Original Research Article

Early neonatal outcome of preterm babies with absent or reverse end diastolic flow in antenatal doppler velocimetry

Mohanraj Kannan, Aishwarya Lakshmi L. G.*, Rajakumar P. G., Selvaraj R.

Department of Paediatrics, Shri Sathya Sai Medical College and Research Institute, Sri Balaji Vidyapeeth University, Chengalpattu, Tamil Nadu, India

*Correspondence:
Dr. Aishwarya Lakshmi L. G.,
E-mail: aish_lg@hotmail.com

ABSTRACT

Background: Preterm babies with abnormal doppler velocimetry during second and third trimesters of pregnancy pose various early neonatal morbidities like recurrent hypoglycaemia, feed intolerance and prolonged hospital stay. In our study we compared the incidence of hypoglycaemia, feed intolerance, risk of necrotising enterocolitis (NEC) and length of hospital stay among preterm babies with abnormal doppler flow to the gestational age matched preterm babies with normal umbilical artery doppler flow velocimetry.

Methods: 30 preterm babies who had abnormal umbilical artery flow during their last antenatal doppler scan were included as study group and gestational age matched 30 preterm babies who had normal doppler study had been taken as controls. The incidence of hypoglycaemia, feed intolerance, NEC, length of hospital stay had been compared between two groups.

Results: The case group with abnormal umbilical artery doppler had increased incidence of hypoglycaemia (15 of 30 babies in case versus 5 of 30 babies in control) which was statistically significant. Feed intolerance, necrotizing enterocolitis and length of hospital stay were all significantly increased in preterm babies with abnormal umbilical artery doppler when compared to preterm babies with normal umbilical artery doppler flow.

Conclusions: Preterm babies with abnormal umbilical artery doppler were at increased risk of hypoglycaemia, feed intolerance, NEC and prolonged hospital stay. Knowledge on this is important to monitor closely for hypoglycaemia, gradually increase feeds and explain parents about expected morbidities which can increase the length of hospital stay in neonatal intensive care unit (NICU).

Keywords: Preterm babies, Absent or reverse end diastolic flow, Hypoglycaemia, Feed intolerance, Necrotising enterocoloitis, Length of hospital stay

INTRODUCTION

The incidence of high risk pregnancy has increased in this era. Pregnancies complicated with hypertension, eclampsia, oligohydramnios, gestational diabetes, chorioamnionitis has led to more preterms and intrauterine growth restriction (IUGR) babies being delivered. The advance in perinatal care has improved survival of preterm and very low birth weight babies. Doppler velocimetry of umbilical artery is a good predictor of perinatal morbidity in intrauterine growth restricted infants.[1] Hence antenatal doppler scan has been introduced as a part of fetal biophysical assessment. The most severe wave forms observed are absent-end diastolic flow and reverse–end diastolic flow patterns.[2] Pregnancy induced hypertension (PIH) is the most common cause for compromised umbilical artery flow. These foetus suffer intra uterine hypoxia leading to increase in incidence of IUGR and low birth weight babies. Even after birth they have metabolic maladoption leading to hypoglycemia, abnormalities in the

splanchnic blood flow persists postnatally leading to feed intolerance and necrotizing enterocolitis. These co morbidities increase the length of hospital stay with poor long term neurodevelopmental outcome.

In our study we aimed at identifying the early neonatal out comes and morbidities associated with preterm infants who had absent or reverse end diastolic flow (AREDF) in umbilical artery compared to preterm infants with normal umbilical artery velocimetry.

METHODS

This was a case – control study done from September 2019 to March 2020 in department of pediatrics, Shri Sathya Sai Medical College and Research Institute.

Inclusion criteria

All the preterm babies less than 34 weeks who had underwent doppler ultrasound velocimetry in our obstetrics department within the study period. Babies less than 34 weeks of gestational age were included to avoid late preterm baby's clinical characteristics.

Case group included 30 preterm babies who had ARED flow and control group included 30 preterm babies with normal umbilical artery flow.

Exclusion criteria

Babies of multiple pregnancy, with major congenital anomalies and parental non-consent were excluded from the study.

Standardization of antenatal doppler velocimetry

Our department of obstetrics and gynaecology follows American journal of obstetrics and gynaecology's recommendation for antenatal doppler flow study of umbilical artery. Systolic/diastolic (S/D) ratio, pulsatility index (PI), resistance index (RI) values are charted for gestational age with 50th and 95th percentile.

Phillips HD11XE colour doppler system is used for estimation

Feed intolerance

Any one of the following feature is taken as feed intolerance: bilious or haemorrhagic aspirate of gastric content, vomiting more than 2 times in 12 hours, and abdominal distension or RT aspirate more than 50% of the previously given feed.

All the babies are managed uniformly for their morbidities like respiratory distress syndrome (RDS), hypoglycemia, sepsis and necrotising enterocolitis (NEC) as per unit protocol.

Length of hospital stay is taken as from the day of birth to day of discharge from the hospital.

Statistical tools

The data collected from the patients were documented in the study performa. Microsoft excel has been used to generate master charts, tables and graphs. Statistical package for the social sciences (SPSS) software was used to analyse the data using chi-square test, independent t-test.

The level of significance noted by significant p value <0.05.

RESULTS

Totally 30 preterm babies <34 weeks of gestational age with absent or reverse end diastolic flow were enrolled in the case group during the study period. 30 preterm babies with normal umbilical artery flow in doppler scan were enrolled in control group, they are gestational age matched to the case group (Table 1). All the 60 babies in the study are inborn and had an antenatal doppler umbilical artery flow assessment done in our hospital.

The mean birth weight in case was 1.46 kg (±420 gm) and in control group was 1.85 kg (±400 gm).

Pregnancy induced hypertension (PIH) is the common high risk pregnancy which leads to compromised doppler umbilical artery flow. In our study 18 mothers in case group (60%) and 17 mothers in control group (56%) had PIH (Table 2).

Hypoglycaemia (capillary blood glucose less than 40 mg/dl after 1 hour of life)

Total 15 babies (50%) in the case group (preterm babies with abnormal umbilical artery flow) had hypoglycemia while 5 preterm babies (16%) in control group had hypoglycaemia. This showed a statistically significant increase in incidence of hypoglycaemia among case group, with p value of 0.006 (Table 3).

Table 1: Distribution of gestational age in study groups (N=60).

Preterm babies	30 weeks GA	31 weeks GA	32 weeks GA	33 weeks GA	34 weeks GA	Total	Mean birth weight
No. cases (ARED)	2	3	6	8	11	30	1.46 kg (±420 gm)
No. controls	2	3	6	8	11	30	1.85 kg (±400 gm)

Table 2: Maternal risk factors associated.

Parameter	PIH/ecl-ampsia	Oligohydra-mnios	No risk factors
Case (N=30)	18	6	6
Control (N=30)	17	4	9

Table 3: Incidence of hypoglycemia between case (30) and control (30) groups.

Parameter	No. of babies had hypoglycemia	Percentage
Case	15	50
Control	5	16

Occurrence of feed intolerance between case and control groups

14 out of 30 babies (46%) with abnormal umbilical artery flow had feed intolerance, whereas 6 out of 30 babies (20%) in the control group had feed intolerance which showed a statistically significant p value 0.03 (Table 4).

Table 4: Incidence of feed intolerance between case and control.

Parameter	No. of babies with feed intolerance	Percentage
Case	14/30	46
Control	6/30	20

Necrotizing enterocolitis

4 babies (13.3%) in the case group had necrotizing enterocolitis. All were of NEC stage 2 and was managed conservatively. No babies in the control group had NEC. This shows a statistically significant (p value 0.005) increased risk of developing NEC in babies with absent or reverse end diastolic flow in doppler velocimetry (Table 5).

Table 5: Incidence of necrotizing enterocolitis.

Parameter	Feed intolerance	NEC
Case (n=30)	14	4/14
Control (n=30)	6	0/6

Duration of hospital stay between the case and the control group

The mean duration of hospital stay in case group was 8.5 days (±3.5 days) and in control group was 6 days (±2.5 days).

The babies with abnormal umbilical artery flow required prolonged hospital stay when compared to their control group. This is statistically significant with t-test value 0.03 (Table 6).

Table 6: Master table: early neonatal outcomes compared between preterm babies with AREDF in antenatal doppler scan and preterm babies with normal umbilical artery flow.

Outcomes	AREDF (n=30)	Normal doppler (n=30)	P value
Mean birth weight (kg) (SD)	1.46 (±420 gm)	1.85 (±400 gm)	-
Hypoglycemia	15	5	0.006
Feed intolerance	14	6	0.03
NEC	4	0	0.005
Duration of hospital stay (days) (SD)	8.5 (±3.5)	6 (±2.5)	0.03
Mortality	2	0	-

DISCUSSION

It is known that preterm and low birth weight babies are at increased risk of multiple morbidities and mortality in the first week of life. With advanced perinatal care the outcome of preterm babies have significantly improved but the babies with ARED flow in their doppler had more morbidities compared to preterm babies with normal umbilical artery doppler. The mean gestational age in the study group was 32weeks +4days. The lowest gestational age of delivery was 30 weeks. Anshual et al in their study concluded that fetus with abnormal umbilical artery flow have early delivery and increased neonatal intensive care unit (NICU) stay than those with normal umbilical artery flow.[3]

In our study 18 (60%) mothers had PIH and 6 (20%) mothers had oligohydramnios in case group, comparatively in Anshual et al study the incidence of PIH was 61.8% and oligohydramnios was 28.6% suggesting that mothers with PIH and oligohydramnios are at increased risk of having abnormal fetal umbilical artery doppler velocimetry.[3]

In our study 15 (50%) babies who had AREDF suffered at least one episode of hypoglycemia while compared to 5 (16%) of babies with hypoglycemia in control group. All the hypoglycemic episodes were asymptomatic. In the AREDF group hypoglycemia have occurred within the 24 hours of life. This result concludes that babies with AREDF in their doppler scan are at increased risk of hypoglycemia, especially in the first 24 hours of life. Hawdon et al in a study of prediction of impaired metabolic adoption by antenatal doppler studies have concluded that in the first few hours of life there was continuous risk of severe hypoglycemia in newborns who had abnormal doppler umbilical artery velocimetry.[4]

In our study 14 (46%) of babies with AREDF had feed intolerance when compared to 6 (20%) of babies in control group. Mukhopad et al study showed 69.5% of babies with

absent or reverse end diastolic umbilical artery flow had feed-intolerance when compared to 20% in preterm with normal doppler study.[5]

In our study 4 out of 30 (13%) babies with AREDF suffered NEC, all 4 of them are managed conservatively. In control group there was no NEC seen. This infers abnormal umbilical artery flow is an important risk factor for developing NEC in preterm babies. Study done by J Dorling et al states that the incidence of NEC is increased in infants with AREDF, the reason being abnormal splanchnic blood flow persists postnataly that recovers during the first week of life.[6]

In our study the mean duration of hospitalization for babies with AREDF was 8.5days (±3.5 days) when compared to 6 days (±2.5 days) in control group. Arora et al from Bombay hospital institute of medical sciences done a study on significance of umbilical artery doppler in perinatal outcome with 140 pregnant women who had abnormal umbilical artery flow, in his study the mean duration of hospitalization among cases was 5.5 days as compared to 2.3 days in control group.[7]

Limitations

All the hypoglycemic events are asymptomatic in our case and control group hence the significance of early detection of hypoglycaemia is not established with a small number of study population. Follow up for at least 12 months would have given the real impact of absent or reverse end diastolic flow doppler finding in preterm babies.

CONCLUSION

Preterm delivery due to pregnancy induced hypertension is a very common reason for NICU admission. Doppler ultrasound for umbilical artery has a significant impact on early neonatal outcomes like occurrence of hypoglycemia, feed intolerance, NEC and prolonged hospital stay. AREDF in doppler ultra-sonogram from second trimester of pregnancy is a sign of IUGR and fetal hypoxia in high risk pregnancy. These babies needs appropriate interventions during delivery and should be supported with expectant morbidities.

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