

Birth Asphyxia - Summary of the previous meeting and protocol overview

Dr Ornella Lincetto, WHO Geneva

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World Health
Organization

Objective of the meeting

- To present the result of the WHO/SNL meeting to develop a diagnostic tool for the recognition of birth asphyxia at hospital and community level in developing country settings
- To adapt the study protocol for country implementation



Uses of a valid diagnostic instrument

- To determine the burden of disease due to birth asphyxia
- To improve outcome definitions for:
 - studies for the identification of determinants and risk factors and health consequences of birth asphyxia
 - randomized clinical trials to test interventions to prevent/treat birth asphyxia and its consequences



Public health importance

- Each year 4 million neonates die, representing 38 % of all deaths of children under 5 years of age
- 23% of neonatal deaths in low-income countries are due to birth asphyxia
- 25 to 30% of stillbirths occur intrapartum
- Disability?



Lack of information

- Because of the limited availability of data, and despite its enormous magnitude, available figures are likely to underestimate the real proportion of the problem
- Epidemiological research is needed to accurately estimate the contribution of birth asphyxia to perinatal morbidity and mortality at community level



Limitations of current diagnostic tools

- The major difficulty in collecting accurate epidemiological data on birth asphyxia is the lack of a common definition of the condition
- At the moment a gold standard for the diagnosis of birth asphyxia is not available even in most developed settings
- Most studies have been conducted in hospital settings in developed countries and may not be representative of the situation at community level in developing countries



Definition of birth asphyxia

Evolution from the utilization of a single indicator such as low Apgar score or delayed respiration to a multiple indicator approach focusing especially on the neurological damage



Current definition (AAP, ACOG, ITCP)

- Umbilical artery metabolic or mixed respiratory-metabolic acidemia with pH less than 7.00
- A persistent Apgar score of 0 to 3 for more than 5 minutes
- Neonatal neurological sequelae, such as seizures, coma or hypotonia (neonatal encephalopathy)
- Multiorgan system dysfunction



Current definition (WHO ICD-10)

Severe birth asphyxia

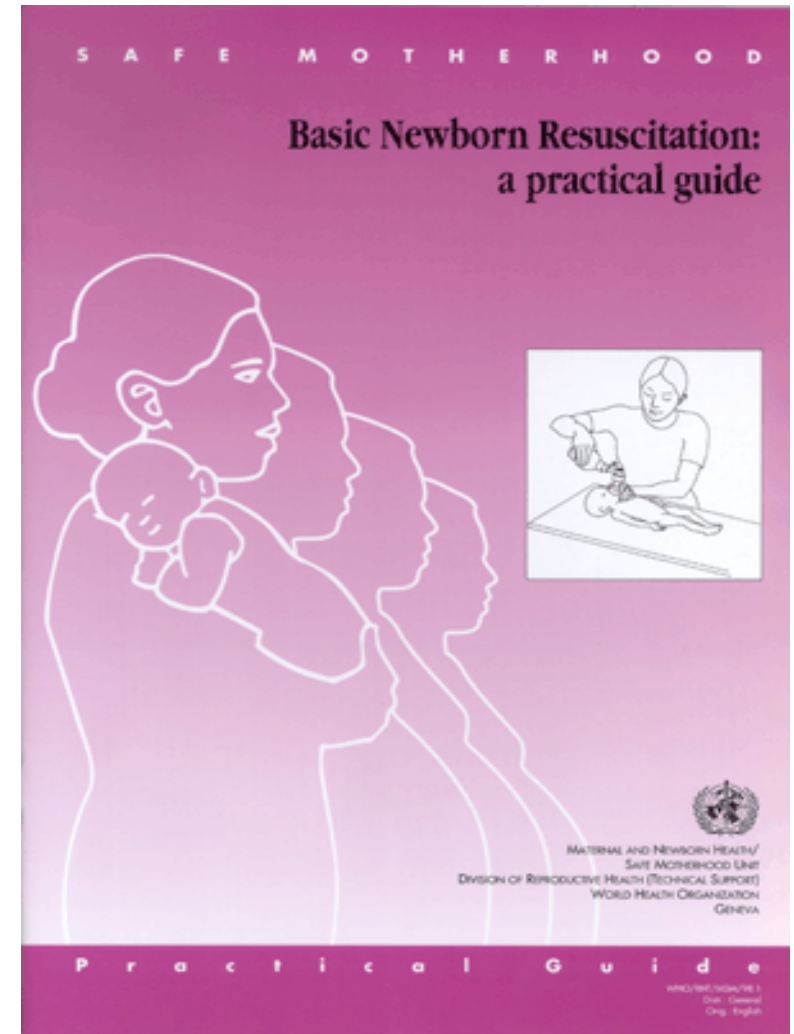
- Pulse less than 100 per minute at birth and falling or steady
 - Absent or gasping respiration
 - Poor colour
 - Absent tone
- > Apgar score 0-3 at 1 minute



Other WHO definition

(Basic newborn resuscitation a practical guide)

- Birth asphyxia defined as the failure to initiate and sustain breathing at birth



WHO definition use and limitations

- Appropriate to screen and identify infants that need resuscitation and further care
- Specificity and predictive value for death and neurological damage are limited
- Tend to over diagnose cases as opposed to definition based on the observation of neonatal encephalopathy (up to 8 times more)



Proposed direction

Diagnostic tool (community and first level facilities) based on:

- **direct observation** of the newborn within 24 hours of birth
- **retrospective recollection of information** on pregnancy, delivery and immediate postnatal period indicative of an hypoxic-ischemic insults before or during delivery



Important considerations

- In developed countries, with intrapartum factors becoming very rare events, cases of neonatal encephalopathy are probably more and more related to antepartum causes or to the superimposition of intrapartum insults over an already affected antepartum situation
- In poor settings, with limited access to adequate obstetric care, intrapartum factors are likely to still represent the major (preventable) cause of neonatal encephalopathy.



Conditions in developing countries

- Limited knowledge of determinants and outcomes
- Large number of cases
- Challenge: to identify a case definition as much as possible specific, related to significant outcomes, and feasible to apply



Proposed topics for discussion

Developing Country Community Settings:

- What indicators of birth asphyxia and related outcomes that can be feasibly applied in peripheral (community) settings in developing countries by the health worker?
- What will be the approach to define and validate the best indicators in the peripheral setting?



Proposed agenda

Day 1: Protocol and study revision

- Gold standard
- Diagnostic tool

Day 2: Plan of action for study implementation



Gold standard

- The ACOG definition will provide a gold standard against which to test a diagnostic tool that will be subsequently used at community level where direct observation of labour and delivery will not be possible and no laboratory assessment will be available.



ACOG definition

- Umbilical artery metabolic or mixed respiratory-metabolic acidemia with pH less than 7.00
- A persistent Apgar score of 0 to 3 for more than 5 minutes
- Neonatal neurological sequelae, such as seizures, coma or hypotonia (neonatal encephalopathy)
- Multiorgan system dysfunction



Questions

- The full ACOG definition implies blood gas and acid base assessment at birth, as well as laboratory markers of multiorgan system dysfunction.
- What are the challenges for using these criteria in developing country facilities?
- Are certain components of the definition more essential than others to obtain an accurate diagnosis?



Metabolic acidemia

ACOG criterium

Umbilical artery metabolic or mixed respiratory-metabolic acidemia with $\text{pH} < 7.00$

Gold standard ? (Facility level)

Blood gas and acid base assessment ($\text{pH} < 7.00$ and base deficit of 12 mmol/L)



Apgar score

ACOG criterium

A persistent Apgar score of 0 to 3 for more than 5 minutes

Gold standard

Apgar score assessment



Neonatal encephalopathy

ACOG criterium

Neonatal neurological sequelae, such as seizures, coma or hypotonia (neonatal encephalopathy)

Gold standard

Neonatal encephalopathy diagnosed according to the criteria proposed by Ellis et al (2000): Conscious level, tone, suck, primitive reflexes, brain stem reflexes, seizures, respiration



Multiorgan system dysfunction

Nervous system

ACOG criterium

Multiorgan system dysfunction

Gold standard

Neonatal encephalopathy
(as before)
Ultrasonography



Multiorgan system dysfunction

Cardiovascular system

ACOG criterium

Multiorgan system dysfunction

Gold standard

Heart rate
Blood pressure
Need for pressor agents
Creatinine kinase MB
isoenzyme



Multiorgan system dysfunction

Respiratory system

ACOG criterium

Multiorgan system dysfunction

Gold standard

Tachypnea

Apnea

Requirement of
supplementary oxygen

Requirement of positive
airways pressure or transient
ventilation

Requirement of mechanical
ventilation



Multiorgan system dysfunction

Renal function

ACOG criterium

Multiorgan system dysfunction

Gold standard

Hematuria
Anuria
Oliguria
Elevation of serum
creatinine



Multiorgan system dysfunction

Hepatic function

ACOG criterium

Multiorgan system dysfunction

Gold standard

Elevation of aspartate transaminase, alanine transaminase, lactate dehydrogenase



Multiorgan system dysfunction

Hematologic function:

ACOG criterium

Multiorgan system dysfunction

Gold standard

Thrombocytopenia
Increase in nucleated red
blood cells



Tool definition

- As a starting point for the discussion we would propose to refer to the criteria proposed by the American College of Obstetricians and Gynecologists
- “Birth asphyxia” defined as a *hypoxic insult severe enough to cause metabolic acidosis, neonatal encephalopathy and multiorgan system dysfunction* .



Diagnostic tool

**Potential variables
to be included**

Challenge

The main challenge is to operationalize the criteria of the definition at community level in developing country settings by using available information according to:

- **Feasibility.** The variables should be easily observed by the health workers and easily recollected from the mothers.
- **Biological and clinical relevance** (defined by review of scientific evidence and expert consensus)



Retrospective assessment (risk and indication of a hypoxic event)

- **Antepartum variables:** maternal age, primiparity, multiple birth, male sex, short stature, no antenatal care
- **Intrapartum variables:** prolonged labour, no cephalic presentation, difficult labour, cord prolapse, meconium, haemorrhage
- **Respiratory patterns at birth:** infant not able to cry, not able to breath, pale, provider had to make efforts to make the baby cry



Direct Observation (Neonatal encephalopathy)

- Neonatal encephalopathy diagnosed according to the criteria proposed by Ellis et al (2000):
 - conscious level
 - tone
 - suck
 - primitive reflexes
 - brain stem reflexes
 - seizures
 - respiration



Direct Observation (Multiorgan system dysfunction)

- Nervous system: Neonatal encephalopathy
- Cardiovascular system: Heart rate, blood pressure
- Respiratory system: Tachypnea, Apnea
- Renal function: Anuria, Oliguria, Hematuria
- Hepatic function: ?
- Hematologic function: ?

