Causes of mortality and associated modifiable health care factors for children (< 5-years) admitted at Onandjokwe Hospital, Namibia

Stellenbosch University

Faculty of Medicine and Health Sciences

Family Medicine and Primary Care

RESEARCH ASSIGNMENT FOR MMED FAMILY MEDICINE

Degree: MMED Family Medicine

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Declaration

I, the undersigned, hereby declare that the work contained in this assignment is my original work and that I have not previously submitted it, in its entirety or in part, at any university for a degree. I also declare that ethical approval for the study was obtained from the Health Research Ethics Committee of Stellenbosch University (Reference number: S12/10/256)

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Signature: Date: 05/11/2014

Abstract

Introduction

Many countries, especially from Sub-Saharan Africa, are unlikely to reach the Millennium Development Goal for under-5 mortality reduction by 2015. This study aimed to identify causes of mortality and associated modifiable health care factors for under-5 year old children admitted to Onandjokwe Hospital, Namibia.

Method

A descriptive retrospective review of the medical records of all children under five years who died in the hospital for the period of 12 months during 2013, using two different structured questionnaires targeting perinatal deaths and post-perinatal deaths respectively .

Results

The top five causes of 125 perinatal deaths were prematurity 22(17.6%), birth asphyxia 19(15.2%), congenital anomalies 16(12.8%), unknown 13(10.4%) and abruptio placenta 11(8.8%). The top five causes of 60 post-perinatal deaths were bacterial pneumonia 21(35%), gastroenteritis 12(20%), severe malnutrition 6(10%), septicaemia 6(10%), and tuberculosis 4(6.7%).

69 (55%) perinatal deaths and 42(70%) post-perinatal deaths were potentially avoidable. The modifiable factors were: late presentation to health care facility, antenatal clinics not screening for danger signs, long distance referral, district hospitals not providing emergency obstetric care, poor monitoring of labour and admitted children in the wards, lack of screening for malnutrition, failure to repeat HIV test in pregnant women in third trimester or during breastfeeding, and lack of review of urgent results of critically ill children.

Conclusion

A significant number of deaths in children under 5-years of age could be avoided by attention to the modifiable factors identified in this study.

Introduction

The under-five mortality rate is one of the health indicators used by the World Health Organization (WHO) to assess a country's progress with improving the health of its citizen.[1]Globally there has been an overall decrease in under-five mortality since 1990, when many countries started working towards the fourth Millennium Development Goal (MDG), which aims to decrease under-five mortality by two thirds by the year 2015.[1] However, in Sub-Saharan Africa and South Asia there has been slow progress in attaining the MDG goal, and many countries in these regions are unlikely to meet the target.[1-4]

Globally almost 40% of all under-five deaths are due to preventable or treatable infectious causes, particularly bacterial pneumonia and diarrhoea diseases, as well as birth complications and malnutrition.[1-19]There is also a high neonatal mortality in many poor countries due to premature birth, birth asphyxia and sepsis.[12-16] Many proven strategies to reduce mortality have not been implemented such as high quality antenatal care, skilled birth attendance, and prioritising services in remote and rural communities where the most vulnerable children and pregnant women live.[11-16]The deaths in older children after perinatal period has remained high due to low coverage of pneumococcal vaccine, poor sanitation leading to diarrhoea in most areas with poor water supply, displaced war camps victims and poor food security in most poor countries and war stricken countries.[3]

Differences in the burden of diseases have been acknowledged and also the need for specific countries to identify their local health challenges and priority areas.[3]Therefore, effort should be made to identify modifiable factors which contribute to the death of children and to develop strategies to address these challenges locally.

Namibia, over the last 43 years, has shown a progressive trend towards decreasing the under-five mortality rate from a high of 118 per 1,000 live births in 1968 to 31 per 1,000 live births in 2012.[18,20]However, the under-five mortality rate is still above the target of 24 deaths per 1,000 live births in 2015 and therefore efforts to identify country specific causes, which could be targeted to decrease further the under-five mortality, are necessary.[18-20]The recent introduction of pneumococcal and rotavirus vaccines in many African countries, including Namibia, should have a further impact on reducing mortality.[3]

South Africa, a neighbouring country to Namibia, has been collecting data on perinatal mortality since 2000, and has also started under-five child mortality reviews, whereby the causes of deaths and avoidable contributors are identified and priority interventions designed.[13-17,21-23] The need of monitoring the trends of under five mortality is highly important in Namibia however, production of useful quality data which can be used by district and national level team for planning and interventions will need more improvement vital registration statistics.[21] The interventions that have been implemented in South Africa to improve under five

survival include changes to the nurseries , creation of Kangaroo Mother Care areas, provision of essential equipment, including Continuous Positive Airway Pressure (CPAP) machines at hospitals, allocation of specific staff for newborn children, retention of key experienced staff in maternity and neonatal unit, improved laboratory services and drug availability, change of attitude among health care that newborns need specialized care, training of large number of doctors and nurses, use of standardized admission forms and record charts, admission or readmission of older neonates to the newborn care facility and not to normal paediatrics ward and use of the Perinatal Problem Identification Programme (PPIP).[22]

Therefore, since no such facility-based reviews of under-5 deaths have been performed in Namibia to determine the local causes of deaths and modifiable factors, this study will be an important cornerstone in introducing such practice and designing specific interventions to decrease deaths in our settings based on local findings.

Aims and objectives

The primary aim of this study was to identify the causes of deaths of children under the age of 5-years who died at Onandjokwe Hospital, Northern Namibia from 1st January 2013 to 30th December 2013. The secondary aim was to look at the management of these children in the paediatric department and to identifying modifiable factors in the quality of care that might be targeted in future to reduce child mortality.

The specific objectives were:

(i) to identify key demographic and clinical information (age, gender, and length of stay in hospital, time of death, nutritional profile, and HIV exposure/status),

(ii) to identify the immediate and underlying causes of death as well as significant conditions contributing to death and

(iii) to identify any modifiable causes of death, where they occurred in the health care delivery chain and who was responsible for the modifiable factor (clinical worker, care giver/ family member or administrator).

Methods

Study design

The study was a descriptive retrospective review of the medical records of all children under 5-years who died in the hospital during 2013. The study population was divided into two groups who were assessed using two different questionnaires: a questionnaire collecting Perinatal Mortality Data for those who died before the first week of life and a second questionnaire collecting data for children who died between 8 days and 5 years.

Study settings

The study took place at the Onandjokwe Lutheran Hospital in Northern Namibia, which is located 750km from the capital city of Windhoek. The hospital has been providing healthcare services for 108 years, has a 450 bed capacity, and serves a population of about 340,000 people. Children are admitted in five difference wards, namely: neonatal ward (neonates delivered in hospital), ward 1 (neonates delivered at home/ out discharged and come back from home), ward 7 (general medicine, malnutrition and surgical cases), ward 9 (children who need isolation and diarrhoea) and the Intensive Care Unit (ICU). The department has one specialist paediatrician and three medical officers allocated to the department at all times. The hospital operates as a referral hospital and receives referrals from four district hospitals. The hospital has a Perinatal and Maternal Mortality Audit Committee comprised of the hospital administrators, paediatric, obstetrics and gynaecology departments. The members meet once per month to audit only maternal deaths and deaths during the perinatal period. Deaths of children who die after perinatal period are not reviewed as there is no hospital committee responsible to audit them.

Study population

All children that died in 2013, from 28 weeks gestation or a birth weight of > 1000 grams to the age of 5-years, at the hospital, were included in the study.

Research tools

Two separate questionnaires were used, namely the Perinatal Data Collection questionnaire and he Child Data Collection Questionnaire (see appendices). The Perinatal questionnaire was a validated questionnaire adopted from the Perinatal Problem Identification Programme (PPIP) of South Africa.[11-15]This questionnaire was used to collect data from records of neonatal deaths (28 weeks gestation and birth weight >1000 grams to seven days old). The Child questionnaire was a validated questionnaire adopted from the Child Problem Identification Programme (Child PIP) of South Africa. [17]This questionnaire was used to collect data from the records of children who died between the ages of 8 days to five years.

Data collection

The clinical and laboratory records, of all children and neonates who died, were identified as they occurred in the wards throughout the year. The investigator was made aware of the deaths through notification by the ward nurse and by regular visits to all the wards that admitted children. All pending results were also collected from the laboratory by the investigator. Data was extracted from the records by the investigator using the questionnaires.

Due to the fact that the hospital did not have any committee in place to audit the deaths of children beyond the perinatal period, the investigator alone audited these 60 records to determine the causes of deaths and modifiable risk factors. The

Perinatal and Maternal Mortality committee reviewed all deaths in the perinatal period which were presented to them by the investigator and a consensus obtained.

Data analysis

Data was captured from the questionnaires using the file numbers as identifiers and information entered into an Excel spreadsheet. The data was double entered from the same questionnaires to clean the missing data and wrongly copied information. The data analysis was done using Epi-info 7 whereby frequencies were generated and the proportions calculated, no testing of associations was required.

Results

The research findings are divided into two sections, the first section presents the findings from the perinatal death review and the second section provides the findings related to children after the perinatal period up to 5 years old.

Perinatal results

During the review period, there were 6171 hospital deliveries and 141 home deliveries brought to hospital within 7 days with 6118 live-births and 56 intra-uterine foetal deaths (IUFD), at above 28 weeks gestation or 1000gm birth weight.

A total of 69 neonates died within 7 days after delivery and therefore the total number of perinatal deaths was 125. Among the 125 children who died within the perinatal period, 60 (48.0%) were female and 65 (52.0%) were male. The In-hospital Perinatal Mortality Rate was therefore 20.2 per 1000 live births.

Among those who died during the perinatal period 56 (44.8%) were IUFDs, 28 (22.4%) died within 24 hours of delivery, 30 (24.0%) died 1-3 days after delivery and 11 (8.8 %) died 4-7 days after delivery.

Among those who died during the perinatal period half of total population had low birth, as showed in Table 1.

Table 1: Birth Weight by Gender (N=125)

Gender	Extreme Low Birth weight (<1500gms)	Low Birth Weight (1500-2999.9gms)	Normal Birth Weight (>2500gms)	Total
Male	11(8.8%)	25(20.0%)	24(19.2%)	60(48.0%)

Female	11(8.8%)	29(23.2%)	25(20.0%)	65(52.0%)
Total	22(17.6%)	54(43.2%)	49(39.2%)	125(100%)

The top five causes of perinatal deaths were prematurity, birth asphyxia, congenital anomalies, unknown and abruptio placenta as shown in Table 2.

Table 2: Causes of deaths during the perinatal period (N=125)

Cause of death	n	%
Prematurity	22	17.6
Birth asphyxia	19	15.2
Congenital abnormality	16	12.8
Unknown cause	13	10.4
Abruption placenta	11	8.8
Cord around the neck	8	6.4
Pre-eclampsia	8	6.4
Meconium aspiration	7	5.6
Septicaemia	6	4.8
Chorioamnitis	3	2.4
Cord prolapse	2	1.6
Intrauterine growth restriction	2	1.6
Ruptured uterus	2	1.6
Maternal trauma	1	0.8
Rubella infection	1	0.8
Hypoglycaemia	1	0.8
Necrotizing entercolitis	1	0.8
Congenital abnormal placenta	1	0.8
Anemia	1	0.8

Obstetrics causes were found to contribute in 47 (37.6%) perinatal deaths, of which the top five causes were pre-eclampsia, abruptio placenta, poor progress of labour, chorioamnionitis and severe maternal anemia as shown in Table 3.

Table 3: Obstetric causes of perinatal mortality (N=125)

Obstetric cause	**n**	**%**
Pre-eclampsia	13	10.4
Abruptio placenta	7	5.6
Poor progress of labour	6	4.8
Chorioamnitis	3	2.4
Severe maternal anemia	3	2.4
Malpresentation	2	1.6
Premature labour	2	1.6
Premature rupture of membranes	2	1.6
Ruptured uterus	2	1.6
Cord around the neck	2	1.6
Foot prolapse	1	0.8
Intrauterine growth restriction	1	0.8
Umbilical cord prolapse	1	0.8
Trauma to the abdomen	1	0.8
Advanced AIDS	1	0.8

Family factors were found to contribute in 23 (18.4%) perinatal deaths, of which the top two factors were late presentation of the neonate (more than 24 hours after delivery at home) and home delivery without assistance by a trained health professional as shown in Table 4.

Table 4: Family modifiable factors for perinatal mortality (N=125)

Family factor	**n**	**%**
Late presentation to health care facility	9	7.2
Home delivery	7	5.6
Poor antenatal attendance	3	2.4
Did not attend antenatal care	2	1.6
Referred, but did not go	2	1.6

In 21 (16.8%) perinatal deaths, the top three factors related to antenatal care that may have contributed to these deaths were no maternal weight chart and no blood pressure recorded despite patients visiting the clinic, poor management of pre-eclampsia at the referral hospital, long distance referral of sick neonates (more than 200km) and three district hospitals not performing emergency caesarean sections as shown in Table 5**.**

Table 5: Clinics, health centres and referring district hospitals modifiable factors (N=125)

Clinic factor	**n**	**%**
Substandard antenatal care services	11	8.8
Poor management of pre-eclampsia at district hospital	3	2.4
Long distance referral	2	1.6
District hospital not performing emergency Caesarean section	2	1.6
Delayed initiation of Highly Active Anti-retroviral Therapy	1	0.8
Lack of transport	1	0.8

Poor management of gestational diabetes at district hospital	1	0.8

In 74 (59.2%) perinatal deaths the top three modifiable factors related to in-patient services at Onandjokwe referral hospital were, poor labour monitoring in labour room, lack of surfactant in severe premature neonates and lack of beds and space in ICU for critically ill neonates as shown in Table 6.

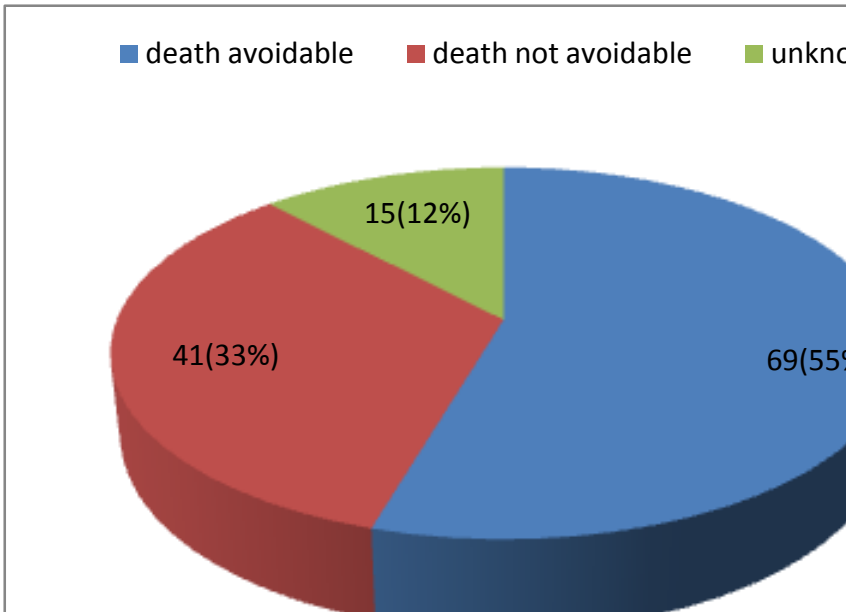
Table 6: Referral hospital modifiable factors for perinatal mortality (N=125)

Referral hospital factors	**n**	**%**
Poor labour monitoring	16	12.8
Lack of surfactant	11	8.8
Lack of Continuous Positive Airway Pressure (CPAP)machine	8	6.4
Lack of beds and space in Intensive Care Unit	5	4.0
Delayed Caesarean section	4	3.2
Few nurses in labour room	4	3.2
Few nurses in neonatal unit	4	3.2
Poor monitoring of neonates in the neonatal unit	4	3.2
Poor monitoring of labour in mothers kept at waiting area waiting to be transferred to labour room	4	3.2
Shortage of theatre nurses when emergency Caesarean section is indicated	3	2.4
Poor decision made by a doctor when consulted in case of poor progress of labour	3	2.4
No space for patient to be admitted in labour room	2	1.6

Insufficient clinic information for next person to act	2	1.6
Lack of air ambulance	2	1.6
Lack of paediatric surgeon	2	1.6

The research found that 69 (55%) of perinatal deaths might have been avoidable if the process of care had been different, and in 15 (12%) of the deaths the researcher was not sure whether better care or same care would have helped to avoid the death (Figure 1).

Figure 1.The researcher opinion whether the death was avoidable or not avoidable (N=125)



Post-perinatal (children 8 days to 5 years) results

There were 4898 admissions of children aged 8 days to 5 years during the review period among whom there were 60 deaths, 31 (51.7%) of which occurred under 1-year of age. A total of 6956 infants aged less than one month were admitted during the review period, of whom 132 died, giving an In-hospital Infant Mortality Rate of 19.1 per 1000 admissions

The study population consisted of 25 (41.7%) males and 35 (58.3%) females. The HIV status of the mothers showed that 29 (48.3%) were HIV negative, 23 (38.3%) were HIV positive and 8 (13.3%) mothers did not know their HIV status and were not

tested during the admission. A total of 9 (15%) children had confirmed HIV positive result using either DNA PCR or HIV rapid testing.

The study found that 21 (35.0%) died seven or more days after admission, 19 (31.7%) died within 1-3 days of admission, 12 (20%) within 24 hours of admission and 8 (1.3%) 4-6 days after admission. The study also found that 24 (40.0%) of the deaths occurred during normal weekday working hours (0700-1900), 20 (33.3 %) during week nights and 16 (26.7%) during weekend days or public holidays.

The study found that 38 (63%) of the study population had known underlying medical conditions likely to predispose the children to poor health among which 14 (23.3%) had severe malnutrition, 9 (15%) HIV infection, 9 (15%) congenital anomalies (mostly Down's syndrome and microcephaly due to birth asphyxia), 4 (6.7%) post-prematurity without catch up weight gain, 1 (2.6%) ischeamic foot gangrene and 1 (2.6%) congenital rubella infection.

The top five causes of death were bacterial pneumonia, gastroenteritis, severe malnutrition, septicaemia, and tuberculosis as shown in Table 8.

Table 8: Distribution of causes of death among study population (N=60)

Cause of death	**n**	**%**
Bacterial pneumonia	15	25.0
Gastroenteritis	12	20.0
Severe malnutrition	6	10.0
Septicaemia	6	10.0
Pulmonary tuberculosis	4	6.7
Congenital anomalies e.g. malrotation of small intestines, ventricular septal defect, transposition of great vessels	3	5.0
Bacterial meningitis	2	3.3
Pneumocystic Jeroverci pneumonia	2	3.3
Aspiration pneumonia	2	3.3
Burn wound	1	1.7
Carbamazepine intoxication (accidental)	1	1.7

Food poisoning	1	1.7
Cytomegallovirus hepatitis	1	1.7
Head injury due to fall from tree	1	1.7
Post-prematurity respiratory failure	1	1.7
Alcohol intoxication	1	1.7
Unknown cause	1	1.7

In 24 (40.0%) deaths, family factors were found to contribute of which the top three factors were late presentation of the child to the health facility (more than 24 hours after starting of illness), not attending follow up for HIV exposed children (these children should receive Nevirapine prophylaxis and HIV PCR testing), and leaving the child in the care of the grandmother or other family members, as shown in Table 9.

Table 9: Family modifiable factors for child deaths (N=60)

Family factor	**n**	**%**
Late presentation for treatment	8	13.3
Not bringing HIV exposed child for follow up	7	11.7
Child left with relatives by the mother	3	5.0
Poor ARV adherence	1	1.7
Poor food security	1	1.7
Early mixed feeding	1	1.7
Mother culturally cannot consent for operation	1	1.7
Kept medication at places easily accessible by child	1	1.7

Defaulted scheduled operation for adenotonsillectomy	1	1.7

In 18 (31.7%) deaths, care at the referring clinic, health centre or district hospital contributed, of which the top three factors were failure to make a nutritional assessment and diagnose malnutrition, not actively tracing HIV exposed children that defaulted from follow up, and failure to repeat the mother's initial negative HIV test later in pregnancy, as shown in Table 10.

Table 10: Referring clinic, health centre and district hospital modifiable factors (N=60)

District health services factor	**n**	**%**
Nutritional assessment not done	5	8.3
No follow up of HIV exposed children	4	6.7
Negative HIV test in early pregnancy was not rechecked later on	4	6.7
Initial treatment not started at clinic during referral process	3	5
Late referral from district hospital to Onandjokwe hospital	2	3.3

In 27 (45.0%) deaths, Onandjokwe referral hospital in-patient services were found to contribute, the top three factors were poor child monitoring in the ward (e.g. no record of vital signs or no record taken for more than 8 hours), urgent results of critically ill children were not reviewed for more than 24 hours, the admitting doctor missed the diagnosis at admission and therefore initiated inappropriate medications, and failure to identify severe malnutrition on admission, as shown in Table 11.

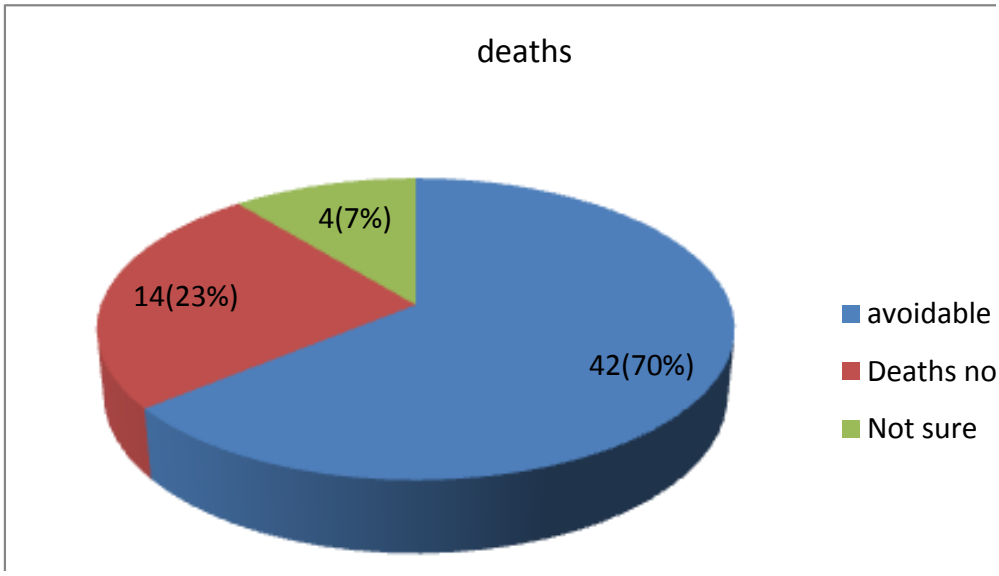
Table 11: Referral hospital modifiable factors (N=60)

Referral hospital factors	**n**	**%**
Poor child monitoring in the ward	8	13.3
Urgent results not reviewed more than 24 hrs	5	8.3

Missed diagnosis at admission	4	6.7
Nutrition assessment not done	4	6.7
Not started on antibiotics early	4	6.7
Lack of ICU bed	1	1.7
Lack of teamwork	1	1.7

Findings revealed that 42 (70%) of the deaths would have been avoidable if the process of care had been different, as shown in Figure 2.

Figure 2: The review opinion whether the death was avoidable (N=60)



Discussion

Key perinatal mortality findings

The perinatal data found that more than half of perinatal deaths might have been avoidable if the process of care and quality of health care provided had been better. The high proportions of avoidable perinatal deaths have been observed in neighbouring South Africa whereby close to half of the deaths were avoidable.[12-16]The similarity in the identified challenges might be explained by their shared colonial history whereby Namibia was part of South Africa until independence in 1990, with closely related social, cultural and geographical challenges.

The avoidable factors related to family, health care providers and health system performance identified in this study correlate closely with the factors identified in South Africa. For example common factors include family/patient delay in seeking medical attention during labour, never attending antenatal care and inadequate equipment and supplies such as availability of CPAP.[12-16]However; in some providences of South Africa the zonal health teams have been implementing the corrective actions and infrastructure to tackle the identified modifiable factors.[22]

Prematurity and birth asphyxia were the top two challenges which were identified to be neonatal related cause of deaths. These two challenges are the most common factors leading to deaths in many parts of the world, especially in developing countries, and including South Africa.[2-16]The proportion of unexplained deaths was high in this study, providing challenges to the need for increased perinatal deaths investigation to prevent same deaths in future pregnancies of the mothers, similar figure was rates reported in South Africa. This can be explained by the limited diagnostic resources in developing countries that do not always allow for a definitive diagnosis to be reached.

<u>Key child 8 days to 5 years mortality findings</u>

The proportion of avoidable deaths was found to be slightly higher compared to South Africa, which reported that 37% of their deaths were avoidable.[16, 23] This might be due to the efforts of South African health care to improve the quality of care as a result of the Child Problem Identification Programme reports since 2004.

Children who become sick with underlying medical conditions appeared more likely to have a poor outcome, and the study found a significant number of children with underlying severe malnutrition, HIV infection and congenital anomalies. Several studies has shown that the Mother To Child Transmission (PMTCT) of HIV and malnutrition makes an important contribution to childhood mortality.[5-9]The recent success of PMTCT programmes in South Africa and Namibia has reduced rates of HIV infections and subsequent childhood deaths, however the prevalence of malnutrition in Namibia is still high 16.5% compared to South Africa 10.2%.[17]

Community acquired pneumonia and gastroenteritis contributed to more than half of the deaths in this study. This finding is consistent with findings in most settings in the world.[1,5-9,19,21,-23]This can probably be explained, not only by avoidable factors in the

health services, but also by low immunisation coverage and by developmental issues such as a lack of access to adequate sanitation and clean water.

The modifiable factors identified in the study such as late presentation of the child to the health care facility, lack of follow up of HIV exposed babies, lack of nutritional assessment and poor monitoring of admitted children, have also been pointed out in studies from other African countries.[1-9]

Limitations of the study

The results were dependent on the quality of record keeping and in some cases the medical record contained only a few notes written by the admitting doctor. However, additional information obtained from patients health passports helped to identify some of the missing gaps in the record of care for these children.

Recommendations/implications

The routine audit of childhood deaths for risk identification and management, in order to avoid further deaths, should be part of the routine activities in all hospitals which admit the children. This will help them identify the modifiable factors in their local settings and plan the locally applicable interventions.

The findings of this study should be shared among the role players from community level and across the health care system involving the individual healthcare workers, primary care facilities, hospitals, regional health administration authority and ministry of health. The following recommendations were generated:

Community level: People at the community level should be educated on the importance of early attendance to the primary health care facility as soon as an illness begins in children under-5 years of age. The community counsellor and health extension workers, who go to the community, should emphasize on early clinic/hospital visit within 24 hours when they have a sick child.

At the clinic: Staff should be reminded on the implementation of and adherence to the Integrated Management of Childhood Illness (IMCI) guidelines. This includes early management of sick children while waiting for the ambulance, regular growth monitoring and assessment of nutritional status, interventions for malnutrition, as well as education on the preparation of Oral Rehydration Solution (ORS) to mothers of children who visit clinics for immunisation and the supply of at least 3 packets of ORS to all mothers with children under-five at home.

District hospital: The doctors to get refresher training on the gaps in clinical care identified and to be motivated to attend Continuous Medical Education presentations on paediatrics care organized at Onandjokwe hospital and Ondangwa doctors' journal club. All 4 district hospitals should be able provide emergency caesarean sections services by sending staff for training on emergency obstetric care, supplying

them with the relevant guidelines, and necessary resources. The doctors and nurses from these 4 district hospital may be sent for attachment at Onandjokwe hospital

At the referral hospital: All medical officers should rotate through the paediatric department as part of their first year orientation to the hospital. The hospital should budget for the ongoing training of medical doctors and nurses working in the paediatric department, for the purchase of necessary equipment and resources, and to distribute nurses with consideration to the special needs of intra-partum care and the neonatal unit.

Government: To increase the vacancies of nurses to cope with the volume of patients in labour ward and paediatrics wards. To set budget to purchase necessary equipment, supplies and medicine such as surfactant for premature neonates, supply CPAP machines to the district hospitals. To strengthen the capacity of all district hospitals to provide obstetrics emergency care services.

By the nurse: Regular nutritional assessment of children and application of IMCI principles

The doctor: Personal effort are needed to update her/himself on latest guidelines and standard operating procedures and to attend CME, especially in areas related to management of pre-eclampsia, gestational diabetes and common childhood illnesses. Quality improvement initiatives should target the following clinical processes: blood pressure measurement in pregnant women, maternal weight monitoring and review of urgent blood results within 24 hours.

Hospital managers: Prioritize distribution of staff among departments with special consideration to children and pregnant women care, to procure essential resources such as surfactant, CPAP machines, expand the ICU bed capacity, establish a hospital committee which will be responsible for coordinating death audits and track the implementation plans to decrease deaths.

District manager: To take note of the identified modifiable factors at the clinics and health centres, and the family factors. To co-ordinate a response from the community, clinic staff, health extension workers and environmental health practitioners in collaboration with the regional health administrators. They should plan for infrastructure development, which favours emergency neonatal and obstetric care.

Conclusion

The major causes of mortality at Onandjokwe during the perinatal period were prematurity, birth asphyxia, congenital anomalies, abruptio placenta and unknown causes. The major family modifiable factors were late presentation of the neonate more than 24 hours after delivery at home, home delivery without assistance by a trained health professional and poor antenatal care attendance. The antenatal care modifiable factors were clinics not monitoring maternal weight and blood pressure, poor management and follow up of pre-eclampsia patients at referral hospital, long distance referral of sick neonates and three district hospitals not performing emergency caesarean sections. Modifiable factors related to in-patient services at Onandjokwe referral hospital were poor labour monitoring in labour room, lack of surfactant in severe premature neonates and lack of beds and space in ICU for critically ill neonates

The major causes of mortality in children eight days to five years old were bacterial pneumonia, gastroenteritis, severe malnutrition, septicaemia, and tuberculosis. The underlying medical conditions identified were severe malnutrition, HIV infection, congenital anomalies (mostly Down's syndrome and microcephaly due to birth asphyxia), and post-prematurity. The major modifiable family factors were late presentation of the child to the health facility (more than 24 hours after starting of illness), defaulting of HIV exposed children from follow up and sick children being cared for by grandmothers or other family members. Modifiable factors at clinics and referring hospitals were failure to make a nutritional assessment and diagnose malnutrition, lack of active recall of the HIV exposed child and failure to repeat HIV testing in pregnant women who initially test negative. The modifiable factors during in-patient services were poor child monitoring in the ward, urgent results of critically ill children not reviewed for more than 24 hours, admitting doctor missing the diagnosis at admission and lack of nutritional assessment at admission.

Key words

The 5 most key words in this study are;
1)Millennium Development Goal 4
2)Child and Perinatal Problem Identification Programme(PPIP and Child PIP)
3)Modifiable health care factors
4)Causes of child mortality
5)Perinatal and Child mortality audit

Appendices

1. Questionnaire 1 : Perinatal data capture tool
2. Questionnaire 2: Child data capture tool
3. Waiver of informed consent

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Questionnaire. 8 DAYS -5 YEARS OLD CHILD DATA CAPTURE

STUDY NO.....

1.Patient Initials		2.File no		3.District
4.DOB/AGE	6.Sex M/ F	7.Readmission Y N U		8.Arrived dead Y N
9.When death occurred	Weekdays (0700-1900)		Weeknight (1900-0700	public holiday/Weekend
10.Date Of admission Time		11.Date of death Time		

12 Provisional Diagnosis

1. 4.

2. 5.

3.

13.Previous admissions in the past 12 months and diagnoses

Date: 1.....Diagnosis.....

2.....diagnosis.....

3.....Diagnosis.....

4.....Diagnosis.....

14. Previous admissions since birth and diagnoses:

Dates 1.....Diagnosis.....

2.....Diagnosis.....

3.....Diagnosis.....

4.....Diagnosis.....

5..... Diagnosis.....

15.Records

1. Folder not available 2. Folder available records incomplete . Folder available, quality of notes poor 4. Folder available notes inadequate and record incomplete 5. Folder available , notes & records ok

16. Nutrition

Weight----------Height.....

OWFA	Normal	UWFA	Marasmus	Kwashiorkor	Marasmic-Kwashiorkor

17. HIV /AIDS Information

Mother HIV status during pregnancy	negative	positive	Not tested	
ARV status mother	Current on ARV	Started before, not on ARV	Never on ARV but indicated	Never started ARV don't qualify
ARV Prophylaxis Given to mother	Yes	No	Mother was on ARV	

18.HIV Status Child	Negative	positive	Exposed HIV not confirmed	Not tested but indicated

Clinical stage 1	11	III	IV	Not staged but indicated
Prophylactic ARV given to child	Yes	No	Given for short duration Duration..... Reason.....	
Cotrimoxazole prophylaxis to child	Given	Not given		

ARV status of a child	current on ARV	Started before, not on ARV	Never started ARV but indicated	Never started ARV, don't qualify

19. Cause(s) of death

Main cause		Underlying cause	
Other Diagnoses			

20.Modifiable factors (Tick)

Family /care giver	Probable	possible

Clinic /ambulance	Probable	possible

Admission/ emergency: Hospital	Probable	Possible

Ward : Hospital	Probable	possible

21. In your opinion had the process of care been different, would this death has been avoidable?

Yes	Not sure	No	Unknown

PERINATAL QUESTIONNAIRE

Serial no of file.....

1.FILE NUMBER				
2.DATE OF BIRTH				
3.DATE OF DEATH				
4.BIRTH WEIGHT	Grams			
5.PLACE OF DELIVERY	At this hospital	At home	At another hospital/health centre	On transit
6.MATERNAL AGE	Years			
7.ANTERNATAL CARE CLINIC VISITS	4 0r more	Less than 4	Did not attend ANC	
8.CONDITION AT BIRTH	Bon e alive	Stillborn, alive on admission	Fresh Stillborn	Macerated stillborn
9.SYPHILIS SEROLOGY TEST OF THE MOTHER	Posi tive	Negativ e	Not done	
10.NUMBER OF PREGNANCIES	1-3	3-5	More than 5 pregnancies	
11.MATERNAL HIV STATUS	POSITIV E	NEGATIVE	UNKNOWN	
12.MOTHER ARV STATUS	Current on HAART	Eligible for HAART , not started	Started HAART before, defaulted	Not eligible for HAART
13.MOTHER ARV PROPHYLAXIS DURING PREGNANCY/LA BOUR	Given from 14 weeks	Given > 14 weeks but soon after start of ANC	Given only during Labour	Did not receive ARV Prophylaxis
14.ARV PROPHYLAXIS TO CHILD	Current on Nevirapin e	Got prophylaxis only soon after birth	Did not receive ARV prophylaxis	

	prophylaxis			
15.PRIMARY OBSTETRIC CAUSE OF DEATH				
OTHER				
16.FINAL CAUSE OF DEATH				
Other				
17.Modifiable CAUSES OF DEATH	Who, where and when related to modifiable factors		Probable	Possible
	1. Family /care giver			
	2. Clinic /ambulance			
	3. Admission/ emergency: Hospital.			
	4. Ward : Hospital.			

18.In your opinion had the process of care been different, would this death has been avoidable?

Yes	Not sure	No	Unknown