



Papua New Guinea Annual Report on Child Morbidity and Mortality 2010

The Child Health Advisory Committee
PNG National Department of Health
May 2011

2010 Annual Report on Child Morbidity and Mortality

Summary

- This report covers data on child admissions in 2010 from 11 hospitals
- There were 10,897 and 646 deaths reported (mortality rate 5.9%)
- Pneumonia was the most common reason for admission (23% of admissions), followed by malaria (17% of admissions), neonatal conditions (15% of admissions) and diarrhoeal disease (12% of admissions)
- Malnutrition either directly caused or contributed to 24% of all deaths. In the post-neonatal period, pneumonia (28% of deaths) and meningitis (19% of deaths) were the leading causes of death.
- Neonatal deaths accounted for 23% of all deaths. The leading causes of death in neonates were: birth asphyxia (36% of neonatal deaths), neonatal infections (25% of neonatal deaths) and very low birth weight (21% of neonatal deaths).
- In the post-neonatal period, children presenting with HIV (24% case fatality rate), septicaemia (22% case fatality rate), meningitis (22% case fatality rate), malnutrition (21% case fatality rate) and severe pneumonia (17% case fatality rate) had the highest risk of death
- Neonates with very low birth weight (32% case fatality rate) and birth asphyxia (11.6% case fatality rate) had the highest risk of death.

In response to the findings of this report, the Child Health Advisory Committee of the National Department of Health has made a series of recommendations which are described in this Report:

1. Deaths from severe pneumonia, sepsis and meningitis can be prevented by improving triage for identification of the most seriously ill children, monitoring with pulse oximetry, oxygen therapy and giving the appropriate antibiotics. (pages 4, 7, 10)
2. To reduce death from diarrhoea, oral rehydration salts (ORS) and zinc are the most important treatments. Children with bloody diarrhoea have dysentery and need antibiotics. The antibiotic guidelines for dysentery have been recently revised (page. 5)
3. Children with malnutrition have a very high risk of death. They need special attention to feeding, prevention and treatment of infections, and close monitoring for complications. Prevention of malnutrition at the community level is the best way to avoid children dying from malnutrition (p. 6)
4. Children with meningitis have a high risk of death, and survivors are at risk of disability. Meningitis deaths can be prevented by more widespread use of the Hib vaccine (Pentavalent), and by the introduction of the pneumococcal vaccine. Children presenting with meningitis need to be recognised and treated early, and monitored closely. Rising resistance to chloramphenicol in the common causes of meningitis means that ceftriaxone is the only effective treatment (page. 7)
5. The diagnosis of sepsis is difficult to make, and varies between hospital. Some clinical signs are useful to standardise the diagnosis (page 10). Due to drug resistance, choosing the right antibiotic for sepsis is very important to prevent death and complications (page 10)

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6. Death in the neonatal period account for a large proportion of all child deaths. Improving neonatal care overall should reduce these deaths, particularly those from very low birth weight and infections. Improving obstetric care is necessary to reduce deaths from birth asphyxia (p. 12)

Introduction

The Child Health Advisory Committee of the National Department of Health is pleased to release this first Annual Report on Child Morbidity and Mortality in Papua New Guinea. The Committee believes the data and recommendations contained in this report should be read by all health workers and health administrators. It is only by critically examining health outcomes that we can improve our services. The data are current, covering all of 2010. The recommendations cover clinical and public health issues that if taken on board by all, would result in many children's lives being saved in the coming years.

Paediatric Hospital Reporting System (PHR)

The Paediatric Hospital Reporting System enables hospitals to record admissions, calculate mortality rates and monitor trends in diseases burdens and outcomes over time. When the data are compiled from all hospitals, this can focus on disease or geographical areas of high mortality where there is scope for improvement. The data are reported using standardised diagnostic criteria, consistent with clinical and public health practice in Papua New Guinea.

In 2010, 11 hospitals participated, providing data for the entire 12 months: Alotau, Buka, Goroka, Kavieng, Kimbe, Manus, Mendi, Modilon, Nonga, Vanimomo and Wabag. 10,897 admissions and 646 deaths were reported, for an overall case fatality rate of 5.9%. Overall case fatality rates varied four fold: from 2.8% in Alotau Hospital to 11.2% in Modilon Hospital.

Differences in case fatality rates reflect many things: these include case mix, severity of illness at the time of presentation, human and other resources available to manage seriously ill children, and disease outbreaks.

Table 1 summarises the data for the 8 most common causes of hospital admission in children and case fatality rates, outside the neonatal period.

The Appendices contain summaries of data for each major diagnostic group at each hospital.

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Diagnoses	Admissions	Deaths	CFR
All admissions	10,897	646	5.9
Pneumonia	2504	140	5.6
Malaria	1814	50	2.8
Diarrhoea	1277	35	2.7
Severe sepsis	79	22	27.8
Severe malnutrition	739	157	21.2
Meningitis	417	92	22.1
Tuberculosis	514	58	11.3
HIV	54	13	24.1

Table 1. The most common causes of hospital admission and highest case fatality rates in children outside the neonatal age group.

Pneumonia

Case mix varies widely between hospitals. There were 2504 admissions for pneumonia. Pneumonia makes up 23.0% of admissions overall; 32.8% in highlands hospitals. However, even in coastal hospitals, pneumonia remains a major killer that needs urgent attention.

The overall pneumonia CFR was 5.6% (140 deaths from 2504 cases of pneumonia). Pneumonia case fatality rates vary considerably, from no deaths among 144 admissions in Alotau, to 26 deaths among 170 admissions in Kimbe (CFR 15.3%).

The PHR enables the calculation of mortality rates for both total cases of pneumonia overall and for cases of *severe* pneumonia. The overall case fatality rate for severe pneumonia was 17.1%; 6 hospitals has case fatality rates in excess of 10%, and 3 had case fatality rates of 20% or more. Severe pneumonia case fatality rates, as they are partly standardised for illness severity at the time of presentation, better reflect systems of practice, staff skills training and resources than do overall rates. High case fatality rates from severe pneumonia may occur if children present late, or are not recognised to be very unwell, if antibiotics and oxygen are not given promptly, or if children are not monitored closely.

Recommendations

It is recommended that hospitals ensure that there is:

- ☐ a system of triage and rapid treatment of the sickest patients in the emergency and outpatients departments
- ☐ a part of the children's ward that is properly equipped and stocked to provide high dependency care and close monitoring

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- ☐ adequate oxygen supplies and staff trained in when and how to effectively give oxygen
- ☐ appropriate stocks of antibiotics to treat pneumonia
- ☐ regular clinical monitoring, including the use of pulse oximetry
- ☐ training for staff in the care of seriously ill children
- ☐ sufficient nursing and medical staff to provide clinical care at all times
- ☐ senior supervision of nursing and medical practice

Chloramphenicol may be becoming less effective in the treatment of very severe pneumonia, and this may be one factor that explains the high case fatality rates in some hospitals. Treatment options include penicillin (or ampicillin) and gentamicin, or ceftriaxone for the seriously ill, septic or deteriorating child with pneumonia.

The high numbers of deaths from pneumonia and meningitis (232 or 36% of all deaths) underline the importance of the more widespread use of the Hib vaccine and the urgent need to introduce the pneumococcal conjugate vaccine. While these vaccines are the only real solution to deaths from meningitis, it should be noted that in other countries these two vaccines have made a modest difference to pneumonia presentations to hospitals, so improving systems for clinical care and other measures to reduce pneumonia should not be neglected.

Diarrhoea

1277 admissions and 35 deaths due to diarrhoea were reported in the 11 hospitals in 2010. The case fatality rate was relatively low compared with that of pneumonia (2.7%). Case fatality rates for diarrhoea in all hospitals were under 4%. Large outbreaks of diarrhoeal disease in Goroka (299 cases with 11 deaths) are concerning from a public health aspect.

Deaths from diarrhoea can be due to severe dehydration where the child does not have access to effective rehydration, from sepsis from bacillary dysentery, or other co-morbidity. Severe diarrhoea can be prevented by timely use of oral rehydration in the community, by parents bringing their child to a health facility if they have diarrhoea, by improved assessment of the severity of dehydration, the use of zinc as additional treatment, and the appropriate use of antibiotics in bloody diarrhoea.

Most watery diarrhoea is due to viruses and does not require antibiotics, but require that children have access to ORS, zinc and breast feeding. If children receive these when they have watery diarrhoea, death is very unlikely.

Dysentery is bloody diarrhoea, and is commonly due to a bacterium called *Shigella flexneri*. A recent study in PNG found very high levels of resistance to amoxicillin and cotrimoxazole among *Shigella flexneri* isolates causing diarrhoea. The study confirmed that cotrimoxazole is ineffective and ciprofloxacin is needed to treat dysentery. Oral ciprofloxacin is currently recommended treatment by WHO for dysentery in a dose of 10-15mg/kg twice daily for 5 days. If children are too sick to take oral medications, give ceftriaxone intravenously (IV) or intramuscularly (IM).

Recommendations

- ☐ Give ORS and zinc to all children with diarrhoea

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- ☐ Treat bloody diarrhoea (dysentery) with ciprofloxacin

In 2010 there was a cholera outbreak in PNG, starting in Morobe then spread to Madang and East Sepik. Cases of cholera are not differentiated in the summary reports provided by the PHR in 2010, but they will be in a future version of the program. An estimated 2000 people were affected by cholera, with 50 deaths, mostly in adults.

Malaria

Malaria accounted for 1814 admissions and 50 deaths (case fatality rate of 2.8%). Malaria case fatality rates were around 3% or less in the coastal and islands hospitals that have a substantial burden of malaria. The higher case fatality rates in 2 hospitals that have lower numbers of admissions with malaria may reflect very small numbers, more severe cases in non-immune highlands populations, less familiarity with malaria treatment, co-morbidities or other factors.

PNG has changed malaria guidelines to:

- ☐ Uncomplicated malaria: artemether-lumefantrine
- ☐ Severe or complicated malaria: artesunate as initial treatment, followed by artemether-lumefantrine

It is important that health workers are familiar with these new treatments. They are described in the Standard Treatment Book for Common Illnesses in Children.

Malnutrition

The PHR records malnutrition as a co-morbidity, so even if it is not the primary diagnosis it is still recorded. In 2010 in the 11 hospitals 739 children were admitted with severe malnutrition (weight for age <60% of expected, or with clinical marasmus or kwashiorkor). This represents 6.8% of all admissions. However severe malnutrition was associated with 157 deaths: 24.3% of all deaths. The case fatality rate for severe malnutrition is high (21.2%). Case fatality rate for malnutrition was more than 10% in 10 of 11 hospitals, and more than 20% in 4 hospitals, and over 30% in 2 hospitals).

Recommendations

Health centres and hospitals need early identification and intervention for children with severe *and moderate* malnutrition:

- ☐ staff need to be trained in Infant and Young Child Feeding
- ☐ all staff should promote breast feeding
- ☐ hospitals should adopt the Baby Friendly Hospital Initiative
- ☐ growth monitoring should be a regular part of child health care
- ☐ there should be ready access in the health centre or hospital to formulas and diets for the management of children with malnutrition
- ☐ guidelines for the management of malnutrition should be in place and used. These include prevention and treatment of fatal complications such as sepsis, hypothermia and hypoglycaemia

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- ☐ children with acute severe malnutrition should be nursed in a high dependency area in the children's ward, where close monitoring and identification of complications can occur
- ☐ children with chronic illnesses that are likely to result in malnutrition, such as HIV, tuberculosis, osteomyelitis or chronic cardiac, respiratory or renal disease should be identified early and provided with supplemental feeding
- ☐ zinc and vitamin A should be available
- ☐ staff should be trained in the prevention and management of malnutrition

The *prevention* of malnutrition must have the highest priority. This requires improved rates of breast feeding and complimentary (weaning) feeding. This will be helped by increased participation in education by girls and by greater economic empowerment for women. Mothers who have been educated to at least primary school completion are much more likely to breast feed their infants for longer, as well as more likely to seek care when their children are sick, and be up-to-date with immunization.

Meningitis

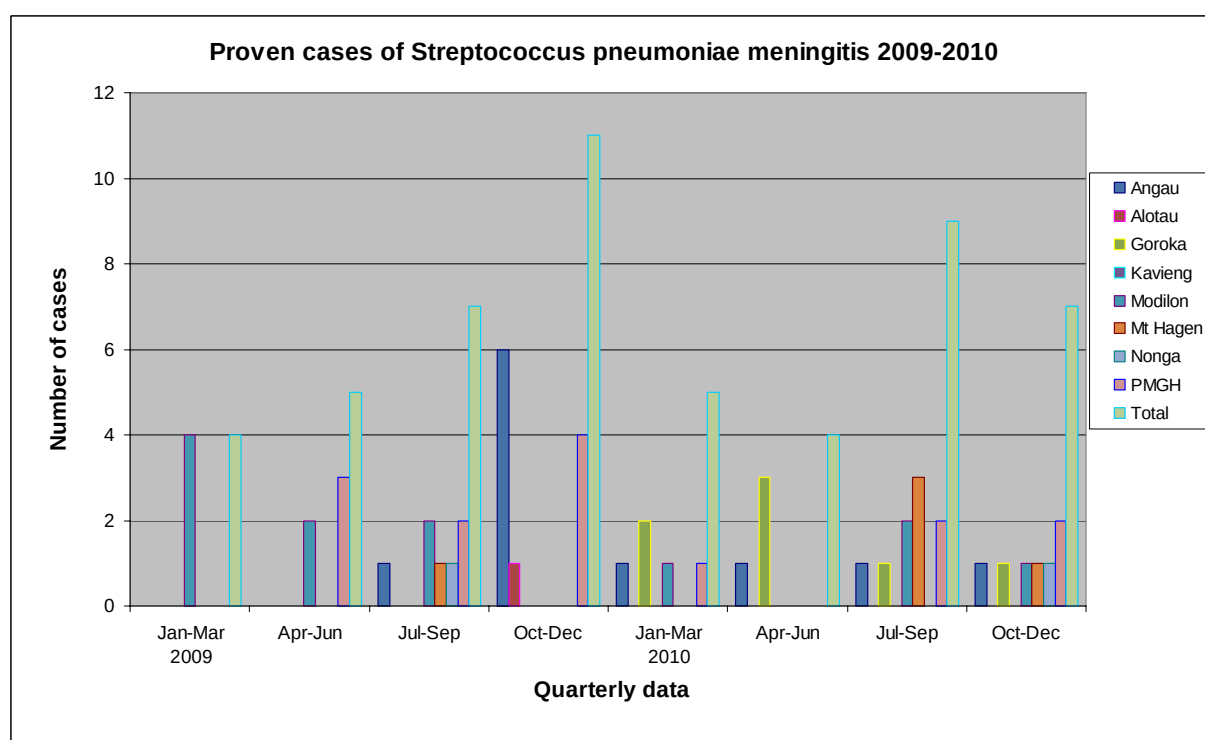
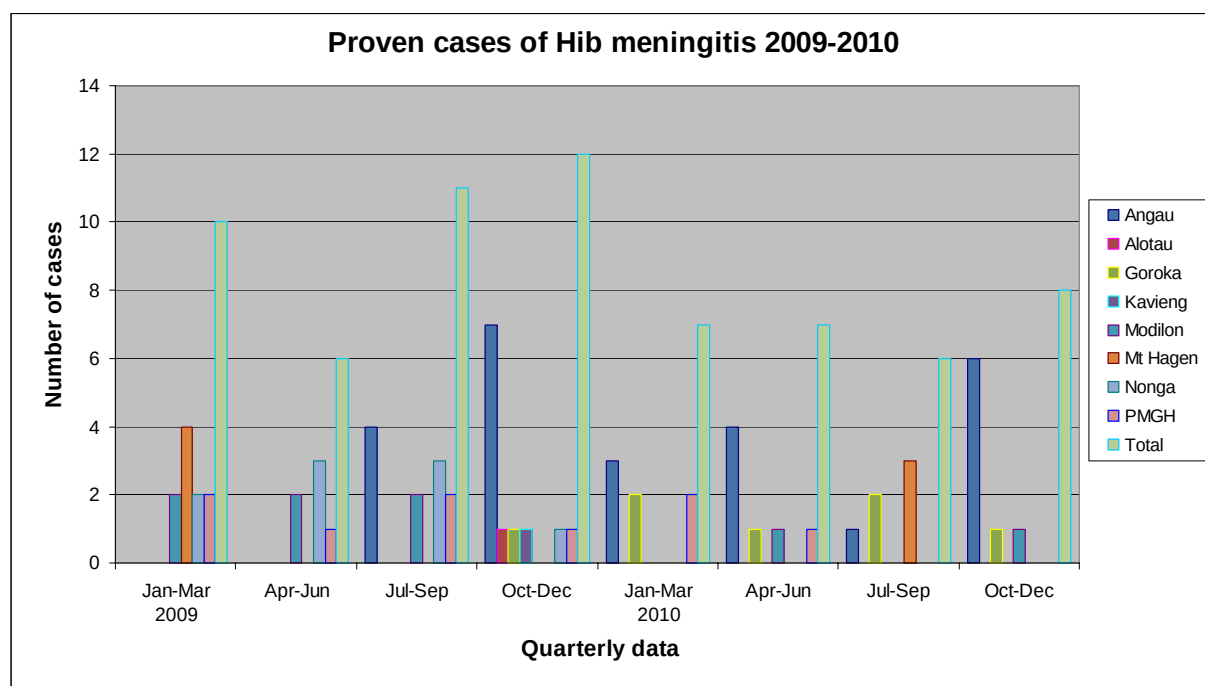
In the 11 hospitals meningitis accounted for 417 admissions and 92 deaths (case fatality rate 22.1%). With more than one-fifth of all children admitted to hospital dying from meningitis there is an urgent need to address this. Case fatality rates for meningitis varied widely, from 5% in Alotau to 41% in Goroka. This is just part of the tragedy, for every death more children survive with serious brain injury which will reduce the child's ability to gain a proper education, or participate in the community or workforce.

The meningitis surveillance system has been in place for several years. This is surveillance through the laboratories in eight hospitals: Angau, Alotau, Goroka, Kavieng, Modilon, Mt Hagen, Nonga, and PMGH. The reported cases by aetiology for 2009-2010 from these hospitals are in Table 1. Note that these are different hospitals to the 8 that have currently reported data to the PHR, and the data covers 2 years, so the numbers are different to the PHR data.

Table 2. Aetiology of meningitis through surveillance of CSF isolates in 8 hospitals

Aetiology of meningitis	Angau	Alotau	Goroka	Kavieng	Modilon	Mt Hagen	Nonga	PMGH	Total
Cases of meningitis with CSF WCC >5 per mm ³	142	9	40	4	109	63	26	132	525
<i>Haemophilus influenzae</i> type b	25	1	7	1	8	7	9	9	67
<i>Streptococcus pneumoniae</i>	11	1	7	0	12	5	2	14	52
<i>Neisseria meningitides</i>	3	1	0	0	1	1	0	4	10
Other pathogens identified	2	0	3	2	5	1	5	8	26

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Figures 1 and 2. The number of cases of proven *Haemophilus influenzae* type b and *S. pneumoniae* meningitis, based on CSF identification

The best method of addressing meningitis is the universal use of conjugate Hib and pneumococcal vaccines. Hib vaccine was introduced in PNG in 2008. Cases are still being reported, suggesting that the vaccine is not yet reaching all children. Meningitis due to *S.*

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pneumoniae, one of the two commonest causes, can only be effectively addressed by the introduction of the conjugate pneumococcal vaccine, which is scheduled for introduction in 2012.

Most Hib and some pneumococci causing meningitis are now resistant to chloramphenicol, so this is now no longer effective treatment for bacterial meningitis. If children receive chloramphenicol for meningitis, rates of death and brain injury will be very high.

Recommendations

All children with suspected meningitis should have a lumbar puncture if it is safe to do so. They should be treated with ceftriaxone 50mg/kg twice daily IV or IM for 10 days.

Acute complications can lead to high case fatality rates, and may be minimised by

- ☐ Nursing all children with meningitis in a high dependency unit
- ☐ Monitoring with pulse oximetry to detect hypoxaemia
- ☐ Monitoring the blood glucose and treatment of hypoglycaemia
- ☐ Close observation for convulsions

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Severe sepsis

There were 79 admissions reported for septicaemia, with 22 deaths and a case fatality rate of 27.8%. This high case fatality rate is concerning, but was heavily influenced by 18 severe sepsis deaths from 18 admissions (100% CFR) from one hospital (Mendi). In other hospitals cases of severe sepsis / septicaemia were reported but no deaths, including 2 hospitals which reported 10 cases or more. This suggests either (a) an outbreak of severe septic shock in Mendi in 2010, (b) different definitions being used, or (c) there were problems in providing emergency treatment or effective antibiotics in Mendi Hospital.

Very high death rates from severe sepsis may occur because of bacteria that are resistant to commonly used antibiotics. There are now high rates of resistance among bacteria causing severe sepsis to chloramphenicol, which would formerly have been the standard treatment for sepsis. Table 3 below indicates common pathogens and their changing resistance patterns.

Bacterial pathogen	Recent changes in antibiotic resistance	Current effective treatment
<i>Haemophilus influenzae</i>	CSF isolates now almost universal resistance to chloramphenicol, amoxicillin	For meningitis or severe sepsis: ceftriaxone, cefotaxime For severe pneumonia in a very unwell child: high dose benzylpenicillin and gentamicin or ceftriaxone
<i>Streptococcus pneumoniae</i>	CSF isolates increasing resistance to chloramphenicol, amoxicillin	For meningitis or severe sepsis: ceftriaxone, cefotaxime For severe pneumonia in a very unwell child: high dose benzylpenicillin and gentamicin or ceftriaxone
<i>Staphylococcus aureus</i>	High levels of resistance to chloramphenicol Emerging resistance to methicillin in hospitals and the community (MRSA)	Flucloxacillin (or cloxacillin) should be first line treatment for suspected Staph sepsis.
<i>Shigella flexneri</i>	Very high levels of resistance to chloramphenicol, cotrimoxazole, amoxycillin	Ciprofloxacin now standard treatment for dysentery Ceftriaxone for severe sepsis / shock and bloody diarrhoea
Enteric Gram-negative bacilli, e.g. <i>E. coli</i> , <i>Klebsiella</i> spp, <i>Enterobacter</i> spp, <i>Pseudomonas</i> spp	Very high levels of resistance to chloramphenicol, cotrimoxazole, amoxycillin	Ceftriaxone for severe sepsis

Table 3. Common bacteria causing severe sepsis, their changing resistance patterns and currently effective treatment

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High rates of resistance to antibiotics that were previously effective may partly explain high case fatality rates from severe sepsis. In severe sepsis ceftriaxone should be used, and if there are signs of Staphylococcal infection, the addition of flucloxacillin (or cloxacillin). If ceftriaxone is not available, then using benzylpenicillin (or ampicillin or amoxicillin) plus gentamicin is the next best treatment (with flucloxacillin if there are signs of Staphylococcal infection). For dysentery, ciprofloxacin should be used.

Lack of availability or use of effective antibiotics may only partly explain high case fatality rates from severe sepsis. Other factors associated with high death rates from sepsis include:

- ☐ lack of timely identification
- ☐ lack of effective supportive care.

Recommendations

It is very important that health workers recognise the signs of severe sepsis, and know how to give emergency management.

There should be a system of Triage in every emergency or outpatients department to enable prompt identification of seriously ill children.

The **general signs of severe sepsis** include:

- ☐ high fever
- ☐ fast breathing and respiratory distress
- ☐ Heart rate >160 with pulses that are difficult to feel
- ☐ cold skin of arms and legs
- ☐ low blood pressure
- ☐ prolonged poor capillary refill
- ☐ pallor
- ☐ lethargy or unconsciousness

There may be **localising signs suggesting meningitis**

- ☐ severe headache
- ☐ neck stiffness
- ☐ severe vomiting
- ☐ repeated convulsions
- ☐ bulging fontanelle

There may be **purpura** (red or black spots on the skin).

There may be **signs of Staph infection**

- ☐ skin sepsis: boils, pustules, abscess, infected scabies or infected skin sores, cellulitis
- ☐ swollen red, hot, tender and painful joint
- ☐ empyema (pus in the chest)

The **emergency treatment for severe sepsis** should be known by all health workers. This includes:

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- ☐ If the child is unconscious or convulsing, nurse on the side and keep the airway clear
- ☐ Give oxygen if there is severe respiratory distress, cyanosis or the oxygen saturation is <90%
- ☐ If the child has signs of shock (several signs: lethargy or drowsiness, low volume pulses, heart rate >160, cold skin or low blood pressure), give an IV bolus of Normal Saline or Hartmanns, 20ml/kg, then reassess.
- ☐ The child will need a further bolus of 20ml/kg if the low blood pressure and shock does not resolve
- ☐ Give appropriate parenteral (IV or IM) antibiotics: ceftriaxone +/- flucloxacillin (if Staph infection is present) or flucloxacillin & gentamicin if there is no ceftriaxone
- ☐ Monitor for signs of sepsis in a high dependency area in the ward or in the ICU. Monitor with pulse oximetry to detect hypoxaemia
- ☐ Check blood glucose. Give a bolus of glucose if the BSL is low
- ☐ Seek assistance from an experienced doctor
- ☐ Look up treatment recommendations in the PNG Standard Treatment Book for Children, and the WHO Pocketbook of Hospital Care for Children.

Neonatal admissions

Neonatal admissions made up 1596 (14.6%) of all 10,897 paediatric admissions to the 11 hospitals. There were 150 neonatal deaths reported, meaning that 23.2% of all deaths in children were in the neonatal period.

Diagnoses	Admissions	Deaths	CFR
All neonatal	1596	150	9.4
Neonatal sepsis	592	37	6.3
Asphyxia	467	54	11.6
Very Low Birth Weight (weight <1500g)	106	32	30.2

Table 4. The most common causes of neonatal admissions and deaths

Neonatal infections

37.1% of neonatal admissions were due to infections. Neonatal infections included pneumonia, meningitis, cord sepsis, skin sepsis and diarrhoea. The case fatality rate for neonatal infections in the 11 hospitals was 6.3%. Some hospitals, mostly those reporting smaller numbers of neonatal sepsis had very high case fatality rates, which may reflect a higher threshold for admission.

Birth asphyxia

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Birth asphyxia is lack of oxygen at or around the time of birth. Many babies survive without serious damage, but the consequences for some children are severe brain injury or death. There were 467 hospital admissions due to birth asphyxia, and the CFR was 11.6% (54 of 467). 36% of neonatal deaths (8% of all deaths in children) were due to perinatal asphyxia.. Six of 11 hospitals had more than 50 cases of birth asphyxia for the year, one of which (Modilon) had 18 birth asphyxia deaths in 2010. Two hospitals (Mendi and Vanimo) admitted nearly 2 cases of birth asphyxia per week.

The developmental implications for many surviving children are significant: cerebral palsy, intellectual disability, blindness, and seizures are common. Prevention of perinatal asphyxia requires encouragement of delivery with a skilled midwife, identification of delays in labour, active management of labour and close communication between obstetric / midwifery services and paediatric services. Neonatal resuscitation training for nurses and doctors can also reduce the effects of birth asphyxia.

Very low birth weight

Very low birth weight is a birth weight between 1000 and 1499g. There were 106 very low birth weight admissions in the 11 hospitals. The case fatality rate for these babies is high, with 32% of 106 VLBW newborns dying while in hospital.

Recommendations for improving neonatal care

All hospitals should have neonatal areas that reach a minimum standard. This includes:

- ☐ Essential newborn care, including initiation of breast feeding in the first hour of life, nursing the baby with the mother and a stable and warm temperature.
- ☐ Supplemental oxygen administration and pulse oximetry. Because clinical signs predicting hypoxaemia in neonates are relatively insensitive, use of protocols for supplemental oxygen administration based on monitoring of pulse oximetry is recommended.
- ☐ Detecting and treating apnea. Apnoea is a major cause of neonatal mortality among premature neonates and also among babies with sepsis and birth asphyxia. The use of apnoea monitors, aminophylline for premature neonates and close observation of all very sick babies are recommended.
- ☐ Prevention and treatment of hypoglycaemia. Hypoglycaemia complicates many neonatal conditions, particularly low birth weight and sepsis. Early breast feeding and close contact with the mother immediately after birth prevents hypoglycaemia. Hypoglycaemia occurs because of insufficient glycogen stores in the liver, inability to feed, and increased glucose metabolism during illness. The clinical signs are non-specific, and regular blood glucose monitoring of high-risk ill neonates is required. Careful correction of hypoglycaemia using breast feeds in babies who can suck, or nasogastric expressed breast milk feeding or IV glucose in babies too sick to feed should be started.
- ☐ Ward organisation to ensure close observation of the most seriously ill and highest risk ill babies
- ☐ Safe use of intravenous fluids in seriously ill neonates. In very low birth weight neonates, large volumes of enteral feeding in the first day or two of life is not well tolerated and may increase the risk of necrotising enterocolitis. The use of any artificial formula feeding is not recommended at any time in low birth weight babies.

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For babies less than 1.5 kg, slow increases in expressed breast milk with cautious intravenous fluids to maintain hydration and prevent hypoglycaemia in the first few days of life is recommended. Babies on IV fluids are at risk of overhydration and nosocomial infection through the IV drip site.

- ☐ Antibiotics. Although many seriously ill neonates have bacterial infections, the inappropriate use of broad-spectrum antibiotics will lead to colonization of babies, and of neonatal units, with bacteria that are resistant to standard antibiotics. Standard treatment of neonatal sepsis is benzylpenicillin (or ampicillin or amoxicillin) and gentamicin, which are effective against most bacteria causing sepsis. *Staphylococcus aureus* is another common cause of infection in young infants in some hospitals, and resistant enteric gram negative bacilli are a common cause of neonatal death. Flucloxacillin or cloxacillin should be used if there are signs Staphylococcal infection, such as purulent umbilical cord, skin pustules or purulent conjunctivitis.
- ☐ Prevention of nosocomial sepsis. Strict hand washing and other basic infection control measures are recommended.
- ☐ Auditing of practice. It is only by keeping accurate records of all admissions and outcomes that patterns of adverse events will become identified. Clinical audit is essential to reduce neonatal mortality.
- ☐ Training of nurses in neonatal high-dependency care

Tuberculosis

In the 11 hospitals there were 514 children admitted with tuberculosis, with 58 known deaths, and a case fatality rate of 11.3%. This represents a minority of the children diagnosed with TB in PNG, but underlines that in its severest forms TB causes many deaths.

The source of transmission of TB to a child is usually an adult family member who has sputum smear-positive pulmonary TB (PTB), although many adults who pass on TB to children will not know they are affected. Children who develop TB disease usually do so within a year after being infected.

Recommendations

It is important to screen all family members (particularly children) of adult patients who are known to be sputum smear-positive PTB.

The most effective way to prevent transmission of TB to children is by early identification and treatment of those people in the community with infectious TB i.e. usually adults and older children with PTB, especially sputum smear-positive PTB.

BCG immunization is effective in preventing severe and disseminated forms of TB (such as miliary TB and TB meningitis) in young children.

Early identification and treatment of children with TB disease will reduce the numbers of childhood deaths and complications (such as bronchiectasis and cerebral palsy) due to TB.

If there is a known sputum smear-positive PTB in the household child contact screening and the provision of Isoniazid Preventive Therapy for young children (< 5 years) who are asymptomatic is recommended.

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In 2009 fixed dose combination therapy has been introduced for children with TB, and guidelines for childhood TB were developed.

HIV

In 2010 there were 54 new cases of HIV reported by the 11 hospitals, with 13 recorded deaths and a case fatality rate of 24.1%. This only represents cases that were reported in hospitals, based on admissions, and will be an underestimate of new cases in the population, as some children are diagnosed as outpatients, or through PPTCT programs.

Recommendations

- ☐ All children diagnosed with HIV should see a paediatrician, for consideration for starting on antiretroviral therapy.
- ☐ All children with HIV need prophylaxis with cotrimoxazole and INAH, treatment of intercurrent infections and good nutrition.

Other vaccine preventable diseases

There were 16 cases of Pertussis, 6 tetanus and 7 acute flaccid paralysis. There were no cases of measles reported in 2010. Outbreaks of pertussis are concerning, and occur because of low vaccination coverage, especially waning vaccine coverage in adults who can pass the infection onto small children who are at highest risk of severe illness.

It is encouraging that there were no measles cases reported in 2010. The Supplemental Immunisation Activities conducted in 2009-10 have maintained the interrupted transmission of measles, avoiding epidemics seen in the last 1990s- early 2000s.

Summary

The Paediatric Hospital Reporting System has highlighted many problem areas in hospitals and the health system. Addressing these in a systematic way will lower the death rates from common diseases. The Child Health Advisory Committee asks that all health workers and hospital administrators play their part to address specific problems, adopt the recommendations in this report, and see these results improve in the coming years.

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Appendices: summaries of data for each major diagnostic group at each hospital

Hospital	Total Admissions	Total Deaths	Overall CFR
Alotau	1002	28	2.8
Angau			
Buka	659	46	7.0
Daru			
Goroka	1517	90	5.9
Kavieng	378	14	3.7
Kimbe	1013	72	7.1
Kerema			
Kundiawa			
Manus	494	9	1.8
Mendi	2262	112	5.0
Modilon	977	109	11.2
Mt Hagen			
Nonga	720	46	6.4
Oro			
PMGH			
Vanimo	820	31	3.8
Wabag	1055	89	8.4
Wewak			
Total	10897	646	5.9

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Hospital	Pneumonia admissions	Pneumonia deaths	Pneumonia CFR	Severe pneumonia admissions	Severe pneumonia deaths	Severe pneumonia CFR
Alotau	144	0	0.0	22	0	0.0
Angau						
Buka	123	4	3.3	40	3	7.5
Daru						
Goroka	426	20	4.7	128	16	12.5
Kavieng	45	1	2.2	6	0	0.0
Kimbe	170	26	15.3	57	20	35.1
Kerema						
Kundiawa						
Manus	12	0	0.0	1	0	0.0
Mendi	786	21	2.7	110	13	11.8
Modilon	233	15	6.4	58	15	25.9
Mt Hagen						
Nonga	78	5	6.4	28	5	17.9
Oro						
PMGH						
Vanimo	113	1	0.9	25	1	4.0
Wabag	374	47	12.6	222	46	20.7
Wewak						
Total	2504	140	5.6	697	119	17.1

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Hospital	Diarrhoea admissions	Diarrhoea deaths	Diarrhoea CFR
Alotau	51	0	0.0
Angau			
Buka	102	3	2.9
Daru			
Goroka	299	11	3.7
Kavieng	13	0	0.0
Kimbe	73	1	1.4
Kerema			
Kundiawa			
Manus	14	0	0.0
Mendi	468	14	3.0
Modilon	39	1	2.6
Mt Hagen			
Nonga	35	1	2.9
Oro			
PMGH			
Vanimo	59	0	0.0
Wabag	124	4	3.2
Wewak			
Total	1277	35	2.7

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Hospital	Malaria admissions	Malaria deaths	Malaria CFR
Alotau	284	7	2.5
Angau			
Buka	233	5	2.1
Daru			
Goroka	20	2	10.0
Kavieng	128	4	3.1
Kimbe	467	15	3.2
Kerema			
Kundiawa			
Manus	52	1	1.9
Mendi	150	3	2.0
Modilon	130	3	2.3
Mt Hagen			
Nonga	170	5	2.9
Oro			
PMGH			
Vanimo	175	4	2.3
Wabag	5	1	20.0
Wewak			
Total	1814	50	2.8

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Hospital	Malnutrition admission	Malnutrition deaths	Malnutrition CFR
Alotau	12	2	16.7
Angau			
Buka	59	12	20.3
Daru			
Goroka	60	8	13.3
Kavieng	25	1	4.0
Kimbe	36	14	38.9
Kerema			
Kundiawa			
Manus	37	5	13.5
Mendi	97	26	26.8
Modilon	119	39	32.8
Mt Hagen			
Nonga	26	3	11.5
Oro			
PMGH			
Vanimo	57	11	19.3
Wabag	211	36	17.1
Wewak			
Total	739	157	21.2

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Hospital	Meningitis admissions	Meningitis deaths	Meningitis CFR	Septicaemia admissions	Septicaemia deaths	Septicaemia CFR
Alotau	20	1	5.0	7		0.0
Angau						
Buka	22	6	27.3	6		0.0
Daru						
Goroka	56	23	41.1	15		0.0
Kavieng	23	3	13.0	1		0.0
Kimbe	81	19	23.5	10		0.0
Kerema						
Kundiawa						
Manus	4	0	0.0	2	0	0.0
Mendi	58	15	25.9	18	18	100.0
Modilon	80	11	13.8	7	4	57.1
Mt Hagen						
Nonga	29	4	13.8	3		0.0
Oro						
PMGH						
Vanimo	25	6	24.0	8		0.0
Wabag	19	4	21.1	2		0.0
Wewak						
Total	417	92	22.1	79	22	27.8

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Hospital	TB admissions	TB deaths	TB CFR	HIV admissions	HIV deaths	HIV CFR
Alotau	20	2	10.0	0	0	0
Angau						
Buka	66	8	12.1	3	0	0
Daru						
Goroka	56	5	8.9	24	4	16.7
Kavieng	8	0	0.0	0	0	
Kimbe	94	14	14.9	3	2	66.7
Kerema						
Kundiawa						
Manus	5	0	0.0	0	0	0
Mendi	109	15	13.8	8	2	25
Modilon	67	4	6.0	9	3	33.3
Mt Hagen						
Nonga	22	2	9.1	2	0	0
Oro						
PMGH						
Vanimo	23	5	21.7	2	0	0
Wabag	44	3	6.8	3	2	66.7
Wewak						
Total	514	58	11.3	54	13	24.1

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Hospital	Neonatal admissions	Neonatal deaths	Neonatal CFR	Neonatal infections admissions	Neonatal infections deaths	Neonatal infection CFR
Alotau	212	10	4.7	129	3	2.3
Angau						
Buka	30	10	33.3	15	4	26.7
Daru						
Goroka	188	7	3.7	128	3	2.3
Kavieng	61	6	9.8	30	3	10.0
Kimbe	40	7	17.5	40	7	17.5
Kerema						
Kundiawa						
Manus	165	4	2.4	16	0	0.0
Mendi	248	21	8.5	123	5	4.1
Modilon	271	56	20.7	34	3	8.8
Mt Hagen						
Nonga	217	21	9.7	12	8	66.7
Oro						
PMGH						
Vanimo	159	8	5.0	61	1	1.6
Wabag	5	0	0.0	4	0	0.0
Wewak						
Total	1596	150	9.4	592	37	6.3

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Hospital	Asphyxia admissions	Asphyxia deaths	Asphyxia CFR	VLBW admissions	VLBW deaths	VLBW CFR
Alotau	79	5	6.3	8	2	25.0
Angau						
Buka	6	2	33.3	11	2	18.2
Daru						
Goroka	53	3	5.7	13	6	46.2
Kavieng	18	1	5.6	5	0	0.0
Kimbe	0	0	0	0	0	0
Kerema						
Kundiawa						
Manus	7	2	28.6	10	1	10.0
Mendi	101	12	11.9	19	8	42.1
Modilon	55	18	32.7	19	7	36.8
Mt Hagen						
Nonga	58	5	8.6	17	5	29.4
Oro						
PMGH						
Vanimo	90	6	6.7	4	1	25.0
Wabag	0	0	0	0	0	0
Wewak						
Total	467	54	11.6	106	32	30.2