyanosis.

Using the PAIRED t TEST and INDEPENDENT t TEST we calculated the standard deviation, mean and significant (P) for statically differences between the two groups. Note that significant results are obtained when $P < 0.05$ [10].

Results

Table (1) shows the relation between the random blood sugar measurements at different times with the type of feeding in female and male newborn babies. There was no significant relationship between mean RBS values for both types of feeding in females and males.

Table(2) shows random blood sugar values (mean and standard deviation) of formula-fed babies (hypoglycemic, non-hypoglycemic) and the total number of formula fed babies at each specific time. There was a significant correlation between jitterness and no jitterness at 10 hrs only.

Table (3) shows random blood sugar values (mean and standard deviation) of breast fed babies (hypoglycemic, non-hypoglycemic) and the total number of breast fed babies at each specific time.

Table (4) compares between the effects both types of feeding on mean RBS values in hypoglycemic and non-hypoglycemic newborns at 10 hours and shows that there is no significant relationship between both types of feeding.

Table (1): The random blood sugar measurement at different times according to the type of feeding in female & male newborn babies.

Measurement	Female			Male		
	Milk Formula Feeding Mean & SD	Breast Feeding Mean & SD	Significance	Milk Formula Feeding Mean & SD	Breast Feeding Mean & SD	Significance
Mother' s RBS	124.00 ±16.962	121.64 ±18.175	0.685	118.77 ±14.484	123.43 ±22.888	0.375
Cord RBS	70.50 ±8.512	73.05 ±9.378	0.351	70.77 ±7.240	71.80 ±8.172	0.622
First feed sugar	52.27 ±5.496	53.45 ±5.796	0.492	50.77 ±6.568	51.70 ±5.434	0.564
10 hours sugar	66.41 ±3.142	66.09 ±5.528	0.816	66.42 ±3.870	65.43 ±3.971	0.351
20 hours sugar	72.18 ±4.171	70.95 ±5.131	0.389	72.15 ±4.305	72.17 ±4.594	0.991
44 hours sugar	77.73 ±6.017	75.64 ±4.766	0.208	77.88 ±5.362	76.63 ±5.068	0.374

Table (2): The number with mean & SD of random blood sugar values of formula-fed babies (jittery and non-jittery) and the total number of formula with P values of fed babies at each specific time.

Hypoglycemia	RBS of cord blood	RBS after 1st feeding	RBS after 10 feeding	RBS after 20 hours	RBS after 44 hours
Jitteriness					
N	2	2	2	2	2
Mean & S.D	73.5±14.849	47.5±7.778	39.5±2.121	68.5±0.707	72.5±2.121
No Jitteriness					
N	46	46	46	46	46
Mean & S.D	70.52±7.595	51.63±6.049	67.48±2.96	72.33±4.217	78.04±5.609
Total					
N	48	48	48	48	48
Mean & S.D	70.65±7.764	51.46±6.084	66.31±6.36	72.17±4.199	77.81±5.61
P Value	0.601	0.353	0.0001*	0.211	0.174

* significant

Table (3): The number with mean & SD of random blood sugar values of breast-fed babies (jittery and non-jittery) and the total number of breast-fed babies at each specific time.

Hypoglycemia	RBS of cord blood	RBS after 1st feeding	RBS after 10 hours	RBS after 20 hours	RBS after 44 hours
Jitteriness					
N	4	4	4	4	4
Mean & S.D	74.75± 5.679	49.75± 6.397	44.5 ±1.732	71.75 ±3.304	73.5± 3.317
No Jitteriness					
N	48	48	48	48	48
Mean & S.D	72.13± 8.85	52.67 ±5.548	67.83 ±3.39	71.65±4.949	76.44 ±4.989
Total					
N	52	52	52	52	52
Mean & S.D	72.33± 8.636	52.44± 5.603	65.81 ±7.81	71.65 ±4.818	76.21± 4.92
P Value	0.564	0.322	0.0001	0.967	0.255

Table (4): Comparison between the effects of both types of feeding on mean RBS values in hypoglycemic and non-hypoglycemic newborns at 10 hours

State of glycemia	Formula fed baby mean RBS at 10 hours	Breast fed baby mean RBS at 10 hours	
Hypoglycemia (Jitteriness)	39.5	44.5	0.277
No hypoglycemia (no Jitteriness)	67.48	67.83	0.591

Discussion

It appears that breast feeding raises RBS values in parallel to the formula feeding. Such finding goes with the finding of other study in which 114 full term, healthy babies were included, 64 were breast-fed and 50 were formula fed. Although statistically differences were found between the serum glucose concentrations in breast-fed and bottle-fed babies, the differences were not considered to be clinically significant [11].

This means that both types of feeding were effective in raising RBS values with time. It is only the paired value [cord RBS-RBS value of the baby after 20 hours] that showed no significant difference,

that means that each type of feeding raised the RBS value of the baby to a level close to cord RBS. In our study, only 6 babies suffered from hypoglycemia presented by jitteriness. However, hypoglycemia and jitteriness were relieved by

feeding, these results go with the results of a Turkish study, in which thirty-five full term infants (38-41 weeks' gestation) were included in the study. All infants were fed (no specific type of feeding) during the first 3 hours of life and this was continued every 4 hours. In the first 3 hours of life there were 12 infants with glucose levels less than 30 mg/dl, but in only three of those did the hypoglycemic level continue and require treatment (9 per cent) [12].

As compared to our study that included both breast-fed and formula fed babies, another study included only breast-fed babies. Here, maternal and cord glucose estimation were carried out within 30 minutes of delivery. All newborn were weighed and glucose levels were measured at 24 and 48 hours of life. All mothers were euglycaemic while seven neonates had plasma glucose level less than (1.7) mmol/1 (=30.6 mg/dl) at birth. Only one neonate had persistent hypoglycemia from birth to 12 hours of age and required treatment. All other neonates had blood glucose level above 1.7 mmol/1 (=30.6 mg/dl) at 24 and 48 hours of life. This means that the exclusively breastfed newborns have adequate glucose supply and are not at risk of having hypoglycemia in the first 48 hours of life. Again such finding goes with our study[13].

Another study done in Japan aimed to examine the incidence of symptomatic and asymptomatic hypoglycemia during the early days of life; the blood glucose levels were analyzed in 38 healthy, full-term, breast-fed neonates cared for by rooming-in immediately after birth. Blood glucose levels were measured randomly using a blood glucose analyzer from birth to discharge. Preliminary results have shown that hypoglycemia (< 40 mg/dL) seldom occurred in healthy, full-term, breast-fed neonates when cared for in rooming-in with frequent suckling immediately after birth. Although the above study mentioned included only breast fed babies, the results go with our study [14].

Other study done in United Kingdom measured RBS values only in the 1st hour .In this study, 75 healthy full term babies divided into 3 groups: a group who were breast fed, a group who were formula fed and the 3rd group was not fed.

RBS was measured only in the 1st hour. Statistical analysis found that mean RBS value have no significant difference between the 3 groups which means that the full-term infants are equipped with homeostatic mechanisms that preserve adequate energy substrate to the brain and other vital organs[15].

To see whether the type of feeding may be a predisposing factor in causing hypoglycemia, we divided the 1st group who were breast fed and also the 2nd who were formula fed into 2 groups: 1st group are those who presented with jitteriness and the 2nd are those who did not present with jitteriness. There was statistically significant difference in RBS values measured after 10 hours after birth between jittery and non-jittery which indicates that jittery babies were hypoglycemic. Then, we compared jittery babies who were breast-fed with those who were formula fed and we found that the difference was not statistically significant. This means that the state of hypoglycemia has no significant relation with the type of feeding.

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