Morbidity and Mortality of Neonates Admitted in Jimma University Specialized Hospital Paediatrics Neonatal Ward: A One Year Retrospective Analysis

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Abstract

***Introduction*:** *The first 4 weeks of life carries one of the highest risks of death of any 4 weeks period in the human lifespan. Reducing Neonatal morbidity and mortality are now a major focus of child health strategies.*

***Objective*:** *To review the morbidity and mortality pattern of neonates admitted to paediatrics neonatal ward.*

***Methods*:** *A retrospective study was conducted at Jimma University Specialized Hospital neonatal ward from Jan 2012 to Dec 2012.All neonates admitted to neonatal ward between Jan 2012 to Dec 2012 were included in the study. Card review format was adopted for the purpose of data collection after reviewing relevant literatures. SPSS version 16.0 statistical package was used for data analysis. All statistical tests were performed at the 0.05 level of significance; for logistic regression models, the results were presented using 95% confidence interval odds ratios.*

***Results*:** *A total of 225 neonates were admitted during the study period, of these 60 % were male, 57.6% of mothers who brought the neonate were from the surrounding district. The main causes of admissions were found to be neonatal infections (40%), low birth weight (32.4 %) and prematurity (30.7%). More than two third of them were hospital deliveries, 78.6% and more than half (55%) of neonates were admitted in the first 24 hours of their life. Regarding the outcome, 78.2% of admitted neonates were improved and discharged and the hospital neonatal mortality rate was 15.9%. None of the neonates diagnosed to have neonatal sepsis had blood culture and sensitivity test. The average length of hospital stay was 9.5 days with SD of 8.2 days. Neonates who were diagnosed to have perinatal asphyxia have increased risk of death [AOR=7.7, (95%C.I:2.49-23.70)]. Weight at admission and perinatal asphyxia were found to have stastically significant association with mortality (p- value <0.05).*

***Conclusion*:** *Most of the neonates were diagnosed with neonatal infection, prematurity, and Low birth weight. The hospital neonatal death rate seen in this study is high; which indicates the need for improving the quality of neonatal care. Limited laboratory investigations were done for admitted neonates; facility pertaining important investigations including blood culture need to be accessible.*

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Introduction

The first 4 weeks of life after birth are known as neonatal period which carries one of the highest risks of death of any 4 weeks period in the human lifespan. The majority of problems during the early neonatal period are causally related with the fetal life or the birth process; while most problems during late neonatal life are acquired. Most neonatal deaths occur during early neonatal period(1). Of the 130 million babies born every year, about 4 million die in the first 4 weeks of life.

Recently since the Millennium Declaration was announced, Promising efforts have been seen to achieve MDG's within the target period of 25 years (1990-2015). MDG-4, two thirds reduction in under 5 childhood mortality by 2015, have been challenged due to slow reduction of neonatal deaths, a rapid progress is highly required to achieve the MDG goal. Most neonatal deaths (99%) arise in low-income and middle-income countries, and about half occur at home. In poor communities, which have constrained resources, needing cost effective interventions targeting deprived and disadvantaged populations(2).

Neonatal morbidity and mortality is a reflection of socioeconomic status of a society. Improved neonatal survival requires not only care before, during and after pregnancy; but also wider issues of socioeconomic development including reduction in poverty and increased maternal education. Similarly, strategies to reduce neonatal mortality should cover the whole continuum of care from maternal health before and during pregnancy to delivery, and early neonatal care to child health programmes (3) .Ethiopia is one of the countries with high neonatal and infant mortality rates. Nearly 42% of the under-5 mortality in Ethiopia is attributable to neonatal deaths. According to the 2011 Ethiopia Demographic and Health Surveys (DHS),the country is experiencing a high neonatal mortality rate at 37 per 1000 live births, comparable to the average rate of 35.9 per 1000 live births for the African region overall(4). Studies done in Gonder teaching hospital and Yekatit 12 hospital, Addis Ababa showed a high mortality rate. Similarly, Sepsis was the major diagnosis in majority the neonates.

This study would have an important input in identifying cause of admission, duration of hospital stay, identifying risk factor for death and overall outcomes of neonatal admissions. It may help in planning to improve neonatal care and services. It would also serve as a stepping stone on which further studies could be planned.

Objective

The objective of this study was to assess neonatal morbidity and mortality pattern in Jimma University specialized hospital neonatal ward.

Methods

Study design and setting: a one year retrospective descriptive study to review neonatal morbidity and mortality from January 2012 to December 2012 was undertaken in Jimma University specialized hospital.

The study was conducted in Jimma University Specialized Hospital neonatal ward; located in Jimma town 350 km southwest of Addis Ababa. The hospital has total 527 beds giving health service in different departments (Internal medicine, surgery, obstetrics and gynecology, pediatrics and child health and ophthalmology).paediatrics ward has 72 beds in general ward and 32 beds in neonatal ward (16 beds in neonatal ward including incubators and 16 beds for mothers) .

Sample size and sapling procedure

All neonates admitted in neonatal ward from January 2012 to December 2012 were included in the study.

Measurement

- Dependant variables include: causes of admission, length of hospital stay and neonatal mortality. While the independent variables are: age at admission, address, (Jimma/outside Jimma), gestational age, place of delivery, mode of delivery, ANC follow up, feeding EBF vs. formula (patterns of feeding), sex of the neonate and weight.

Data collection process

Trained medical doctors collected the data by using a chart review guide which was developed for this study. Data was collected from neonatal admission card and neonatal logo book. The quality of data was ensured through training of data collectors, close supervision and immediate feedback, reviewing each of completed data collection forms daily. Data consistency and completeness was checked throughout the data collection, data entry and analysis.

Statistical analysis

SPSS version 16.0 statistical package was used for data entry, cleaning and analysis. Frequency distribution and Chi square (x^2) tests were calculated to detect associations at 5% level of significance for selected variables. Binary logistic regression model was done for binary outcomes.

Ethical consideration

The ethical approval and clearance for the study before data collection was obtained from the Jimma University College of Medical Sciences and Public Health. An official letter from Health Research and post graduate coordinator office was obtained to the hospital and verbal consent and letter from the Medical directors and card registry office were taken. Name and other identifying information of the neonates or mothers were not used in the study.

Limitation of the study

Operational definitions

- Gestational age is determined by calculating from the last normal menses to the day of delivery in weeks or clinically estimated using Ballard score.
- Term: if newborn is delivered at 37+ completed weeks.
- Preterm: if newborn is delivered in < 37 weeks.
- Low birth weight: if birth weight is <2500 grams
- Extremely low birth weight: if weight is < 1500 grams
- Appropriate for gestational age: when birth weight is compared with gestational age and lie between 10% and 90 %.
- Small for gestational age: when birth weight is compared with gestational age and less than 10%.
- Large for gestational age: when birth weight is compared with gestational age and greater than 90%(7).
- Neonatal mortality rate (NMR): Number of infant deaths of less than 28 days per thousand live births during the year.
- Antenatal care follow up: pregnant women who had atleast one follow up at health institution.

Results

Background characteristics

Two hundred twenty five neonates were admitted to neonatal unit over one year study period .Of these, 135 (60 %) were males with a male to female ratio 1.6:1.Sixty (35.3%)of the neonates were having low birth weight, and 78(42.6%) were premature. More than two third of them were hospital deliveries, 132(78.6%). More than half 123(55%) of neonates were admitted in the first 24 hours. Majority of the mothers were from outside Jimma Town, 139(63.0 %). (Table 1)

Table 1: Baseline characteristics of neonates admitted to Jimma University specialized Hospital during January 2012 to December 2012

Variable	**Admission(N=225)**
Weight (in grams)	**(N=170)**
<1500	9 (5 .3%)
1500-2499	51 (30.0%)
2500-3999	101 (59.4%)
≥4000	9 (5.3%)
Sex	**N=225**
Male	133 (60.0 %)
Female	92 (40 .0%)
Weight for gestational age	**N=185**
SGA	11(6.0%)
AGA	166(90.0%)
LGA	8(4.0%)
Gestational age at birth	**N=183**
Term	96 (52.5 %)
Preterm	78 (42.6 %)
Post term	9 (4.9 %)
Age on admission (days)	**N=225**
<24 hours	123 (55.0%)
1 -3	72(32.0%)
4 -7	19(8.5 %)
>7	9 (4.0%)
Address	**N=220**
Jimma	81(37.0 %)
Outside Jimma town	139(63.0 %)
Place of delivery	**N=168**
Home	18(10.7%)
Hospital	132(78.6%)
Health center	14(8.3%)
Other	4(2.4%)

SGA=Small for gestational age, AGA= Appropriate for gestational age, LGA=Large for gestational age

Concerning the obstetrics history of the mothers, majority of the mothers had ANC follow up, 131(79.0%), most of the mothers delivered by the spontaneous vaginal delivery 95(56.0%), ceserean sections and instrumental deliveries account 60 (35.0%) and 16(9.4%) respectively. Prolonged labour and prolonged rapture of membrane occurred in significant number of the deliveries, 26(16.0%) and 37(23.0%) respectively. (Table 2)

Table: 2 The obstetric and delivery history of mothers and neonates admitted to Jimma University Specialized Neonatal ward during January 2012 to December 2012

Characteristics	**Number and percent**
ANC follow up	**N=166**
Yes	131(79.0%)
No	35(21.0%)
Mode of delivery	**N=166**
C/S	60(35.0%)
SVD	95(56.0%)
Instrumental delivery	16(9.4%)
Duration of labor	**N=163**
<3 hours	17(10.4%)
3-24 hours	120(73.6%)
≥24 hours	26(16.0%)
Duration of rupture of membrane	**N=162**
<18 hours	124(77.0%)
≥18 hours	37(23.0%)

Morbidity and mortality

The three most common causes of admissions to neonatal ward during the study period were neonatal infections (40 %), low birth weight (32.4%), and prematurity (30.7 %). Perinatal asphyxia, hyaline membrane disease, neonatal jaundice, hypoglycemia, hypothermia, CHD, tetanus, congenital anomalies were responsible for the rest cause of admissions. Table 3

Table 3: Pattern of Neonatal admissions in Jimma University Specialized Hospital during January 2012 to December 2012

Diagnosis at admission	Frequency in numbers	Percent (%)
Neonatal infections	90	40
LBW	73	32.4
Prematurity	69	30.7
VLBW	16	7.1
MAS	29	12.9
PNA	25	11.1
HMD	25	11.1
*Other diagnosis	43	19.1

*the percentage adds up more than 100% because of multiple diagnosis at admission.

LBW=low birth weight, VLBW =very low birth weight, MAS =meconium aspiration syndrome, PNA=perinatal asphyxia, HMD =hyaline membrane disease

*These are hypothermia, hypoglycaemia, kernicterus, extremely low birth weight, neonatal tetanus, congenital anomalies, and HIV exposed neonates

During the study period, more than two third (70%) of admitted neonates had received more than two drugs; antibiotics, anticonvulsants and 10% dextrose being the commonest drugs used. Out of the neonates initiated on antibiotics, 12% of them needed change of antibiotics due to their clinical deterioration.

Among investigations done for neonates, blood group and Rh factor, haematocrit done for 143 (84.6 %)neonates, random blood sugar for 122(72.2%), cerebrospinal fluid (CSF) analysis 93(55 %) accounted for majority of investigations. Complete blood count 22 (12.4%), chest X-ray 5(2.9%), erythrocyte sedimentation rate 5(3%), and blood culture was not done for any of the neonates.

The majority of neonates 128(75.3%) were initiated on exclusive breast feeding, 4 (2.4%) on formula, and the rest mixed feeding and 10 % dextrose until adequate breast milk is obtained.

Concerning the outcome neonates, 133 (78.2%) % of the neonates were improved and discharged, while 27 (15.9%) of them died; and 8(4.7%) of them were discharged against medical advice.

The higher rate of mortality was seen in neonates weighing less than 1500 grams (VLBW), 5 0f the 9 VLBW babies died (56%). Perinatal asphyxia and LBW were found to have statistically significant association with poor outcome. Average length of hospital stay was 9.45 days (SD 8.2 days).

Table 4: Association of selected variables with outcome of neonates admitted to Jimma University specialized Hospital Neonatal ward during January 2012 to December 2012

	Frequency(percent)		P-value	AOR (95%CI)
Weight of neonate(grams)	Alive	Died		
<1500	4(44.4%)	5(55.6%)	0.107	0.133(0.011-1.550)
1500-2499	43(84.3%)	8(15.7%)	0.048	0.123(0.015-0.98)
2500-3999	89(88.1%)	12(11.9%)	0.09	0.163(0.020-1.330)
>=4000	7(77.8%)	2(11.9%)	reference	
Perinatal asphyxia	8(32.0%)	17(68.0%)	**<0.001**	**7.70(2.49-23.70)**
Duration of labor				
<3 hours	15(88.2%)	2(11.8%)	0.36	0.44(0.078-2.52)
3-24 hours	103(85.8%)	17(14.2%)	0.26	0.55(0.19-1.56)
>=24 hours	20(76.9%)	6(23.1%)	reference	

Discussion

This retrospective study provides the pattern of neonatal admissions in Jimma University specialized Hospital neonatal ward. Neonatal death rate in the hospital is found to be high compared to other similar studies. Majority of the babies were born in the same hospital and most of the mothers were referred to the hospital from surrounding districts of Jimma. Unlike other similar studies (study done in South Africa and Nigeria) there was no association found between sex of neonates and their outcome in this study (P=0.976). (20 and 21) Fifty eight per cent of mothers had ANC follow up; this is higher than that of national (34 %) as well as that of regional coverage (31.3 %) according to DHS of Ethiopia 2011. Similar to other studies from developing countries, neonatal infections were found to be number one cause of admissions (40 %), likewise, Sepsis was the major diagnosis in majority the neonates Admitted to Gonder teaching hospital and Yekatit 12 hospital in Ethiopia (5&6). Low birth weight was the second cause of admission (32.4%), which is in accordance with other studies done in many developing countries and has important consequences for subsequent morbidity and mortality in infancy and childhood(9–11). Similarly it was found to be a significant cause of neonatal death in this study (29.3%). This result is comparable with Studies done in Gonder teaching hospital and Yekatit 12 hospital, Addis Ababa (5&6). But, higher than a study done previously in Jimma University Specialized Hospital and Metu Karl Hospital (11.02 % and 8.6 %) respectively(12,13). Unlike the finding of this study, a study done in one of teaching hospitals in Nigeria, neonatal sepsis was the second most common cause of admissions (25.3%).The leading diagnoses were birth asphyxia (27%), (severe birth asphyxia18.1%, moderate asphyxia8.9%) and prematurity account for 16 of the admissions(14).

However, the overall incidence of LBW in our hospital was lower than those from neonatal unit of a secondary hospital in Pakistan in which low birth weight was the main cause of admissions (37.7 %) but higher than study from India (20 %) (15–17). Preterm birth rates have been reported to range from 5% to 7% of live births in some developed countries, but are estimated to be substantially higher in developing countries (15). Prematurity was the third most common cause of admission (30.7 %).This finding is significantly higher than those from Pakistan and Tanzania (27.9 % and 18.4 %) respectively(9,18).

Neonatal infections were the major cause of admission in this study. However, none of the affected neonates were investigated enough to confirm the diagnosis. Even if blood culture from central body fluids are the most useful specific diagnostic test for neonatal infection, none of the neonates were investigated with blood culture(19,20). CSF analysis (excluding CSF culture) was done for all neonates with clinical sepsis (neonatal infections). According to research done by North America, doing lumbar puncture for all suspected neonatal sepsis cases is beneficial, as meningitis can be missed if CSF is examined only in patients with positive blood culture. Because up to 28 % of meningitis patients have a negative blood culture and 37 % of meningitis cases may be missed if lumbar puncture is not routinely performed as part of the sepsis work up (21).

Neonatal death rate in this study is comparable with a similar finding from tertiary hospital in Nigeria (16.9 %)(22). But it's much higher than the reports from developed countries. Neonates who had perinatal asphyxia and low birth

weight were found to have increased risk of death (p=0.004. This finding is similar to with other findings, as 15% to 20% of asphyxiated infants who exhibit hypoxic–ischemic encephalopathy die during the newborn period(23).

As a retrospective analysis, some of the patient records were incomplete; the gap was filled by collecting the data from log book. Despite this effort, most of the variables do not sum up 225, different variables are reported according to the availability of the information on patient records and log book.

Based on this retrospective study the following conclusions can be drawn: Neonatal infections, low birth weight and pretermaturity were the major cause of admission in Jimma University Specialized Hospital neonatal ward during study period. Weights at admission of neonates had negative association (the lower admission weight the higher odds of death) with their outcomes in this study. Blood culture was not done for all neonates with sepsis, and medications were prescribed based on clinical findings only. The hospital neonatal death rate seen in this study is high; which indicates the need to improve the quality of neonatal care. The neonatal unit data recording system needs also improvement as some of the patients' records were incomplete. The neonatal unit should have access to important laboratory investigations including blood culture so that unnecessary prescription of antibiotics, prolonged duration of hospital stay and misdiagnosis is reduced. A prospective study, larger sample size, over several years could help to find out factors associated with neonatal morbidity and mortality, so that the quality of care will be improved, morbidity and mortality of the neonates admitted to Jimma University teaching Hospital will be reduced.

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