Causal analysis and treatment protocols for childhood diseases

SIDDARTH RAMJI

1. Birth asphyxia

Table 1.1 Causes of birth asphyxia (by significance)[1–3]

	Direct	Indirect	Distant
Main causes	• LBW (preterm and IUGR) • Obstetric complications (APH, cord prolapse, PIH, etc.) • Foetal malformations	• Unskilled birth attendant (especially newborn resuscitation skills) • Poor maternal health (e.g. poor nutrition, medical illness) • Inadequate antenatal care • Maternal age (<18 or >35 years) • Poor/absent emergency obstetric and newborn care • Absence of credible referral system	• Poor maternal literacy • Lack of community awareness • Low socioeconomic status

LBW: low birth weight; IUGR: intrauterine growth retardation; APH: antepartum haemorrhage; PIH: pregnancy-induced hypertension

Table 1.2 Interventions (by significance) for the management of birth asphyxia[4–6]

Outcome	Medical interventions	Non-medical interventions/prevention
Establish cry at birth	• Skilled birth attendant • Strengthening EmOC services • Training of *dais* • Resuscitation • Developing an effective and functional referral system • Thermal control • Improving the quality of ANC (including monitoring of gain in weight of the mother)	• Improving maternal nutrition during pregnancy (role of ICDS) • Improving the condition of roads for faster transportation of the newborn to the nearest appropriate health facility • Preventing child marriage so that women conceive at the appropriate age

EmOC: emergency obstetric care; ICDS: Integrated Child Development Scheme; ANC: antenatal care

Table 1.3 Standard treatment protocols for birth asphyxia[7,8]

Personnel (units of time and type)	Drugs (dosage, type and time)	Inpatient stay	Equipment
District hospital • Paediatrician (1 hour/day) • Nurse (2 hours/day) • Obstetrician (for EmOC, management of complicated labour)	• Anticonvulsants (phenobarbitone and phenytoin 20 mg/kg stat and then 3–5 mg/kg/day bd) • Oxygen	Up to 5 days	• Radiant warmers • Oxygen hoods • Resuscitation bags
CHC • Paediatrician (1 hour/day) • Nurse (2 hours/day) • Obstetrician (for EmOC, management of complicated labour)	• Anticonvulsants (phenobarbitone and phenytoin 20 mg/kg stat and then 3–5 mg/kg/day bd) • Oxygen	1–2 days	• Radiant warmers • Oxygen hoods • Resuscitation bags
PHC • Medical officer • Auxiliary nurse–midwife		<1 day	Resuscitation bags

CHC: community health care: PHC: primary health centre; EmOC: emergency obstetric care; ICDS: Integrated Child Development Scheme

Department of Paediatrics, Maulana Azad Medical College, New Delhi; e-mail: sumisid@vsnl.com

2. Neonatal sepsis

Table 2.1 Causes of neonatal sepsis (by significance)

	Direct	Indirect	Distant
Main causes	• Low birth weight • Acute maternal intrapartum infection (including STIs) • Prolonged and preterm rupture of membranes • Delayed and non-exclusive breastfeeding • Inappropriate community practices (e.g. cord care practices, branding, etc.) • Inappropriate intrapartum interventions by untrained attendants	• Unskilled birth attendant • Unhygienic delivery and postnatal conditions • Delayed recognition and care-seeking • Increased biological risk in males	• Poor maternal literacy • Lack of community awareness • Low socioeconomic status

STI: sexually transmitted infection

Table 2.2 Interventions (by significance) for neonatal sepsis

Outcome	Medical interventions	Non-medical interventions/prevention
Survival	• Injectable antibiotics • Oxygen therapy • IV fluids	• Exclusive breastfeeding • Use of '5' cleans during delivery (includes neonatal tetanus) • Tetanus toxoid for mother (for neonatal tetanus)

Table 2.3 Standard treatment protocols for neonatal sepsis

Personnel (units of time and type)	Tests (by type)	Drugs (dosage, type and time)	Inpatient stay	Supportive care
District hospital • Paediatrician (1 hour/day) • Nurse (24 hours/day)	• Blood culture • CSF examination • Blood counts	• Inj. ampicillin 100 mg/kg/day x 7–10 days • Inj. gentamicin 7.5 mg/kg/day x 7–10 days	7 days	• IV fluids • Oxygen therapy • Breastfeeding support during recovery of infant
CHC • Paediatrician (1 hour/day) • Nurse (24 hours/day)	Blood counts	• Inj. ampicillin 100 mg/kg/day x 7–10 days • Inj. gentamicin 7.5 mg/kg/day x 7–10 days	3 days	• IV fluids • Oxygen therapy • Breastfeeding support during recovery of infant
PHC • Medical officer • Auxiliary nurse–midwife		• First dose of antibiotic —Inj. ampicillin 50 mg/kg (or oral co-trimoxazole) and Inj. gentamicin 5 mg/kg	Referral	

CHC: community health centre; CSF: cerebrospinal fluid; PHC: primary health centre

3. Low birth weight

Table 3.1 Causes of low birth weight (by significance)[9–12]

Direct	Indirect causes	Distant causes
• Poor maternal health • Obstetric complications • Medical illness (e.g. malaria) • Multiple pregnancy • Foetal malformations	• Inadequate antenatal care • Heavy maternal work and inadequate rest during pregnancy • Adolescent pregnancy • Maternal age <18 or >35 years • Previous childbirth <2 years ago	• Poor maternal literacy • Lack of community awareness • Low socioeconomic status

Table 3.2 Interventions (by significance) for low birth weight[6,13–15]

Outcome	Medical interventions	Non-medical interventions/prevention
Birth weight <1500 g	• Thermal control (warmers/incubators/KMC) • IV fluids/breastfeeding/vitamin–mineral supplements • Drugs, depending on complications	• Clean environment/hygienic practices • Adequate antenatal care • Improved maternal nutrition
Birth weight 1500–1800 g	• Thermal control (warmers/KMC) • Breastfeeding • Drugs, depending on complications	• Clean environment/hygienic practices • Adequate antenatal care • Improved maternal nutrition
Birth weight 1800–2500 g	• Thermal control (KMC, rooming-in) • Breastfeeding • Drugs, depending on complications	• Clean environment/hygienic practices • Adequate antenatal care • Improved maternal nutrition

KMC: kangaroo mother care

Table 3.3 Standard treatment protocols for the management of low birth weight[15]

Condition	Personnel (units of time and type)	Tests (by type)	Drugs (dosage, type and time)	Inpatient stay
Birth weight <1500 g	• Paediatrician (4 hours/day) • Nurse (24 hours/day)	Blood sugar	Depends on complications	14–21 days
Birth weight 1500–1800 g	• Paediatrician (1/2 hour/day) • Nurse (3 hours)	—		3–5 days
Birth weight 1800–2500 g	• Paediatrician (1/2 hour/day) • Nurse (1 hour)			1–2 days

4. Diarrhoea

Table 4.1 Causes (by significance) of diarrhoea/dysentery

	Direct	Indirect	Distant
Main causes	• Non-exclusive breastfeeding (<6 months) • Contaminated water and food	• Low birth weight/malnutrition • Vitamin A deficiency	• Poor maternal literacy • Lack of community awareness about sanitation • Low socioeconomic status • Improved sanitation, safe water supply
Interaction with other causes	Urinary tract infection		

Table 4.2 Interventions (by significance) for diarrhoea/dysentery[15,16]

Disease/condition	Outcome	Medical interventions	Non-medical interventions/prevention
Diarrhoea	Severe dehydration	• IV fluids • ORS • Antibiotics in case of cholera or dysentery	• Adequate nutrition • Safe drinking water
	Some dehydration	ORS	• Adequate nutrition • Safe drinking water
	No dehydration	ORS	• Home available fluids • Adequate nutrition • Safe drinking water
Dysentery		• Oral antibiotics • ORS	• Adequate nutrition • Safe drinking water

ORS: oral rehydration salt

Table 4.3 Standard treatment protocols for diarrhoea/dysentery[15,16]

Condition	Personnel (units of time and type)	Tests (by type)	Drugs (dosage, type and time)	Inpatient stay
Severe dehydration	*DH/CHC/PHC* • Paediatrician (1/2 hour/day) • Nurse (6–8 hours/day)	Stool examination	IV fluids—Ringer lactate 150 ml/kg x 8 hours	1 day
Some dehydration	*DH/CHC/PHC/SC* • Paediatrician/MO (1/2 hour/day) • Nurse/ANM (2 hours)	—	Oral rehydration salt 75 ml/kg x 4 hours	OPD observation for 4 hours
Dysentery	OPD consultation	Stool examination	Oral nalidixic acid 55 mg/kg/day x 5 days	Nil

DH: district hospital; CHC: community health centre; PHC: primary health centre; SC: subcentre; ANM: auxiliary nurse–midwife

5. Pneumonia

Table 5.1 Causes of pneumonia (by significance)

	Direct	Indirect	Distant
Main causes	• LRTI in the family • Use of biomass fuels	• Non-exclusive breastfeeding (<4 months) • LBW/severe malnutrition • Vitamin A deficiency • Inappropriate immunization for age • Passive smoking	• Lack of community awareness • Low socioeonomic status • Poor literacy • Male sex
Interaction with other causes	• Asthma • Heart disease • Gastroenteritis • Measles • Whooping cough		

LRTI: lower respiratory tract infection; LBW: low birth weight

Table 5.2 Interventions (by significance) for the management of pneumonia[15,16]

Outcome	Medical interventions	Non-medical interventions/prevention
Severe pneumonia	• Injectable antibiotics • Oxygen • IV fluids	• Cough remedies • Adequate nutrition • Protection from passive smoking
Pneumonia	Oral antibiotics (e.g. co-trimoxazole)	• Home-based cough remedies • Adequate nutrition • Protection from passive smoking
Cough/cold		Home-based cough remedies

Table 5.3 Standard treatment protocols for pneumonia[15,16]

Condition	Personnel (units of time and type)	Tests (by type)	Drugs (dosage, type and time)	Inpatient stay	Supportive care
Severe pneumonia	• Paediatrician (2 hours/day) • Nurse (6–8 hours/day)	Chest X-ray	• Inj. chloramphenicol 100 mg/kg/day x 7–10 days • Inj. ampicillin 100 mg/kg/day x 7–10 days	5–7 days	• Oxygen • IV fluids
Pneumonia	• Paediatrician/MO (2 hours/day) • ANM (4–6 hours/day)		• Oral co-trimoxazole 6–8 mg/kg/day x 5 days • Oral amoxycillin 20–40 mg/kg/day x 5 days	Ambulatory	

MO: medical officer; ANM: auxiliary nurse–midwife

6. Malnutrition

Table 6.1 Causes of malnutrition (by significance)

	Direct	Indirect	Distant
Main causes	• Non-exclusive breastfeeding during the first 6 months • Inadequate quantity of weaning foods • Non-energy dense feeds • Recurrent infections	• Low birth weight • Poverty • Community feeding practices	Natural disasters (drought, floods, etc.)
Interaction with other causes	Measles		

Table 6.2 Interventions (by significance) for the management of malnutrition[15,16]

Outcome	Medical interventions	Non-medical interventions/prevention
Severe malnutrition	• Dietary rehabilitation • Micronutrient supplementation • Treatment of severe anaemia • Treatment of infections • Correcting dehydration	• Maternal education • Community IEC activities • Immunization • Food security • Preventing low birth weight (adequate antenatal care)
Mild–moderate malnutrition	• Nutritional counselling • Micronutrient supplementation	• Maternal education • Community IEC activities • Immunization • Food security

IEC: information, education and communication

Table 6.3 Standard treatment protocols for malnutrition[15,16]

Condition	Personnel (units of time and type)	Tests (by type)	Drugs (dosage, type and time)	Inpatient stay
Severe malnutrition	*DH* • Paediatrician (1 hour/day) • Nurse (2 hours/day)	• Haemoglobin • Peripheral blood smear • Stool examination	• Micronutrients • Antibiotics (if infection is present) • ORS in case of diarrhoea	Up to 2 weeks
	CHC • Paediatrician (1 hour/day) • Nurse (2 hours/day)	• Haemoglobin • Peripheral blood smear • Stool examination	• Micronutrients • Antibiotics (if infection is present) • ORS in case of diarrhoea	Up to 2 weeks
	PHC • MO • ANM (30 minutes)			Immediate referral
Mild–moderate malnutrition	*DH/CHC/PHC* • Paediatrician • MO (30 minutes)		Micronutrients	Ambulatory

DH: district hopital; CHC: community health centre; PHC: primary health centre; ORS: oral rehydration salt; MO: medical officer

References

1. Chandrashekar S, Rao RSP, Chakladar BK, Krishnan L, Nair NS. Perinatal mortality in rural district of South India. *Indian Pediatr* 1998;**68:**709–15.
2. Misra PK, Thakur S, Kumar A, Tandon S. Perinatal mortality in rural India with special reference to high risk pregnancies. *J Trop Pediatr* 1993;**39:**41–4.
3. Shah U, Pratinidhi AK, Bhatiawande PV. Perinatal mortality in rural India: A strategy for reduction through primary care. *J Epidemiol Community Health* 1984;**38:**134–7.
4. Ramji S, Rasaily R, Mishra PK, Narang A, Jayam S, Kapoor AN, *et al.* Resuscitation of asphyxiated newborns with room air or 100% oxygen at birth: A multicentric clinical trial. *Indian Pediatr* 2003;**40:**510–17.
5. Kumar R. Effectiveness of training TBAs for management of asphyxia neonatorum using resuscitation equipment. *Prenat Neonat Med* 1998;**3:**25–6.
6. Bang AT, Bang RA, Baitule S, Reddy MH, Deshmukh M. Effect of home based neonatal care and management of sepsis on neonatal mortality: Field trial in rural India. *Lancet* 1999;**354:**1955–61.
7. Finegold JG, Mizrahi EM, Lee RT. The newborn nervous system.

In: Taeusch HW, Ballard RA (eds). *Avery's diseases of the newborn.* 7th ed. New Delhi: Harcourt Asia Pvt Ltd; 2000:839–92.
8. Ramji S. Treat and counsel. In: Kumar H, Kuba R (eds). *Care of newborn and young infant (ME-103).* New Delhi: Indira Gandhi Open University, School of Health Sciences; 2003:61–77.
9. Hirve SS, Ganatra BR. Determinants of low birth weight: A community based prospective cohort study. *Indian Pediatr* 1994;**31:**1221–5.
10. Agarwal KN, Agarwal DK, Agarwal A, Rai S, Prasad R, Agarwal S, *et al.* Impact of the ICDS on maternal nutrition and birth weight in rural Varanasi. *Indian Pediatr* 2000;**37:**1321–7.
11. Radhakrishnan T, Thankappan KR, Vasan RS, Sarma PS. Socio-economic and demographic factors associated with birth weight: A community based study in Kerala. *Indian Pediatr* 2000;**37:**872–6.
12. Deshmukh JS, Motghare DD, Zodpey SP, Wadhva SK. Low birth weight and associated maternal factors in an urban area. *Indian Pediatr* 1998;**35:**33–6.
13. Pratinidhi A, Shah U, Shotri A, Bodhani N. Risk approach strategy in neonatal care. *Bull World Health Organ* 1986;**64:**291–7.
14. Dayal RS. Problems and management of low birth weight babies in an improvised neonatal unit of a developing country. *Bull Int Pediatr Assoc* 1980;**3:**36.
15. Sharma S, Sethi GR, Gulati RK (eds). *Standard Treatment Guidelines.* Delhi: Delhi Society for Promotion of Rational Use of Drugs; 2002.
16. World Health Organization. *Management of the child with a serious infection or severe malnutrition. Guidelines for care at the first referral level in developing countries.* New Delhi: WHO; 2000.