IS FACILITY BASED NEONATAL CARE IN LOW RESOURCE SETTING KEEPING PACE? A GLANCE AT UGANDA'S NATIONAL REFERRAL HOSPITAL

Abstract

Background: Limited improvement in neonatal mortality rate is a major obstacle to further reduction of under-five mortality in most developing countries. Community based interventions have had some impact; Continuous intervention to further reduction needs scaling up care in health facilities.

Method: A retrospective review was conducted on records of neonates admitted to Mulago National referral hospital Special Care baby Unit from 1st November 2013 to 31st January 2014. Relevant data was captured analyzed using SPSS 12.0.1. Bivariate and multivariate analyses were conducted to identify factors associated with mortality.

Results: There were 1192 admitted neonates, overall mortality was 22.1%. Major contributors to mortality were prematurity with hypothermia and respiratory distress (OR-16.9, P-0.000<0.005), birth asphyxia with HIE grade III (OR-33.3, P-0.000<0.005), presumed sepsis (OR-2.1, P-0.000<0.005), and prematurity with respiratory distress (OR-3.4, P-0.000<0.005). Death increases with decrease in birth weight (Birth weight 1000-1499g with OR-2.3 and <1000 with OR 3.9.

Conclusions and recommendations: A structured neonatal care with trained personnel, and guidelines are urgently needed. Prevention of hypothermia and management of respiratory distress need to be urgently addressed. Capacity to provide standard therapeutic hypothermia must be expedited.

Background

Globally an estimated 6.3 million children under 5years die annually with 44% of these deaths occurring during the first month of life. Ninety eight percent of the global neonatal deaths occur in developing countries. Sub-Saharan Africa accounts for 39.3% of all these deaths.

Whereas most developing countries have made strides towards reducing under five mortality, further reduction has become challenging and slow decline in neonatal mortality rate has been identified as the major obstacle to further reduction of under-five mortality.

Many community based interventions designed to address neonatal mortality in developing countries may have contributed to some decline in neonatal deaths[6] but further reduction in neonatal deaths in the developing countries will need scaling up care in health facilities.

In Uganda, neonatal mortality contributes 26% of under-five mortality. Like most developing countries the decline in neonatal mortality rate in Uganda has not been significant. Many deliveries take place in the community. With intensive effort in addressing maternal and neonatal mortality in the community, we foresee increasing referral of high risk mothers and sick neonates to hospitals.

Study setting and population

Mulago National Referral Hospital is situated in Kampala (the capital city of Uganda) serving the urban and peri-urban communities. It is a teaching institution for Makerere University College of Health Sciences and other health training schools. The hospital has over 33,000 births annually.

The unit functions at level II but receives critically ill neonates in need of advanced respiratory and cardiovascular support. Services offered in the unit include provision of intravenous antibiotics, intravenous fluids mainly as boluses, phototherapy and nasal tube feeding. Maximum respiratory support available is with fixed expiratory valve Continuous Positive Airway Pressure (CPAP). Mothers/caregivers feed their babies on a two hourly basis. Continuous vital monitoring is not readily available. Servo-control temperature regulation for babies is not possible due to lack of probes and often more than one baby in an incubator.

Study design, sample selection and data collection

A retrospective descriptive study was conducted including all neonates admitted to the SCBU of Mulago Hospital in the months of November 2012 to January 2013. All files for neonates admitted during the study period were retrieved from records. All relevant data were captured and missing data noted.

A list of diagnoses / problems was generated (low APGAR score, prematurity, Prematurity + hypothermia, Prematurity + Hypothermia + Respiratory Distress Syndrome (RDS) , Prematurity + RDS, Asphyxia + Hypoxic ischemic Encephalopathy (HIE) I, Asphyxia + HIE II, Asphyxia + HIE III, Presumed sepsis, transient tachypnea of the newborn (TTN), Jaundice, Fever + Dehydration, HDN, birth defect, birth injury, MAS, Others). Although some babies might have had more than one problem the most important was considered. For any contradiction in terms of diagnosis two Pediatricians analyzed the sequence of events and determine the most likely final diagnosis.

Term neonates delivered by Caesarean section with respiratory distress that settled within 24 hours were categorized as having TTN. Preterm neonates with distress needing CPAP were categorized as RDS. Term neonates with low 5 minute APGAR Score or stated as low APGAR Score but non-quantified who were encephalopathy were given a diagnosis of asphyxia. Hypoxic ischemic Encephalopathy (HIE) was graded according to the Sarnat grading. Term neonates admitted with non-quantified APGAR Score but documented as 'low' and who were not encephalopathy were considered as admitted for "low APGAR Score".

Data analysis

Data of the study population were entered into EPIDATA and exported to SPSS 12.0.1 for analysis. The analysis of patient demographics and baseline outcome variables were summarized using descriptive summary measures: expressed as mean (standard deviation) or median (range) for continuous variables and percent for categorical variables.

All statistical tests were performed using two-sided tests at the 0.05 level of significance. For the regression model, the results were expressed as effect (or odds ratios for binary outcomes), corresponding two-sided 95% confidence intervals and associated p values. The p- values were reported to three decimal places with values less than 0.001 reported as <0.001.

Permission was obtained from the hospital management and the institutional ethics review committee to utilize the neonatal records for this study.

Results

Table 1 Bivariate analysis on diagnosis and death

Diagnosis N=1192	Deaths (N=264)	OR (95% CI)	p-value
Low APGAR Score	1(0.6)	0.16 (0.002-0.114)	0.000
Prematurity	11(7.3)	0.247 (0.131-0.463)	0.000
Prematurity and Hypothermia	20(14.6)	0.568 (1.736-0.346)	0.932
Prematurity, Hypothermia and RDS	89(76.7)	16.971 (10.713-26.885)	0.000
Asphyxia and HIE grade I	1(3.6)	0.127 (0.017-0.938)	0.017
Asphyxia and HIE grade II	11(21.6)	0.965 (0.488-1.909)	0.919
Asphyxia and HIE grade III	65(87.8)	33.353 (16.337-68.093)	0.000
Presumed Sepsis	23(35.9)	2.065 (1.215-3.508)	0.006
Prematurity and RDS	22(47.8)	3.424 (1.887-6.212)	0.000
Birth Defects*	7(33.3)	1.778 (0.710-4.452)	0.213
Jaundice	2(33.3)	1.763 (0.321-9.681)	0.508
Bleeding	3(25.0)	1.174 (0.315-4.367)	0.811

Table 2 Multivariate regression showing factors associated with death

Variables	Odds Ratio	Std. Err.	z	P>z	[95% Conf.	Interval]
Prem, Hypothermia & RDS	12.19673	3.859619	7.90	0.000	6.56124	2.27457
Prematurity & RDS	5.952511	2.326828	4.56	0.000	2.76673	12.80659
Asphyxia & HIEIII	77.83339	31.51406	10.75	0.000	35.19831	172.1115
Presumed Sepsis	11.15763	3.579409	7.52	0.000	5.949815	20.9238
Gestational age < 30weeks	5.318775	2.895748	3.07	0.002	1.829719	15.46105
Gestational age 30-34+6weeks	1.684789	0.4856997	1.81	0.070	0.9575398	2.964383
BWT<1000g	3.890608	2.368197	2.23	0.026	1.180034	12.82745
BWT1000-1499g	2.394624	0.7818417	2.67	0.007	1.262761	4.541021
Vaginal delivery	0.9273835	0.2105445	-0.33	0.740	0.5943065	1.447132
Maternal HIV status Unknown	1.254547	0.2596035	1.10	0.273	0.8362728	1.882029
5Minute APGAR Score <7	2.255787	0.5500348	3.34	0.001	1.398773	3.637885
5Minute APGAR Score Unknown	0.8863844	0.3545099	-0.30	0.763	0.404747	1.941157
Health Center Delivery	1.492029	0.5004579	1.19	0.233	0.773155	2.879309
Home Delivery	1.692816	1.345695	0.66	0.508	0.3564112	8.040221
Delayed Admission	1.269897	0.3174676	0.96	0.339	0.7779872	2.072833

Discussion:

The overall mortality of 22.1% observed in the Mulago SCBU during the three months was higher than that observed in the same unit in the late 80s and higher than that observed in the other developing countries. This can be attributed to the high number of babies admitted to the Mulago SCBU unit with inadequate services and personnel.

While initiatives to reduce neonatal mortality in the community are being implemented, a concurrent scaling up of care in the health facilities where referrals of difficult cases are envisaged is not taking place. Improvement in public health systems has been highlighted as a necessary component to achieving reduction in neonatal and under 5 mortality.

From the analysis low APGAR score did not contribute significantly to mortality (OR 0.16); APGAR score <7 at 5minutes was independently associated with mortality with an Odds of 2.23 and $p > 0.001$ in the multivariate analysis. Whereas it is a good practice to admit babies who score poorly at birth[19] since low APGAR score of less than 7 at 5minutes has been shown to be associated with asphyxia, poor neurodevelopmental outcome and even death[20] more objective admission criteria like APGAR score less than 7 at 5minutes would reduce unnecessary admissions into the Mulago SCBU.

The other main indication for mortality was prematurity (12.6%) without any other co-morbidity. Admission with diagnosis of prematurity alone was protective against death OR (0.247 $p>0.00$). Birth weight of <1500g was a better predictor of mortality than maturity, odds of death increased with reducing birth weight. This is in keeping with findings from the other centers. Admitting babies based on birth weight rather than maturity status using 1500g and below as an admission criteria would reduce number of babies admitted to the unit.

Although using birth weight of ≤1500g and APGAR Score of <7 at 5minutes as an admission criteria would reduce admissions to SCBU, a step down level where at risk babies are admitted for close monitoring is essential to ensure that these babies are safely discharged home. This calls for more space, personnel, monitoring equipment's and guidelines for discharge or escalation of care.

The third leading indication for mortality was prematurity and hypothermia (OR 0.568), whereas it is well known that hypothermia is an independent predictor of death, from this data it wasn't

the case. This again calls for functional step down level where Kangaroo mother care (KMC) can be instituted promptly with early initiation of breast feeding to prevent hypothermia and SCBU admission among low birth weight stable babies. KMC on low birth weight babies has been associated with reduced morbidity and mortality.

RDS of prematurity was significantly associated with death. Prematurity with RDS was associated with death (OR 8.66, p 0.03) while the association between Prematurity with RDS and hypothermia with death was even higher (OR 33, p <0.00). From this data it is evident that preventing hypothermia should reduce mortality among preterm neonates with RDS. The European guideline on management of RDS in preterm neonates indicates the need for good thermal regulation as necessity in improving outcome of preterm neonates with RDS. The use of plastic bags at birth and during transportation of preterm babies needs to occur. More heat sources including radiant warmers and incubators need to be put in place in order to stop the practice of sharing heat source and to encourage servo control thermoregulation for preterm neonates. It is also necessary that oxygen given is heated up as this can be a cause for hypothermia. For these to be instituted more space, equipment and personnel are necessary.

Birth asphyxia with grade III HIE was significantly associated with death OR 77.8, p<0.00. It is well known grade III HIE is significantly associated with mortality and morbidity even in highly sophisticated. Research is also needed in the field of asphyxia in low resource setting in order to identify cheaper modalities of care.

Presumed sepsis was another major contributor to mortality among neonates admitted to the SCBU, out of 64 babies admitted with diagnosis of presumed sepsis, 23 died. Currently SCBU babies are managed clinically for sepsis. No standard work up is done; the choice of antibiotic is based on old studies and text book literature. A study to ascertain pathogens and sensitivity pattern is necessary if deaths from sepsis are to the reduced in the unit.

Conclusions:

Number of neonates admitted to SCBU has more than tripled over the last 20 years and mortality rate has increased**.** A structured neonatal care with more space, trained personnel, equipment's and guidelines are urgently needed in reducing unnecessary admissions, identifying of sicker babies and promoting prudent resource allocation. The management of hypothermia and

respiratory distress among preterm neonates needs to be scaled up. Capacity to provide standard therapeutic hypothermia for term neonates with hypoxic ischemic encephalopathy should be developed.

Study limitations:

This was a retrospective chart review. Some relevant information might have not been captured.
Most diagnoses were made on clinical grounds no investigations were done.
Direct cause of death could not be ascertained since investigations were not carried out, and postmortems not done.

What is already known?

Major causes of death in low resource settings are asphyxia, prematurity and infection

What this study adds:

Admission and mortality rates are increasing. It is clear from this study that prematurity with other comorbidity are the major contributors of death. It is also clear that a good proportion of babies with asphyxia survive.

Conflict of interest: None of the authors has any conflict of interest to declare.

Contributor ship statement:

Mr. Francis Opolot handled the statistical analysis and write up, Dr. Abdallah Yaser and Dr. did the data entry and literature review

Acknowledgement: We would like to thank the Mulago administration for allowing us access this data.

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