

Risk Factors of Neonatal Hypoglycemia at Al Yarmook Teaching Hospital

Mohammed Habib Abdul-Hamed Raed Yeiha Salman

(C.A.B.P)

(C.A.B.P)

Mohammed Abdulqader Ghanim

MBChB

Abstract

Background: Neonatal hypoglycemia is a common but usually preventable condition. The sequelae of severe, prolonged hypoglycemia including neurological damage resulting in mental retardation and recurrent seizures.

Aims of study: To determine the extent of maternal and neonatal risk factors affecting a sample of neonatal hypoglycemia from al-Yarmook teaching hospital.

Methods: A case series study design at Al-Yarmook teaching hospital in the neonatal care unit, where 112 neonates included in this study, starting from November 2014 to March 2015, statistical analysis was done using SPSS.

Results: Neonatal risk factors for hypoglycemia were found: low birth weight (66.9%), prematurity (58.9%), polycythemia (33.9%), respiratory distress syndrome (32.1%), macrosomia (20.5%), sepsis (16.1%), perinatal asphyxia (8%) and Rhesus hemolytic disease (4%). Maternal risk factor of neonatal hypoglycemia was as: maternal diabetes (35.7%), premature rupture of membrane (25%), eclampsia (23.2%) and maternal use of tocolytic (16%). Regarding symptomatology asymptomatic hypoglycemia found in (41.9%) of all cases. Multiparous women (73.2%), primigravida women (26.8%).

Conclusion: Important neonatal risk factors for Neonatal hypoglycemia include low birth weight, prematurity, polycythemia and respiratory distress syndrome. Important maternal risk factors include maternal diabetes, premature rupture of membrane and eclampsia. High percentage of asymptomatic hypoglycemia necessitates high risk groups to be identified and screened.

Introduction:

In general a plasma glucose level of <50 mg/dL is a practical, reasonable, and safe threshold for assessing a newborn for hypoglycemia.⁽¹⁾ Hence, Neonatal Hypoglycemia is defined as: Blood glucose values are less than 35mg/dL in the first 2 hours of life, less than 40 mg / dL in the first 24 hours of life and less than 45 mg/dL after 24 hours among term or preterm infants.⁽³⁾

Classification of Neonatal Hypoglycemia:⁽¹⁾

- Transient (Days):
e.g.: prematurity, asphyxia, hypothermia, sepsis and maternal diabetes and toxemia.
- Transient (Weeks to months)
e.g. hyperinsulinism in small for gestational age (SGA) infant and birth asphyxia.
- Persistent.

Clinical signs:

The clinical signs of hypoglycemia are neither sensitive nor specific. Babies with signs suggestive of hypoglycemia require urgent pediatric review.⁽⁶⁾

Many neonates are asymptomatic or display minimal signs and symptoms, and therefore the detection of hypoglycemia requires a high index of suspicion, especially in at-risk neonates.⁽³⁾

Screening:

- It is recommended the first blood glucose to be measured after 2 hours of age in a risk baby and prior to the second feed unless the baby is symptomatic.⁽¹⁵⁾
- Universal screening for hypoglycemia is not recommended, however, risk infant should be screened by measuring serum glucose level within 1, 2, 4, 8, 12 and 24 hours of age or whenever the neonate is symptomatic (16)

Aims of the Study:

To determine the extent of maternal and neonatal risk factors affecting a sample of neonatal hypoglycemia from al-Yarmook teaching hospital.

Study Design:

A case series study design at Al-yarmook teaching hospital in the neonatal care unit for a period of five months, starting from 1st of November 2014 to 31st of March 2015. Screening done by using glucose meter (on call plus) there for capillary blood sampling by heel prick way. And hypoglycemia where considered as RBS <35 mg/dl in first 2 hours of life and <45 mg/dl on later hours.⁽¹⁾

Confirmatory test was done by taking 1ml of peripheral venous blood to the lab measuring plasma glucose level using spectrophotometric

(JENWAY Spectrophotometer) method the result of plasma glucose <50mg/dl were considered as hypoglycemia.

Screening test was carried out at 2h, 4h, 6h, 12h, 24h of age. Neonates who were found to be hypoglycemic on both screening & confirmatory tests were included and neonates who found to be hypoglycemic on screening test but not meet the hypoglycemic level of confirmatory test were excluded. 112 Patients were met the criteria for neonatal hypoglycemia in the first 24 hours of life.

The information taken:

- Sex.
- Gestational age:depend on examination of baby (preterm <37week of gestation, term 37-41 week and post term more than 41 week of gestation).⁽³⁾
- Birth weight (low birth weight < 2.500gm).⁽³⁾
- Symptoms if symptomatic.

Physical examination applied for all neonates within this sample to asses' sex,gestational age, birth weight, vital signs and any other sign of hypoglycemia.Also information taken from mothers about: (Maternal history, maternal illness,maternal drug intake, Type of delivery, and Parity)

The data analyzed by statistical Package for the social sciences (SPSS) program version 20.

Results:

The Sample size was (112) neonates included in this study, of them 60 (53.6%) males and 52 (46.4%) females.

Neonates less than 37 weeks were 66 (58.9%) and neonates with gestational age 37 week and above were 46 (41.1%) of total sample (N= 112) as shown:

Table (1): Gender distribution (N= 112)

Gender	NO.	%
Male	60	53.6
Female	52	46.4
Total	112	100 %

Table (2): Gestational age distribution

Gestational age	NO.	%
Less than 37 week(preterm)	66	58.9
37 weeks and more(term or post-term)	46	41.1
Total	112	100%

The result had shown also that there is strong positive correlation between gestational age and hypoglycemia in the first 2 hours.

Low birth weight 75 (66.9%), prematurity66 (58.9%), respiratory distress syndrom36 (32.1%), polycythemia30 (26.7%) macrosomia 23 (20.5 %), sepsis 18 (16.1%), perinatal asphyxia 9 (8%) and Rhesus hemolytic disease 5 (4%). As shown diagram (1):

Maternaldiabetis 40 (35.7%), premature rupture of membrane28 (25%), eclampsia 26 (23.2%) and maternal use of tocolytic 21 (18.7%), of the total sample (N=112). As shown below in the diagram (2):

Asymptomatic hypoglycemia was found in 47 (41.9%) neonates of the total sample (N=112).

Symptomatic hypoglycemia was found in 65 (58.1%) neonates of the total sample (N=112), as shown in diagram (3):

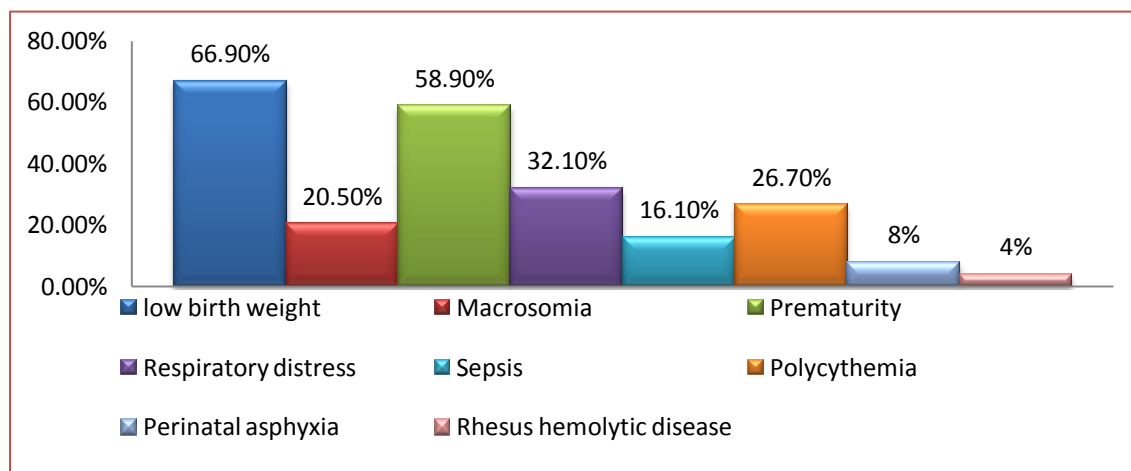


Diagram (1) Neonatal risk factors

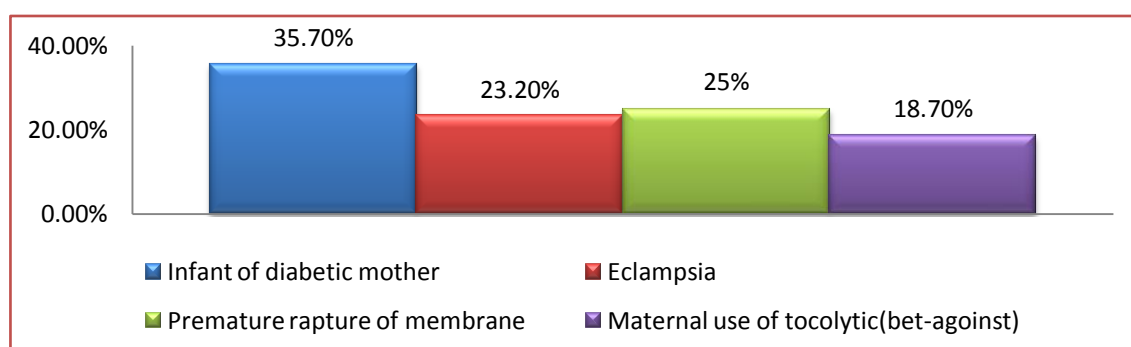


Diagram (2): maternal risk factors

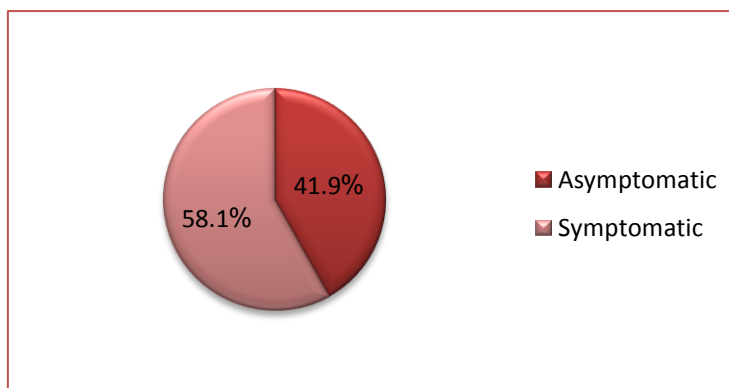


Diagram (3): Symptomatology

Clinical features of symptomatic neonates were as: jitteriness N=50 (44.6%), tachypnea N=36 (32.1%), cyanosis N=28 (25%), plethora N=24 (21.4%), lethargy N=24 (21.4%), poor feeding N=20 (17.9%), exaggerated Moro reflex N=20 (17.9%), seizure N=16 (14.3%), pallor N=10 (8.9%), jaundice N=10 (8.9%), hypotonia N=8 (7.1%), high

pitch cry N=8 (7.1%) and apnea N=2 (1.8%), As shown in diagram (4):

This study results showed that neonatal hypoglycemia is less in primigravida than multiparous women N=30 (26.8%) of the total sample (N=112), and multiparous women N=82 (73.2%) of the total sample (N=112), as shown below

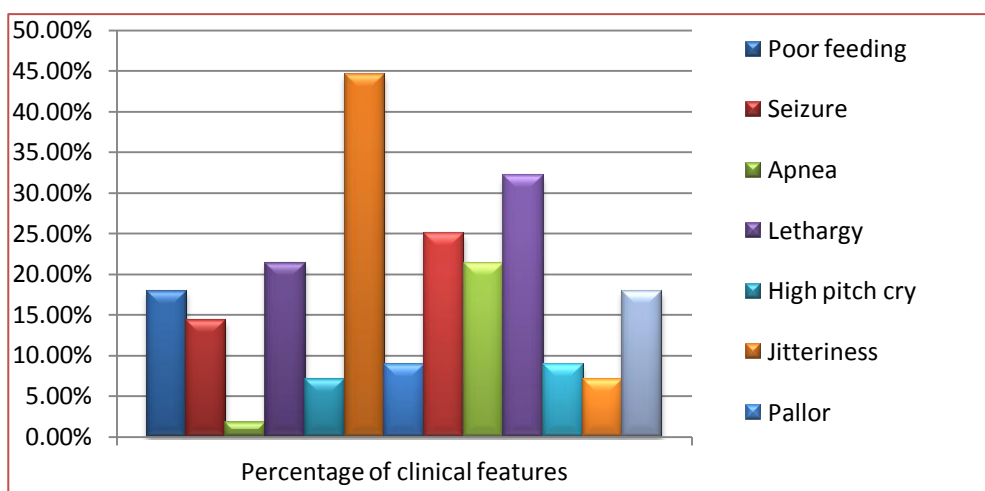


Diagram (4) Percentage of clinical sign and symptoms

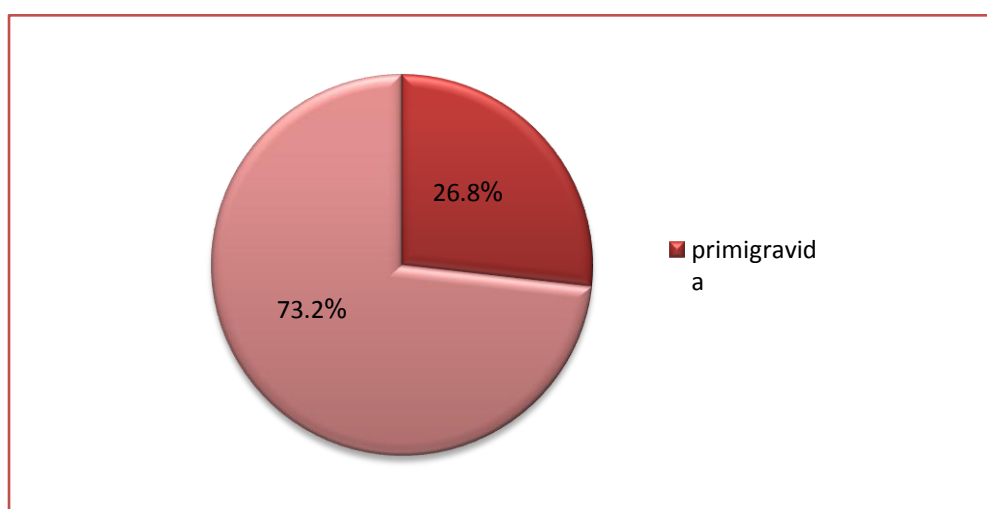


Diagram (5) Symptomatology

Discussion

The sample of this study was (N=112) of hypoglycemic neonates, in which Hypoglycemia was found in (60) male out of total number (N=112) (35.6%) which was more than females (52) out of (112) which was (46.4%), which was the same, as found by (Cornblath M., shwartz R.)⁽²¹⁾ Taking in consideration the differences in the sample and study designs.

As for the gestational age the result was: [less 37 week (66) patients out of (112) (58.9%), and 37 week and above (46) patients (41.1%)] near result found by (Bhand S. A., Sheikh F., Siyal AR., Nizamani MA.*et al.*) a study in Pakistan.⁽²²⁾

A strong association between gestational age and glucose level in the first 2 hours of neonatal life this result could explain by the fact that more gestational age leads to increase in probability of

having a normal body weight of newborn which decrease the chance of hypoglycemia.

In this study the majority (75) patients out of (N=112) (66.9%) of hypoglycemic neonates were low birth weight this result is in agreement to a study by (Burdan D. R., Botiu V., Teodorescu D.) from Romania (N=2687)⁽²⁴⁾. which also concluded that low birth weight represented the category with greatest risk of hypoglycemia.

A study from Pakistan (Bhand S. A., Sheikh F., Siyal AR., Nizamani MA.*et al.*) in 2014 (N=100)⁽²²⁾, has also concluded that low birth weight is a risk factor. Low birth weight neonates have insufficient hepatic and cardiac muscle glycogen stores and a limited capacity for gluconeogenesis.⁽¹⁾ thus more liable for hypoglycemia

Macrosomic neonates (23) patients out of the sample size in this study (N=112) (20.5%) which is in agreement as a risk factor with a study done by (Bhand S. A., Sheikh F., Siyal AR., Nizamani MA.*et al.*) from Pakistan (N=100)⁽²²⁾, which conclude that macrosomia was a neonatal risk factor for hypoglycemia. As macrosomia occurs because insulin has anabolic effects and lead to fatty deposition in the fetus.^(28, 29)

Also prematurity represent (66) patients out of (112) (58.9%) of hypoglycemic neonates and this result agree to a study by (Najati N., Saboktakin L.) from Iran (n=52)⁽²³⁾, which concluded the prematurity were important cause of hypoglycemia. Prematurity increased risk of hypoglycemia because the developmental immaturity in fasting adaptation is coupled with inadequate reserves of glycogen and fat that serve as substrates for gluconeogenesis and ketogenesis⁽¹⁾

Respiratory distress represent (36) patients out of (112) (32.1%) in this study and this result agree with the study (Bhand S. A., Sheikh F., Siyal AR., Nizamani MA.*et al.*) from Pakistan (N=100)⁽²²⁾, and also found by study of (Thomas R. Moore).⁽²⁹⁾

Sepsis ,polycythemia, birth asphyxia and Rhesus hemolytic disease of newborn were frequent pathological association with neonatal hypoglycemia in this study with results out of the sample size (N=112);(18) newborns(16.1%),(30) newborns (26.7%),(9) newborns (8%) and (5) newborns (4%) respectively. This agrees with study by (Thomas R. Moore)⁽²⁹⁾, study of (Kleigman Rm.)⁽⁴⁾, and study done by (Burdan D. R., Botiu V., Teodorescu D.) from Romania (N=2687).⁽²⁴⁾

The pathogenic mechanism of respiratory distress, sepsis, polycythemia and birth asphyxia is the increase of consumption and /or the decrease of the production of the glucose.⁽²⁴⁾

This study show that maternal risk factors for neonatal hypoglycemia with majority of maternal diabetes (40) neonates out of (112) (35.7%), and maternaleclampsia (26) neonates out of (112) (23.2%) and this results agree with results found by (Thomas R. Moore.)⁽²⁹⁾, and study by (Bhand S. A., Sheikh F., Siyal AR., Nizamani MA.*et al.*) from Pakistan (N=100).⁽²²⁾

Maternal diabetes mellitus an important risk factors for hypoglycemia in the newborn infants, poor control of diabetes during pregnancy result in hyperinsulinemia in the fetus and after labor this

lead to increase in glucose utilization and inhibition of hepatic glucose production and result in hypoglycemia in the newborn babies.⁽¹⁹⁾

Mother's arterial hypertension is a risk factor for small for gestational age neonates.⁽³⁰⁾

According to (Cornblath M.*et al.*)⁽³⁰⁾, maternal risk factor for neonatal hypoglycemia is arterial hypertension, which is correlated with neonates of eclamptic mothers of his study.⁽³⁰⁾

This study show that premature rupture of membrane represent (28) neonates out of (112) (25%) of hypoglycemic neonates this result also found by (Burdan D. R., Botiu V., Teodorescu D.) study from Romania⁽²⁴⁾, which conclude that premature rupture of membrane risk factor for neonatal hypoglycemia.⁽³¹⁾

Also maternal use of tocolytic(beta-agonist) show (21) neonates out of (112) (18.7%) of neonatal hypoglycemia, which was found by (Bhand S. A., Sheikh F., Siyal AR., Nizamani MA.*et al.*) Study in pakistan⁽²²⁾, and considered a risk factor by (kleigman RM.)⁽⁴⁾, and (Polin RA.)⁽⁵⁾, this could be du to use of beta-agonist tocolytic agent such as terbutaline also associated with hyperinsulinemia in newborn, especially if the agent was used for more than two weeks and discontinued less than one week prior to delivery.⁽³²⁾

Asymptomatic hypoglycemia (47) patients out of (112) (41.9%) of the hypoglycemic neonates and symptomatic hypoglycemia (65) patients out of (112) (58.1%) which differ from that reported by (Shams S.)⁽²³⁾, in which there was (56%) asymptomatic and (44%) symptomatic, This is probably due to that other neonatal disorders like sepsis, asphyxia, have the same clinical features of hypoglycemia and presented in large number in the study.

The clinical features of hypoglycemia of the neonates results with numbers and percentage out of the total sample size (N=112) were as the following ; jitteriness (50) neonates(44.6%), tachypnea (36) neonates (32.1%), cyanosis (28) neonates (25%), plethoric (24) neonates (21.4%), lethargy (24) neonates (21.4%), poor feeding (20) neonates (17.9%), exaggerated Moro reflex (20) neonates (17.9%), seizure (16) neonates (14.3%), pallor (10) neonates (8.9%), jaundice (10) neonates (8.9%), hypotonia (8) neonates (7.1%), high pitch cry (8) neonates (7.1%) and apnea (2) neonates (1.8%), which was found by (Khattab S., Younis N. T.) study in Iraq⁽²⁷⁾.

Also this study show (82)patients out of(112) (73.2%) of hypoglycemic neonates were neonates of multiparous women and (30) patients out of(112) (26.8%) of hypoglycemic neonates were primigravida women this high frequency of neonatal hypoglycemia in multiparous women which may be related to that pregnant women with increase parity show less care in herself not attend antenatal care clinic regularly , which was agree with the found by (COLE MD)⁽²⁰⁾ , not agree with finding of study done by (Ayoub N.I., Naif M. H.) in Iraq⁽²⁵⁾

Conclusion

1. from the result mentioned above we found that of neonatal risk factors: low birth weight, prematurity, respiratory distress syndrome, polycythemia, macrosomia, sepsis, perinatal asphyxia; and maternal risk factors: maternal diabetes and maternal eclampsia are the most important risk factors for Neonatal hypoglycemia.
2. High percentage of asymptomatic hypoglycemia necessitates high risk groups to be identified and screened.

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