ORIGINAL ARTICLE

The Association Between Neonatal Polycythemia, Hypocalcemia, and Hypoglycemia

by

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Abstract

A study about the association between neonatal polycythemia, hypoglycemia, and hypocalcemia was carried out at the Hasan Sadikin General Hospital Bandung, Indonesia, between November 1986 and August 1987. Fourty-six neonates with polycythemia were enrolled in the study and 92 neonates born during the same period formed the control subjects. The control subject neonates were sampled among those with equal birth weight and gestational age compared to the polycythemia subjects.

Blood glucose levels were examined more than three hours after birth and before the first feeding by using the God-PAP method and blood calcium levels at less than 24 hours of age by using calorimetric method. The cut-off point for hypoglycemia and hypocalcemia were 30 mg% and 7 mg%, respectively.

The results showed that there was a significant difference for hypoglycemia ($p < 0,01$) and hypocalcemia ($p < 0.05$) between the exposed subjects and the control subjects.

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Introduction

It had already known that neonatal polycythemia or hyperviscous neonate is a risk factor of hypoglycemia and hypocalcemia. Black et al, (1982) and Black et al. (1985) found significant increased hypoglycemia among the hyperviscous neonates. Goldberg et al. (1982) followed up blood calcium level on 20 neonates with hyperviscosity during their hospital stay and all patients had normal values, while Humbert et al. (1969), Gross et al. (1973) and Wiswell et al (1986) found hypocalcemia among hyperviscous neonates but their studies did not use control subjects.

The aim of this study is to find the association between hypoglycemia, hypocalcemia and neonatal polycythemia in Hasan Sadikin General Hospital Bandung, Indonesia.

Materials and Methods

Neonates of diabetic mother, congenital anomalies, hypothyroidi and neonatal infections were excluded from the study. Fourty-six neonates with polycythemia born between November 1986 and August 1987 were enrolled in the study and 92 neonates without polycythemia born during the same period formed the control group. The control group was sampled among those with equal birth weight and gestational age compared to the polycythemia group.

Venous hematocrit was obtained from studied neonates at less than 4 hours after birth. Polycythemia was defined as a venous hematocrit of 65% or higher. Blood glucose levels were examined at more than three hours after birth and before the first feeding by using God-PAP method. Blood calcium levels were examined at less than 24 hours of age by using colorimetric method. The cut-off point for hypoglycemia and hypocalcemia was a blood glucose level of 30 mg% and blood calcium level of 7 mg%, respectively.

Information from the neonatal polycythemia population was compared with that of the control subjects and analysis of fourfold tables was used to compare unpaired proportions.

Results

There were two low birth weight infants with neonatal polycythemia and two of the control subjects were appropriate for gestational age. These two low birth weight infants with neonatal polycythemia showed neither hypoglycemia nor hypocalcemia and among the control subjects one showed hypoglycemia but no hypocalcemia.

No asphyxia cases were found among the neonatal polycythemia subjects, but there were eleven asphyxia cases in control subjects; two of which had hypoglycemia and seven had hypocalcemia.

The distribution of neonatal polycythemia and control subjects is shown in table 1.

Table 1 : *Distribution of neonatal polycythemia cases and controls according to birth weight for gestaional age*

Group	No. of neonates	No. of neonates classified age		
		AGA	SGA	LGA
Polycythemia	46	35	8	3
Control	92	70	16	6

AGA : Appropriate for gestational age
SGA : Small for gestational age
LGA : Large for gestational age

Seventeen out of 46 neonatal polycythemia cases and 15 out of 92 control subjects showed hypoglycemia, as shown in table 2.

Table 2 : *Distribution of hypoglycemia among neonates with and without polycythemia*

Group	No. of neonates	No. of neonates	
		with hypoglycemia	without hypoglycemia
Polycythemia	46	17	29
Control	92	15	77

$Z = 2.710$; $P < 0.01$

Nineteen out of neonatal polycythemia and 28 out of 92 neonates without polycythemia showed hypocalcemia (table 3).

Table 3 : *Distribution of hypocalcemia among neonates with and without polycythemia*

Group	No. of neonates	No. of neonates	
		with hypocalcemia	without hypocalcemia
Polycythemia	46	19	27
Control	92	28	64

$Z = 1.27$; $P > 0.05$

If the 7 hypocalcemia cases out of 11 neonatal asphyxia cases from the control subjects are excluded, the percentage of hypocalcemia between neonatal polycythemia and neonates without polycythemia is significantly different ($Z = 2.255$; $P < 0.05$).

Discussion

Neonatal polycythemia has been defined as a venous hematocrit in excess of 60 percent (Humbert er al., 1969; Kontras, 1972) or 65 percent (Wirth et al., 1979; Cross et al., 1973). The use of a venous hematocrit of 65 percent or greater is now generally accepted as the definition of neonatal polycythemia (Oski and Naiman, 1982).

In this study the cut off point for neonatal polycythemia is set at a venous hematocrit of 65%. Using this criteria the prevalence of neonatal polycythemia was 4.1% in Hasan Sadikin General Hospital (Dahlan and Sukadi, 1987).

A venous hematocrit of 65% was invariably associated with hyperviscosity, but some infants with venous hematocrit between 60% and 64% also had hyperviscosity (Wirth et al., 1979). In this study blood viscosity was not determined.

Black et al. (1982) found 30 out of 111 hyperviscous patients sufferring from hypoglycemia compared to 11 out of 110 control patients ($p < 0.05$), but the hypoglycemia of 15 hyperviscous patients and 9 control patients was diagnosed by dextrostix. During the first six hours 8 of 20 hyperviscous patients had blood glucose levels less than 40 mg/100 ml, compared to one of the ten control patients. Blood glucose levels were measured by using dextrostix (Goldberg et al., 1982). Black et al. 1985 also found that hypoglycemia was more common among the infants with hyperviscosity than among control infants (P 0.02). In this study, with the cut-off point for hypoglycemia set at a blood glucose level of 30 mg%, the presentage of hypoglycemia among neonatal polycythemia cases was significantly different compared to the control group. Hypoglycemia was more common among neonatal polycythemia cases because the glucose disappearance rates increased in neonates with polycythemia. This can not be attributed to hyperinsulinism or the lack of a gluconeogenic substrate (Leake et al., 1976). It has been suggested that the hypoglycemia may be a consequence of either increased cerebral extraction of glucose or reduced endogenous glucose production caused by sluggish hepatic circulation (Leake et al., 1980).

Goldberg et al. (1982) found no abnormality of serum calcium levels in 20 hyperviscous infants. Humbert et al. (1969) found 4 hypocalcemia cases among 11 small for gestational age infants with polycythemia and Gross et al. (1973) found one out of 18 neonates with polycythemia, whereas Wiswell et al. (1986) found 9 (1%) out of 932 neonatal polycythemia. All the above mentioned studies did not use control subjects.

In this study hypocalcemia on neonatal polycythemia was not significantly different compared to control patients, but if the control group was corrected by means of exclusive neonatal asphyxia with hypocalcemia, the difference of hypocalcemia on neonatal polycythemia and control patients was significant.

The conclusion of this study is that there was an association of neonatal polycythemia and hypoglycemia and hypocalcemia, respectively. In caring of neonatal polycythemia blood glucose and calcium should be monitored as routine examination.

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