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Incidence, Aetiology and Manifestations of Neonatal Hypoglycaemia

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Summary

Njokanma OF and Fagbule D. Incidence, Aetiology and Manifestations of Neonatal Hypoglycaemia. *Nigerian Journal of Paediatrics* 1994; 21:26. In a two-year prospective study of neonatal hypoglycaemia among babies admitted into the neonatal unit, Ogun State University Teaching Hospital, Sagamu, the overall incidence of the condition was 9.5 percent among 675 admissions, while the incidence for in-born babies was 2.4 percent among 1081 live births. The highest prevalence of 25.8 percent occurred in babies of gestational age≤32 weeks. The commonest aetiologic factors in the series included LBW in 51.6 percent and prematurity in 45.3 percent of the total number of cases. Respiratory distress was the commonest clinical manifestation, being present in 32.8 percent of the cases; this was followed by hypothermia in 18.8 percent and seizure in another 18.8 percent of the 64 cases. Mortality in the series was high at 49.6 percent and hypothermia, occurring in 30.0 percent of the cases, was the leading risk factor associated with mortality.

Introduction

HYPOGLYCAEMIA is an important as well as a serious metabolic disorder in the newborn infant; it may be caused by several known factors, including preterm delivery, low birthweight (LBW), small-for-gestational-age (SGA), birth asphyxia, septicaemia and maternal diabetes mellitus.[1] Neonatal hypoglycaemia is currently defined as the level of sugar in whole blood below 40mg/dl (2.2mmol/L)[2] and this is in contrast to the old definition[3] which was based on the level of blood sugar in relation to gestational and post-natal ages, respectively. This old definition has largely been abandoned, as there is no evidence that lower gestational or postnatal age, conferred any special protection against the consequencies of low blood sugar.[4] Furthermore, adverse consequencies had been associated with blood sugar level below 2.2mmol/L, irrespective of gestational or postnatal age.[5]

The first and only study on neonatal hypoglycaemia in this country was, to the best of

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our knowledge, undertaken about 16 years ago [6] and this was based on the old definition.[3] The present prospective study, based on the current definition [2] and covering a period of two years (January 1991 to December 1992), was however, carried out in order to determine the incidence, aetiological factors, clinical manifestations and mortality of the condition among in- and out-born babies admitted into the neonatal ward, Ogun State University Teaching Hospital (OSUTH), Sagamu.

Patients and Methods

The patients consisted of preterm, low birthweight (LBW), small-or, large-for-gestational-age (S or LGA), asphyxiated babies and other newborns who were products of high-risk pregnancies, such as babies born to hypertensive mothers. Medical records that were kept for each patient admitted into the ward, contained information on sex, birthweight (BW), gestational age, assessed by using the Dubowitz criteria,[7] aetiological factors of hypoglycaemia, pregnancy history and the clinical manifestations of hypoglycaemia.

Random blood sugar level on each in-born patient, was estimated at birth, or on admission of all out-born babies, using standard laboratory methods.[8] Serum bicarbonate level was also simultaneously estimated. All the babies with a level of sugar in whole blood below 2.2mmol/L were included in the study. Treatment of the hypoglycaemia consisted of intravenous bolus injection of 25 percent dextrose-water solution (4ml/kg body weight) *stat*; this was followed by an intravenous infusion of 10 percent of the solution (85ml/kg body weight/24 hours). If after the the 24-hour infusion, a repeat blood sugar level was above 40mg/dl, the infusion was continued with five percent dextrose-water solution for the next 24 hours. Chi-square and Student's "t" tests, as and when appropriate, were used for the analysis of the data.

Results

During the two-year period of the study, there were 64 patients with neonatal hypoglycaemia; thus, the incidence of the condition in our institution, was 9.5 percent out of 675 total admissions into the neonatal ward. Among the 64 patients, there were 38 out-born (59.4 percent) and 26 in-born (40.6 percent) babies. Over the same two-year period, there were 1081 live births at OSUTH; therefore, the incidence of hypoglycaemia in these 26 in-born babies was 2.41 percent among live births. The highest prevalence of hypoglycaemia in different categories of newborn babies (Table 1) was 25.8 percent among very preterm babies (gestational age, ≤ 32 weeks) and this was followed by 20.5 percent among very low birthweight (VLBW,≤1500gm) babies. The prevalence of 1.2 percent was the least among the large-for gestational-age (LGA) babies.

Of the aetiologic factors (Table II), the commonest was low birthweight (LBW ≤ 2500gm), in 33 (51.6 percent) of the babies, 16 (25.0 percent) of whom, were of VLBW. This was followed by 29 (45.3 percent) preterm babies, 16 (25.0 percent) of whom were very preterm and by 21 (32.8 percent) babies with severe birth asphyxia. It should be noted that several com-

TABLE 1

Prevalence of Hypoglycaemia among different Categories of Newborn Babies

Category	*No of cases*	*Total No of Babies*	*Percent of Total*
Birthweight (gram)			
≤1500	16	78	20.5
1500 - 2499	17	234	7.3
≥2500	31	1084	2.9
Gestational age (Week)			
≤32	16	62	25.8
33 - 36	13	120	10.8
≥37	35	1214	2.9
Intra-uterine growth			
SGA	15	182	8.2
AGA	48	1131	4.2
LGA	01	83	1.2

SGA = small-for-gestational-age
AGA = appropriate-for-gestational-age
LGA = large-for-gestational-age

TABLE II

Aetiologic Factors in 64 Cases of Neonatal Hypoglycaemia

Factor	*No of Cases*	*Percent of Total*
LBW	33	51.6
Preterm	29	45.3
Severe birth asphyxia	21	32.8
SGA	15	23.4
Septicaemia	10	15.6
Moderate birth asphyxia	9	14.1
Prolonged obstructed labour	9	14.1
Maternal hypertension	6	9.4
RDS	5	7.8
Foetal distress	4	6.3
Kernicterus	3	4.7
Delayed feeding	2	3.1
Tetanus	2	3.1
APH	2	3.1
LGA	1	1.6

LBW = low birthweight
SGA = small-for-gestational-age
RDS = respiratory distress syndrome
APH = antepartum haemorrhage
LGA = large-for-gestational-age

bined factors were involved in most cases.In Table III are listed the recorded clinical manifestations of neonatal hypoglycaemia. There were 21 (32.8 percent) patients who manifested with respiratory distress, while in 12 others each (18.8 percent), the manifestation was hypothermia, seizure and cyanosis, respectively. Sweating was the least common manifestation, occuring in only one (1.6 percent) of the 64 patients, while non-specific manifestations comprised 15 (23.4 percent) in the series. Associated and underlying aetiologic factors in some of these manifestations, included five cases of respiratory distress syndrome and six of severe birth asphyxia associated with respiratory distress, eight cases of VLBW and two of severe birth asphyxia associated with seizure and four cases of VLBW and three of severe birth asphyxia associated with apnoea.

There were 30 deaths in the series, a mortality rate of 46.9 percent. During the same two-year of the study, there were 181 neonatal deaths; thus, death from neonatal hypoglycaemia contributed 16.6 percent to total neonatal mortality.

TABLE III

Manifestations in 64 Cases of Neonatal Hypoglycaemia

Manifestation	*No of Cases*	*Percent of Total*
Respiratory distress	21	32.8
Hypothermia	12	18.8
Seizure	12	18.8
Cyanosis	12	18.8
Lethargy	10	15.6
Apnoea	9	14.1
Irritability	4	6.3
Jitteriness	3	4.7
Sweating	1	1.6
Non-specific	15	23.4

Table IV compares the 30 fatal cases and 34 survivors in respect of gestational age, birthweight, blood sugar and serum bicarbonate levels. There was a significant difference ($P < 0.025$) between the gestational age of the fatal cases and that of the survivors. Similarly, there was a difference ($P<0.05$) between the birthweight of those who died and the survivors. There was no difference ($P>0.5$) in the blood sugar level, or in the level of serum bicarbonate ($P>0.5$).

Table V summarizes some identified risk factors and the respective mortality. With nine (30.0 percent) of the 30 deaths, hypothermia was the leading risk factor, which was associated with other contributory factors, including eight babies with VLBW; this factor was followed by severe birth asphyxia that was associated with three cases of VLBW and one case of haemoperitoneum.

TABLE IV

Comparison between 30 Fatal Cases and 34 Survivors of Neonatal Hypoglycaemia with Mean Gestational Age,Birthweight, Blood Sugar and Serum Bicarbonate Levels

Feature	*Fatal Cases*	*Survivors*	*t*	*P value*
Gestational age (week)	33.80±4.5	38.78±2.34	5.46	<0.025
Birthweight (gram)	18.58±9.23	27.04±6.07	4.30	<0.05
Blood sugar (mmol/L)	1.36±0.47	1,44±0.59	0.61	>0.5
Serum bicarbonate (meq/L)	11.83±5.04*	12.23±4.66+	0.27	>0.5

+ Indicates that determination was performed on 27 patients

* Indicates that determination was performed on 22

TABLE V

Risk Factors in Relation to Mortality among 30 Patients with Neonatal Hypoglycaemia

Factor	*No of Deaths*	*Percent of Total*
Hypothermia	9	30.0
Severe birth asphyxia	6	20.0
Moderate birth asphyxia	5	16.7
RDS	5	16.7
Seizure	3	10.0
Septicaemia	2	6.7
Kernicterus	2	6.7
APH	1	3.3
Haemoperitoneum	1	3.3
Tetanus	1	3.3

RDS = respiratory distress syndrome
APH = antepartum haemorrhage

Discussion

The 9.5 percent overall incidence of neonatal hypoglycaemia obtained from the present study, was much lower than the 20.6 and 15.0 percent reported from the USA and Switzerland by Sexson [9] and Leibundgut *et al,* [10] respectively. The incidence of 2.41 percent among our in-born babies was similarly, very much lower than those cited above. Koh, Eyre and Aynsley-Green [11] have commented that the variation in the incidence of neonatal hypoglycaeemia, as reported by different authors, is a reflection of the rates of predisposing factors in the various study centres. It is noteworthy, that the current definition [2] of hypoglycaemia that was used in the present study, enabled us to identify and treat more patients than would have been, since by using the old definition, [3] Omene [6] in Benin City, reported a lower incidence of 6.6 percent than our incidence of 9.5 percent. Similarly, had this old definition been used, only 33 (51.6 percent) of our patients would have been diagnosed and treated.

The highest prevalence of hypoglycaemia was 25.8 percent among very preterm babies and this was followed by 20.5 percent among babies with very low birthweight (VLBW). Our findings in these two categories of babies were similar to those reported by other workers , [12 13] but higher than that of Pildes and Pyati. [14]

The commonest aetiologic factors in the present series, were low birthweight in 51.6 percent and prematurity in 45.3 percent of the cases. These findings compared favourably with the 44.3 percent reported by Omene. [6] As reported elsewhere, [14] combined aetiologic factors were involved in most of our patients. In the present series, patients manifested those clinical features that are usually associated with hypoglycaemia [6] and these comprised respiratory distress in 32.8 percent, hypothermia, seizure and cyanosis in 18.8 percent each, of the cases. Jitteriness manifested in only 4.7 percent of the cases. In respect of seizure and jitteriness, Omene [6] in Benin City, reported that seizure occured in 2.9 percent, while jitteriness was present in 20.0 percent of his cases. This reversed pattern of manifestations in Omene's cases vis-a-vis, our experience, would suggest that perhaps, our patients presented after onset of seizure, while the Benin patients presented earlier with jitteriness in the pre-convulsive stage.

In our series, the mortality of 46.9 percent was about twice that of Benin City, reported as 22.6 percent by Omene; [6] this higher mortality in our study, may be due to a higher prevalence of risk factors as well as the multiplicity of these factors, than in the series from Benin City. As shown above, there was a significant difference between the gestational age of the fatal cases and that of the survivors. There was also a difference between the birthweight of those who died and the survivors. Hypothermia was the leading risk factor in association with other contributory factors such as LBW, that caused 30.0 percent of the deaths.

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