

Hypoxic Ischemic Encephalopathy. ***Still haunting!***

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HIE. Definition

- ***Hypoxia***: partial or complete lack of oxygen in the brain or blood.
- ***Ischemia*** is a reduction in or a cessation of blood flow into an organ, which compromises not only the oxygen delivery to the tissues but substrate delivery as well (Vannucci RC, 1997).
- HIE is a neurological consequence of a non-progressive encephalopathic clinical picture (Rufo-Campos and Palencia-Lucas, 2000).

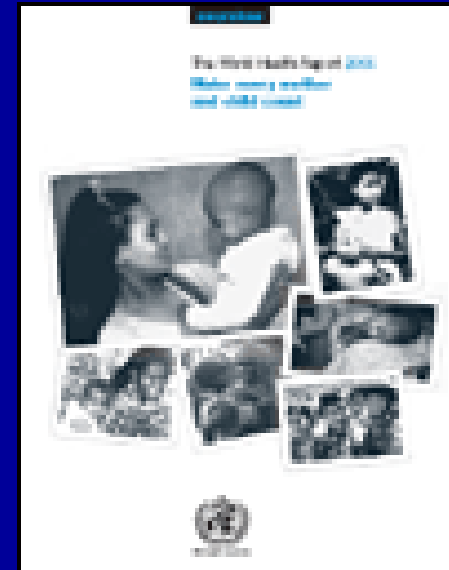
Magnitude of the Problem

World Health Report, 2005- Make every Mother & Child count

- Preterm birth, birth asphyxia and infections account for 37% of the total death among children under five.



<http://www.who.int/mediacentre/news/releases/2005/pr16/en/index.htm> WHO





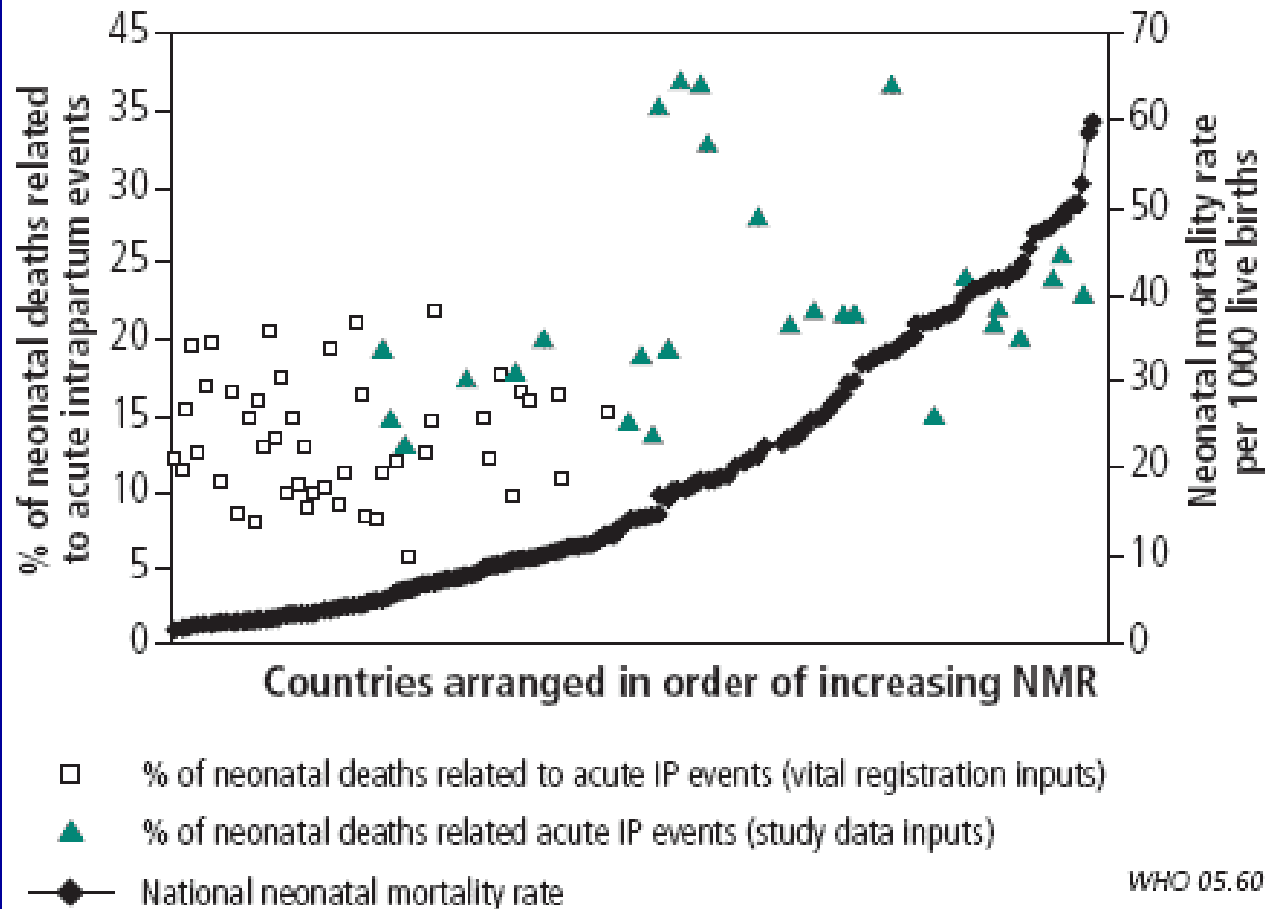
- Reported global totals of neonatal deaths due to the non-specific condition of birth asphyxia vary from **0.7 million to 1.6 million** . “World Health Organization. *Global burden of disease, 2000*” , 2003
- Of the more than 5 million neonatal deaths that occur worldwide each year, it has been estimated that birth **asphyxia accounts for 19%** of these **Jamison , WHO, 1999** .

- Most common diagnoses for admission of critically ill neonates in the developing countries is peripartum asphyxia with its numerous complications (Zupan, 2003)
- Statistically, asphyxia claims the lives of eight to ten per 1,000 infants worldwide.

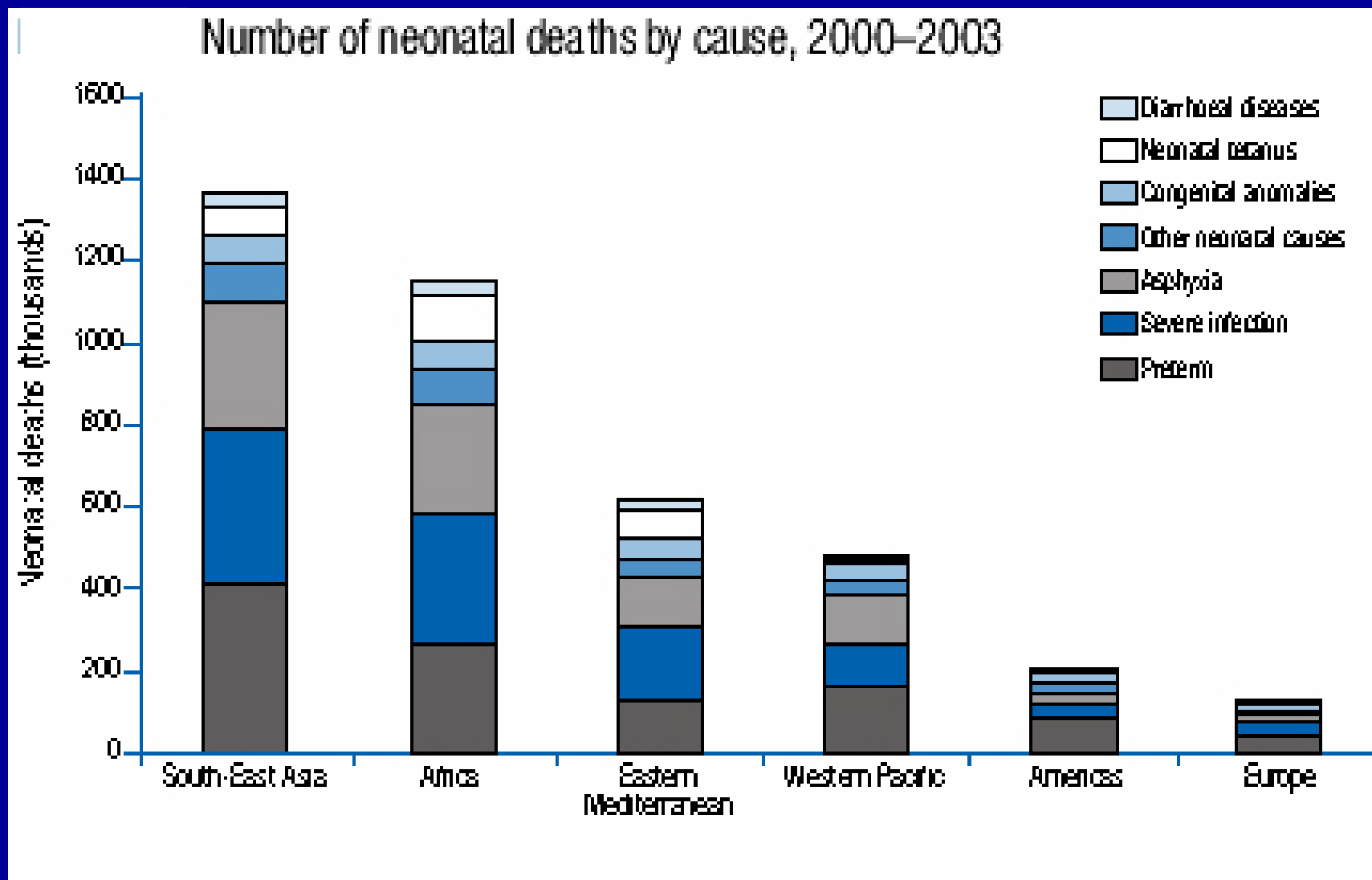
Sherman et al, 2002



Input data by country from vital registration (48 countries, $n = 97\ 297$) and studies (46 populations, 30 countries, $n = 12\ 355$). Countries are arranged in order of increasing neonatal mortality rate (NMR) and the reported proportion of neonatal deaths related to intrapartum (IP) events is plotted



(Lawn et al, 2005),
Bull World Health Organ vol.83 no.6 Geneva June 2005



(World Health Report, 2005),
<http://www.who.int/whr/2005/chapter5/en/>



- Apgar < 5 among infants > 37 wks:
- 15/1000 live births.
- Overall mortality: 42%
- Apgar scores remained 0-3 at 5 min, mortality was 77%.
- severe-to-moderate HIE :44 (52%)

Risk factors

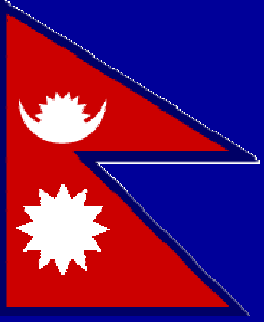
- Primiparity
- Prolonged second stages of labour [Nathoo et al, 1990](#)



- Incidence of **5.5 cases per 1000** term births Itoo et al, 2003

Causes:

- Prolonged 2nd stage of labor,
- Antepartum hemorrhage,
- Delivery by emergency cesarean section (CS) or the use of instrumental delivery
- IUGR
- Male sex



- 64 in 1000 births
- Combining the NE deaths and fresh stillbirths gives an upper estimate for term birth asphyxia, perinatal mortality rate of 10.8 per 1000 total births [95% CI 9.2, 12.6],
- 24% of all perinatal deaths occurred before hospital discharge. [Ellis et al,2000](#)



- The neonatal mortality of **24.7%** among asphyxiated neonates was 34.5-times compared to that of the non-asphyxiated population ($p < 0.001$).
- The mortality rates in preterm-and term-asphyxiated neonates were 47.8% and 6%, respectively ($p < 0.0001$).
- PPV: 58.3% [Paul et, 1997](#)
- Mortality: 7.5% of HIE among all born infants
[Bose et al, 1998](#)



- HIE: 2.2 per 1000 live births
- Among very-low-birthweight (<1500g) live births.
- Prevalence was 44.5 per 1000 (95% confidence interval 32.3-59.8) [Dolk et al, 2006](#)

Cerebral Palsy

- The global CP is estimated to be approximately 1 to 2 cases per 1000 live births (Torfs et al, 1990)
- CP that is due to HIE in the singleton term infant has a reported prevalence of ~ 1 in 12,500 live births (Blair & Stanley, 1988)(Phelan et al, 2005)

- HIE is an important cause of mortality and morbidity in full-term newborns, and neurologic handicaps occur in about **25% to 28% of these infants** (Freeman & Nelson, 1988)
- CP is a common problem, occurring in about **2 to 2.5 per 1,000 live births** (Hagberg et al, 2001)



- HIE: 4.4 per 1000 live births
 - Prenatal: 26.6%
 - Perinatal/neonatal: 18.5%
 - Postnatal: 5.9%
- CP:
 - Diplegia: 39.8% Hemiplegia: 28%
 - Tetraplegia: 19.9%, Ataxia: 5.9%
 - Dyskinetic: 6.4%.
- Prenatal factors: ↑ SES, Perinatal : ↓ SES
- ↑ level of obstetric and neonatal problems
- Lack of etiological factor in approximately 50%

Serdaro Gcaron Lu et al, 2006

- Preterm 24-32 weeks
- Cerebral palsy of different types (with majority of serious cases) was diagnosed in 8% of children
- Tetraplegia IVH/PVL [Rutkowska et al, 2005](#)




- The CDC estimates that HIE occurs in two to **four per 1,000** live-term newborns in the US
- 0.3% of all deliveries are complicated by severe fetal acidemia (Goldaber, 1991)(Salhab et al, 2005)
- One third are admitted to a neonatal intensive care unit , of the latter group, approximately 10% to 15% develop moderate to severe neurologic deficits. (Fee et al, 1990)(Salhab et al, 2005).



Neonatal Asphyxia

The perinatal risk factors associated with subsequent neurologic sequelae :

- need for delivery room resuscitation
- 5-minute Apgar score ≤ 5 (Perlman & Risser ,1993, 1995)
(Salhab et al, 2005)

239 infants > 36 had moderate or severe encephalopathy  whole body cooling

- Death or moderate or severe disability: 44%
- CP: 19 :% (hypothermic group)

30 %: control (Shankaran et al, 2005)



Mother-baby package WHO1996:

Implementing safe motherhood in countries ,



In developing countries, 3% of all newborn babies (3.6 million) develop moderate or severe asphyxia. Of these, about 840 000 die and ~ the same number develop severe sequelae (epilepsy, mental retardation) with devastating human, social and economic consequences. WHO, 1996



- **Total population: 74,033,000**
- **Child mortality m/f (per 1000): 36/36**
- **HIE Rate: 4.5-5.5 cases per 1000 term births** (MOH, 2006)
- **Cairo: 3.6% admission recorded and up to 4.4 % Diagnosis at discharge**
Alex: HIE: 4.2%,
Mortality: 6.5% (FT: 7.7%) (MOH, Publication pending, 2005)



- El Shatby Children Hospital, Jan, 2005, March, 2006 1- 17 years : 156 (114 males, 41 females) cases, [132 cases < 5 years].
(National Health Insurance, MOH, 2006)
- Neurodevelopmental delay among HIE infants: 39.6%
- CP rate 23% of HIE infants (referral from Suez Canal Area, 90% outborn transferred cases) El Metwally, et al, 2006



Type of Handicap	1996	2001	2006
Visual	151510	169805	183098
Hearing	90906	101883	109859
Mental	1515100	1698050	1830975
Motor	303020	339610	366195
All types (mixed)	2060536	2309348	2490127

The Central Agency for Public Mobilization and Statistics, 2005
UNICEF, 2006 El Metwally, Mf, FAAP, MHPE

Kind of handicap	Rate currently sited	Rate calculated by UNICEF	1996	1997
1.Blindness	0.25 %	0.25 %	57747	66760
1.Weak eye sight	0.1 %	0.1 %	23099	26704
1.Deafness	0.1-0.2 %	0.15 %	34648	40056
1.Bad hearing	0.3-0.4 %	0.35 %	80846	93464
1.Motor handicap	0.5 %	0.5 %	115495	13352
1.Complete speech handicap	0.63 %	0.63 %	145523	16823
1.Partial speech handicap	0.95 %	0.95 %	219440	25368
1.Special health problems & epilepsy	0.07-0.15%	0.10%	230990	26704
1.Other problems	0.028 %	0.028 %	6467	7477
1.Light mental retardation	2.5 %	2.5 %	577475	66760
1.Profound mental retardation	0.5 %	0.5 %	115495	13352
1.Psychic & emotional troubles	0.5- 1 %	0.5%	115495	13352
1.Difficulties at school	1%	1%	123750	14538
Total in millions			1.846	2.137

Birth asphyxia does not feature on most lists of childhood "killers" and is not a policy or funding priority. [Lawn et al, 2005](#)

Management / Prevention

- Recent multi-center RCT for total body cooling/Hypothermia Gunn et al, 2000 ,Hunt et al, 3003 (Chochrane, meta-analysis), Shankaran et al, 2005,, Eicher et al, 2005
- Antenatal Care
- Neonatal Resuscitation
- Specialized Neurodevelopmental centers

Antenatal Care

The general lack of antenatal care is responsible not only for most maternal deaths but also for high neonatal morbidity and mortality rates

(Dünser et al, 2006)

- Antenatal missed opportunity for referral for high risk pregnancy as high as 81.3% [Awad et al, 2005](#)
- Lack of etiological factor in approximately 50% of pregnancies yielding HIE infants [Serdaro Gcaron Lu et al, 2006](#)

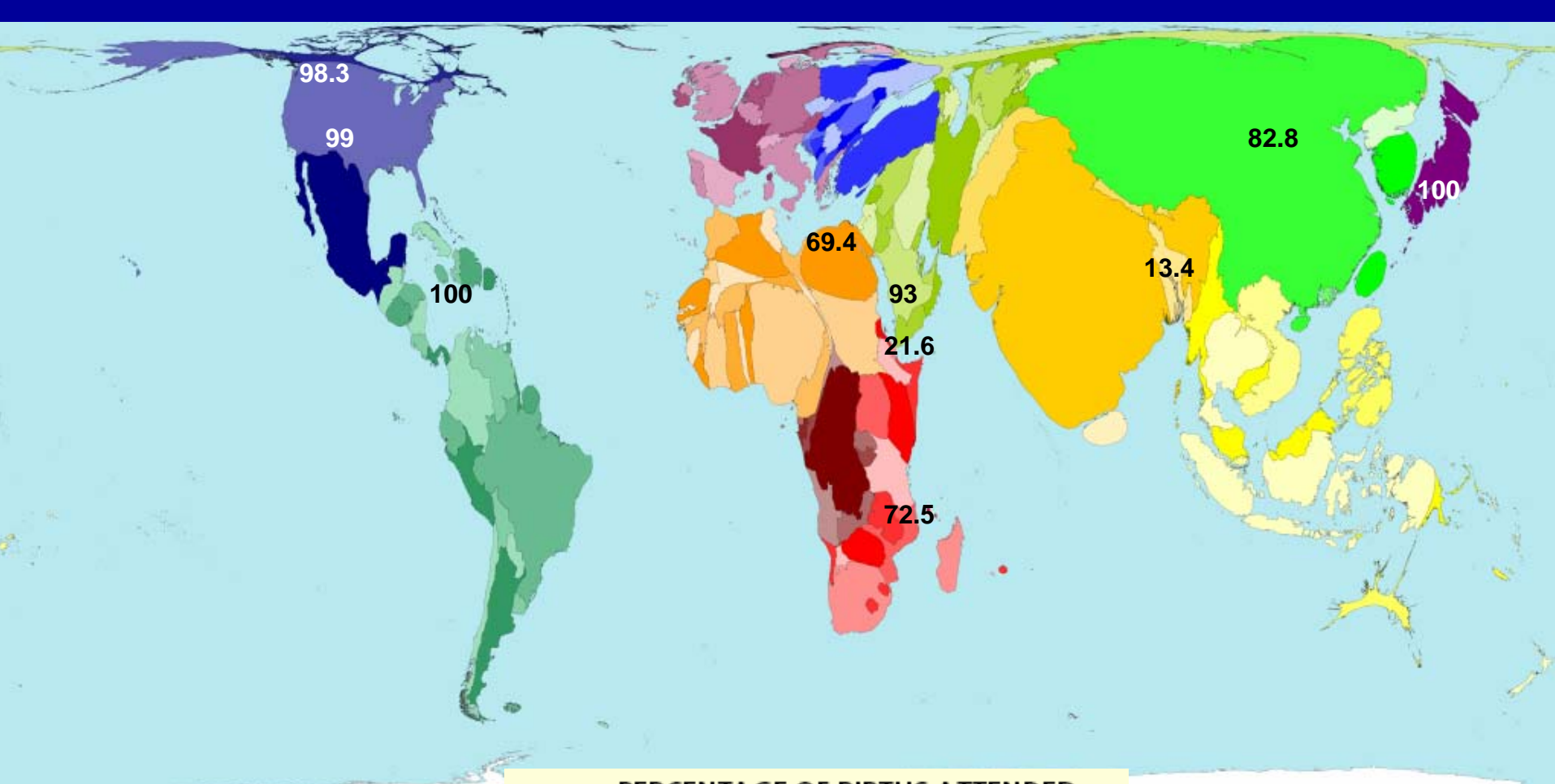


**Department of Reproductive
Health and Research (RHR),
World Health Organization
Monitoring and evaluation
(MAE) Estimates by country -
2004**

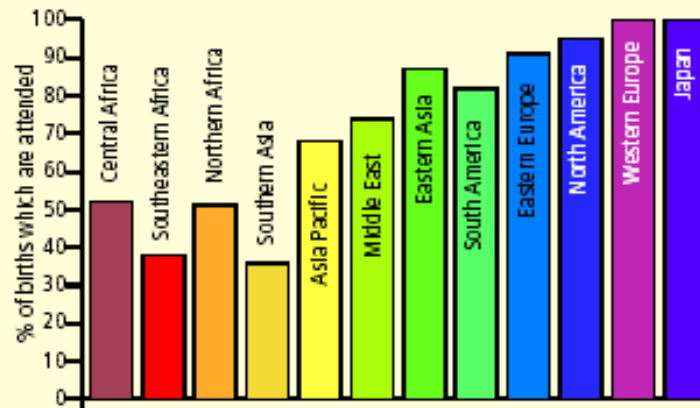
- Proportion of births attended by skilled health personnel**

www.who.int/reproductive, 2004

Egypt:	69.4	2003
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PERCENTAGE OF BIRTHS ATTENDED



How skilled?


Skilled in what?

Neonatal Resuscitation





- In low-income countries **23%** of deaths are reported to be due to asphyxia from potentially preventable causes.
- It has been estimated that **6% to 42%** of neonatal mortality or morbidity in the developing world could be decreased by **neonatal resuscitation** (Darmstadt , 2005)

Use of oxygen during neonatal resuscitation

Term

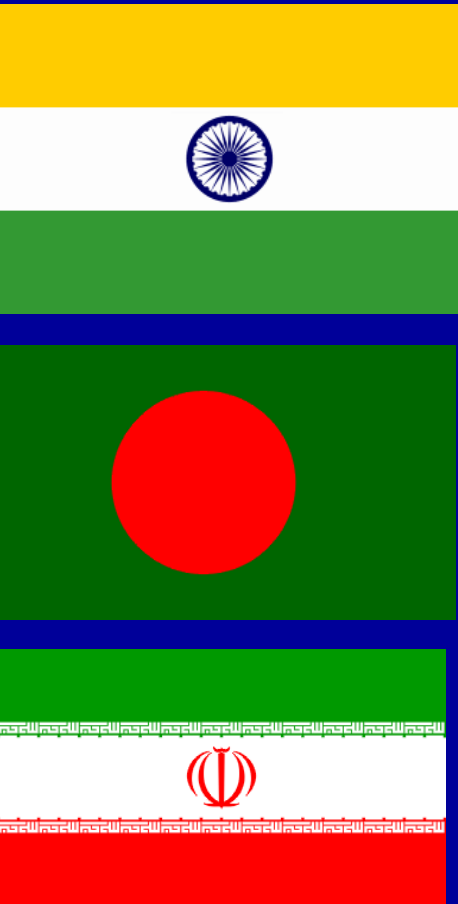
- 100% supplemental oxygen
 - cyanotic
 - PPV
- **< 100% may be just as successful.**
- If started <100% O₂  no appreciable improvement within 90 sec after birth: 100% O₂
- If supplemental O₂ is unavailable, use room air

Preterm < 32 wks:

- Use an O₂ blender and pulse oximeter
- Begin PPV with O₂ (RA & 100%)
- Adjust O₂ for oxyhemoglobin to  90%.
-  the O₂ as sats.  >95%
- If the HR  100 /min. use 100% O₂.
- If no O₂ blender and pulse oximeter use 100% O₂
- *There is no convincing evidence that a brief period of 100% O₂ during resuscitation will be detrimental to the preterm infant*

Regional Consultation

New Delhi, India, 1-5 April 2002.



WHO,2006

- An operational study with support from WHO, USAID and PATH. SWACH Foundation)
- 210 providers (TBAs/ maternity facility staff) were trained. 5005 deliveries
- Skills retention: 3-13 months

- Physical stimulation/ suction revived 31-71.3% babies, Ventilation revived 34-75% of asphyxiated babies

Only 19 babies died. Mortality from birth asphyxia was 5.8/1 000 live births. (WHO, 2006)

- **Birth asphyxia management is recommended in health facilities where more than five deliveries take place each month**

GN trial of 2 methods Neonatal Resuscitation

- Zambia
- FIRST BREATH
- WHO essential NB care + ENC + AAP-NRP

Wright L, IAMANEH, 2006



- Health workers should be periodically trained in the assessment and management of birth asphyxia.
- Necessary equipment for resuscitation should be available and health care providers trained in its use.

**Neonatal
Resuscitation Program
(NRP) with the
Pediatric Department.
Suez Canal University
2004
Ismailia, Egypt**





**The Egyptian
Association of
Neonatology (EAN)
In Collaboration with
the
Neonatal
Resuscitation Program
(NRP)
May 11th -12th, 2006
Cairo Egypt**



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Community Reach

- Tailoring NRP to primary health care personnel (Nurses, Midwives, EMS):
 - Language
 - Simplicity
 - Feasibility
- A multi-center study of the Impact of NRP on community health care personnels
- Other programs (PEP, First Breath, etc)

Specialized Centers

- High risk infants, neurodevelopmental clinics:
 - Follow-up
 - Management of complications
 - Physiotherapy/Rehabilitation
 - Referral
 - Health education
 - Data-base

Thank You

EI Metwally, Mf, FAAP, MHPE

References