Stable term infants with acidaemia had no major adverse outcomes within 48 hours of birth

King TA, Jackson GL, Josey AS, et al. *The effect of profound umbilical artery acidemia in term neonates admitted to a newborn nursery.* *J Pediatr* 1998 Apr;132:624-9.

Question

Do term or near term infants who are stable and have an umbilical artery pH ≤ 7.0 (fetal acidaemia) have any adverse outcomes in the first 48 hours of life?

Design

Cohort analytic study.

Setting

A university hospital in Dallas, Texas, USA.

Participants

35 newborn infants with acidaemia who were ≥ 35 weeks gestation, weighed ≥ 2100 g, had an Apgar score ≥ 7 at 5 minutes, and had no serious cardiopulmonary disturbance. 35 infants who did not have acidaemia (controls) were identified and matched for gestational age within 1 week of enrolment. Exclusion criteria were obvious congenital anomalies and in utero infections.

Assessment of risk factors

Acidaemia was identified within 4-6 hours of birth using double clamped segments of cord for acid base analysis and was categorised as respiratory ($PCO_2 \geq 62.5$ mm Hg with a base deficit < 12 meq/l), metabolic ($PCO_2 < 62.5$ mm Hg with a base deficit ≥ 12 meq/l), or mixed metabolic-respiratory ($PCO_2 \geq 62.5$ mm Hg and base deficit ≥ 12 meq/l) based on previous laboratory values. Urine analysis was done to assess non-prescription drug use by the mothers. Perinatal and delivery data were extracted from charts.

Main outcome measures

Head and body tone, primitive and deep tendon reflexes, and cranial nerve function were measured on days 1 and 2 of life. Auditory brain stem response was done on day 2. Renal function was assessed by noting the time to first void, doing a urine analysis on day 1, and measuring serum blood urea nitrogen and creatinine on days 1 and 2. Gastrointestinal function was assessed by an abdominal examination on days 1 and 2, evidence of feeding intolerance, and stool guaiac tests on days 1 and 2. Hepatic dysfunction was assessed by measuring serum transaminases and alkaline phosphatase on days 1 and 2.

Infants with acidaemia were more likely than infants without acidaemia to have fetal heart rate deceleration (46% v 11%, $p=0.001$), lower median Apgar scores at 1 minute (8 v 9, $p<0.001$), and some abnormal laboratory values (higher creatinine levels on day 2 [$p=0.005$], positive urine chemstrip heme results [14 v 3 infants, $p=0.005$], higher levels of alanine aminotransferase on day 2, [$p=0.01$], and lower levels of gamma glutamyltranspeptidase on day 1 [$p=0.03$]). Mothers of infants with acidaemia were more likely to have had caesarean section (57% v 17%, $p=0.001$) and spinal anaesthesia (46% v 3%, $p=0.001$) and used less narcotic analgesia (26% v 49%, $p=0.05$). The groups did not differ for birth weight; Apgar scores at 5 minutes; pregnancy induced hypertension; abruptio placentae; moderate or thick meconium; use of general or epidural anaesthesia; neurological outcomes (muscle tone, reflexes, cranial nerves, and auditory brain stem evoked potentials); renal function measured by blood urea nitrogen, urine specific gravity, hematuria, or time to first void; hepatic function measured by aspartate aminotransferase or alkaline phosphatase; abdominal examinations; stool guaiac test results; or feeding intolerances.

Main results

Term or near term infants who were stable and had an umbilical artery pH ≤ 7.0 (fetal acidaemia) generally did not differ for most outcomes within 48 hours of birth from infants with no acidaemia.

Conclusion

Term or near term infants who were stable and had an umbilical artery pH ≤ 7.0 (fetal acidaemia) generally did not differ for most outcomes within 48 hours of birth from infants with no acidaemia.

Source of funding: University of Texas Southwestern Medical Center.

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Commentary

Fetal acidaemia (umbilical artery pH ≤ 7.0) may be one of the clinical markers to detect in utero asphyxia, but by itself it has failed to be associated with long term consequences of hypoxia in vigorous, term newborns. The American Academy of Pediatrics (AAP) and the American College of Obstetricians and Gynecologists (ACOG) concur that diagnosis of acute perinatal asphyxia is based on multiple factors: fetal acidaemia (cord pH ≤ 7.0), persistent Apgar score ≤ 3 at 5 minutes, neonatal neurological sequelae, and multiple organ system sequelae.¹ This prospective study by King *et al* confirms that fetal acidaemia by itself in stable, vigorous term and near term newborns admitted to the newborn nursery, is not associated with the adverse outcomes of hypoxic-ischaemic encephalopathy.

All infants in this prospective study were from 1 US perinatal centre with matched controls; 97% of these infants had umbilical artery pH measures. Fetal acidaemia was defined as an umbilical artery pH of ≤ 7.0 , which concurs with the AAP and ACOG. The mothers of infants with acidaemia had a higher caesarean section rate and a higher use of spinal anaesthesia which concurs with previously reported results.²

The clinical implications of this study are that stable, vigorous newborns with fetal acidaemia alone, can be safely admitted to the newborn nursery and do not have adverse outcomes. The outcomes for these infants are similar to infants without acidaemia. This has implications for the infant and also for the family because it prevents an unnecessary

admission to the highly technological neonatal intensive care unit. For the neonatal nurse practitioner who performs resuscitations of these infants, the study confirms that these infants can safely be sent to the newborn nursery.

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1 American College of Obstetrics and Gynecology, Committee on Obstetric Practice. *Fetal distress and birth asphyxia*. Washington: American College of Obstetrics and Gynecology, 1994. Committee opinion no 137.

2 Mueller MD, Bruhwiler H, Schupfer GK. *Obstet Gynecol* 1997;90:131-4.