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## **Pattern of Admission and Outcome of Neonate Admitted to Adama Hospital Medical College Neonatal Intensive Care Unit, Adama, Ethiopia**

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### **Abstract**

Neonatal morbidity and mortality remains a major health problem, and contributes largely to under-five mortality, especially in developing countries. Hence, identifying the reasons for neonatal admission and outcomes in a hospital setting is important to improve the quality of existing practices in the hospital. The aim of this study was to assess the pattern of admission and outcomes of neonates admitted to Adama Hospital Medical College, Neonatal Intensive Care Unit (NICU). Institution based cross sectional study design was conducted. A total of 384 selected neonates who were admitted to Adama Hospital Medical College, Neonatal Intensive Care Unit (NICU) from 11/09/2015 to 10/09/2016 were included in this study. The data was collected using data collection check list. By using SPSS version 20, simple frequency and bivariate logistic regression used to summarize socio-demographic and other variables. 95% CI and P value less than 0.05 were considered statistically significant. The results shows that total of 1550 neonates were admitted to NICU from 11/09/2015 to 10/09/2016, of those 384 were selected.

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The most common cause of admission diagnosis at NICU was sepsis 78.4% (301), followed by prematurity 14.1% (54) and respiratory distress 8.3% (32).

Out of 384 selected neonates, 91.9% (353) improved and discharged, 4.9% (19) died, 1.8% (7) referred and 1.3% (5) left against medical advice. Among selected neonates deaths were high with the diagnosis of sepsis 52.6% (10) and respiratory distress 26.3% (5).

This study shows that sepsis, prematurity and respiratory distress were the most common cause of neonatal admission; and also neonatal jaundice, perinatal asphyxia and meconium aspiration syndrome contribute less. From admitted neonates 91.9% were improved and discharged and 4.9% were died, among this fatality was highest for sepsis.

**Keywords:** Neonatal admission; Treatment outcome; Sepsis; NICU; Adama; Ethiopia.

## **1. Introduction**

Neonatal period is defined as up to first 28 days of human life and further divided into very early (birth to less than 24 hours), early (birth to less than 7 days) and late neonatal period (7days to less than 28 days). Neonatal period is the most vulnerable period of human life for diseases and most of these are preventable [1].

A Neonatal Intensive Care Unit (NICU) is a specialized section of a hospital in the Newborn unit (NBU) that provides comprehensive and continuous care for neonates who are critically ill and/or preterm with low birth weight (LBW) who can benefit from each treatment; and also Neonatal Intensive Care Units (NICUs) are being utilized to care for high-risk neonates [2,3].

Neonatal mortality and morbidity pattern is a sensitive indicator of availability, utilization and effectiveness of mother and child health services in the community [4].

The first 28 days are almost pivotal period of life. Neonatal period is the most hazardous period compared to any other time during the child's first year of life [5]. Infections remain one of the major causes of admissions in Pediatric Intensive Care Unit throughout the world. It is estimated that 20% of all neonates develop sepsis and approximately 1% die of sepsis related causes. Pre-maturity also accounts for majority of admissions [6].

With the current infant and under-five child mortality rates of 42 and 52 per 1000 live births respectively, about 70% of infant deaths and more than half of under-five child deaths occur in the neonatal period, the first 4 weeks of life [7]. Approximately 98% of these deaths occur in developing countries, and are attributable to infections, asphyxia, and consequences of prematurity and low birth weight. Overall, neonatal mortality accounts for nearly two-third of infant mortality and one-third of under-five childhood mortality worldwide [8, 9]. The World Health Organization estimates that a significant proportion (40%) of all under 5 deaths occur in the neonatal (0 to 28 days of life) period [10].

Much is known regarding outcomes of neonates admitted to the neonatal intensive care unit (NICU) in western

countries. Internationally, major causes of neonatal mortality in the NICU include birth before 37 weeks' gestation (28%), infections (26%), and asphyxia (23%). In western countries such as the United States, Congenital malformations account for a significant cause of neonatal mortality (20%) [11].

Neonatal morbidity and mortality continue to be a large component of the burden of disease in Sub-Sahara Africa and its rates reflect a nation's socio-economic status, the efficiency and effectiveness of health care services [12, 13].

Despite improvements over the past decade, Ethiopia's current neonatal mortality rate is one of the highest in the world. Neonatal mortality comprises a significant proportion of the under-five mortality in the country. Forty percent of the under-five mortality in the country is attributable to neonatal mortality. Hence, reducing the neonatal mortality rate is pivotal to reducing under-five mortality in the country [14].

Infant mortality rate has remained unacceptable high in developing countries due to low access to health care and high neonatal mortality. The main causes of newborn deaths are prematurity and low-birth-weight, infections, prenatal asphyxia and birth trauma. These causes account for nearly 80% of deaths in this age group [15].

Neonatal mortality is reliable index for evaluating the overall progress of neonatal and prenatal care in a community, which is a valuable indicator of the standard of country's educational, social and community health system, the nutritional status of the population and the national medical program in obstetrics and neonatal care [16].

Knowledge of the characteristics and outcomes of critically ill patients admitted to ICUs in low-income countries may help with the identification of priorities and the resources required for improvement of the care of critically ill patients in resource-limited regions of the world. Having an idea of the type of disease burden commonly encountered in a particular unit, will help in future planning for the better management of such patients [17,18].

Based on the above facts the aim of this study was to determine cause of admission and treatment outcome of neonate admitted to Adama Hospital Medical College NICU. Therefore, assessing the cause of admission and treatment outcome of neonate is important to decrease neonatal mortality by improving maternal care and early intervention, for identification of priority problem and to allocate resource required for improvement of care, for future planning and better management. Generally neonatal mortality is reliable index for evaluating the overall progress of neonatal and perinatal care in a community. This is valuable indicator of the standard of country's educational, social and community health system.

## **2. Methods**

### **2.1. Study Area**

This study was conducted at Adama Hospital Medical College (AHMC) Neonatal Intensive Care Unit (NICU),

which is located in Adama City, 99 km East of Addis Ababa. The hospital is a teaching and referral hospital that gives various health care services for more than 5 million people living in East Shewa Zone of Oromia Regional State, Ethiopia. The hospital also serves patients from surrounding areas (regions). Adama Hospital Medical College Neonatology ward was established in 2011.

## **2.2. Study Design**

A facility-based descriptive cross sectional study design with quantitative data collection method was conducted from November 10 to December 10, 2016 at Neonatal Intensive Care Unit (NICU) of Pediatrics Department, Adama Hospital Medical College (AHMC). The sampling frame is a list of all neonates < 28 days admitted to NICU in AHMC from 11/09/2015-10/09/2016. Neonates with incomplete data, if the cause of admission and outcome of neonates were not recorded, were excluded in the study. 384 neonates were selected based on simple random sampling technique. After study units were selected from registration book the patients' card were checked for consistency. The data was collected using prepared questionnaire.

Data of the neonate like age at admission, sex, birth weight, gestational age, gestation, mode of delivery, duration of stay in NICU, treatment given, diagnosis upon admission and treatment outcome were manually extracted for analysis and documented.

## **2.3. Data Analysis**

The extracted data were double entered to minimize data entry errors. Descriptive analysis of frequencies and percentages for categorical variables were performed using SPSS version 20. Then Binary logistic regression and multivariate analysis were used to examine the relationship between the predictors and outcomes. Those variables, which revealed a statistically significant association in univariate logistic regression analysis, were entered into multivariable logistic regression to identify variables independently associated with outcomes. 95% CI with a respective odd ratio was used to assess the statistical significance of association among the variables. P value less than 0.05 was used as a cutoff point to see the presence of statistically significant association.

## **2.4. Ethical approval**

Ethical clearance for the study was obtained from Ethical Review Board of Adama Hospital Medical College Research and Publication Office. Permission to undertake the study at the facility was granted by the hospital Medical Director and the head of the Pediatrics Department.

## **3. Results**

### **3.1. Socio-demographic status of neonatal admissions**

According to table 1, a total of 1550 neonates were admitted to NICU from 11/09/2015 to 10/09/2016. From total admissions 384 were selected. From selected neonates 239 (62.2%) were males and 145 (37.8%) were females. Age of neonate at admission of, < 24 hours were 292 (76%) and > 24 hours were 92 (24%).

From total selected neonates, 299 (77.9%) neonates were term and 85 (22.1%) were preterm. Regarding birth weight of neonates, 256 (66.7%) >2.5kg, 103 (26.8%) between 1.5-2.49 kg and 25 (6.5%) < 1.5 kg. From selected neonates 218 (56.8%) were delivered by SVD, 56 (14.6%) were delivered by assisted vaginal delivery and 110 (28.6%) by C/S.

**Table 1:** Socio-demographic status of neonates admitted to AHMC NICU, (2016)

| Socio demographic status |                              | Frequency | Percent % |
|--------------------------|------------------------------|-----------|-----------|
| Sex                      | Male                         | 239       | 62.2      |
|                          | Female                       | 145       | 37.8      |
| Age at admission         | < 24 hour                    | 292       | 76.0      |
|                          | > 24 hour                    | 92        | 24.0      |
| Mode of delivery         | spontaneous vaginal delivery | 218       | 56.8      |
|                          | assisted vaginal delivery    | 56        | 14.6      |
|                          | cesarean section             | 110       | 28.6      |
| GA                       | preterm                      | 85        | 22.1      |
|                          | term                         | 299       | 77.9      |
| BWT                      | >2500gram                    | 256       | 66.7      |
|                          | 1500-2499gram                | 103       | 26.8      |
|                          | <1500gram                    | 25        | 6.5       |

### 3.2. Patterns of neonatal admission

Using the diagnosis at the time of admission, majority of the neonate 85.9% (330) cause of admission was prematurity/low birth weight. EONS and RDS were the next common causes of neonatal admission, recording 21.6% (83) and 8.3% (32) respectively.

The fourth and fifth common causes of neonatal admission were neonatal jaundice 7.8% (30) and prenatal asphyxia 7.6% (29). Neonatal admissions were less frequent with MAS 5.2% (20), Congenital Anomalies 3.4% (13) and Anemia 1.0% (4) (**Table 2**).

**Table 3:** Percentages of common causes of neonatal admission in Adama Hospital Medical College NICU, (2016)

| <b>Cause of admission</b> | <b>Frequency</b> | <b>Percent %</b> |
|---------------------------|------------------|------------------|
| Prematurity               | 330              | 85.9             |
|                           | 54               | 14.1             |
| EONS                      | 83               | 21.6             |
|                           | 301              | 78.4             |
| RDS                       | 352              | 91.7             |
|                           | 32               | 8.3              |
| Prenatal Asphyxia         | 355              | 92.4             |
|                           | 29               | 7.6              |
| Anemia                    | 380              | 99.0             |
|                           | 4                | 1.0              |
| Congenital Malformation   | 371              | 96.6             |
|                           | 13               | 3.4              |
| M A S                     | 364              | 94.8             |
|                           | 20               | 5.2              |
| Neonatal Jaundice         | 354              | 92.2             |
|                           | 30               | 7.8              |

**Abbreviations:** EONS, Early Onset Neonatal Sepsis; RDS, Respiratory Distress Syndrome; MAS, Meconium Aspiration Syndrome.

**3.3. Treatment given to admitted neonates**

In table 3, concerning the treatment given to neonates, antibiotics 352 (91.7%), glucose 111 (28.9%), oxygen 86 (22.4%), phototherapy 30 (7.8%), KMC 26 (6.8%) and blood transfusion 5 (1.3%) were used. Antibiotics, glucose and oxygen were the common interventions used for the management.

**3.4. Treatment outcome of admitted neonates**

In table 4, regarding outcome of neonates, out of 384 neonates studied 353 (91.9%) were improved and discharged, 19 (4.9%) were died, 7 (1.8%) were referred and 5 (1.3%) were left against medical advice.

**3.5. Causes of neonatal deaths**

Concerning cause of death, as the result shown in figure 1.

high case fatality was observed among neonates with the diagnosis of sepsis 10 (52.6%) followed by respiratory distress 5 (26.3%), prematurity 2 (10.5%) and perinatal asphyxia 2 (10.5%).

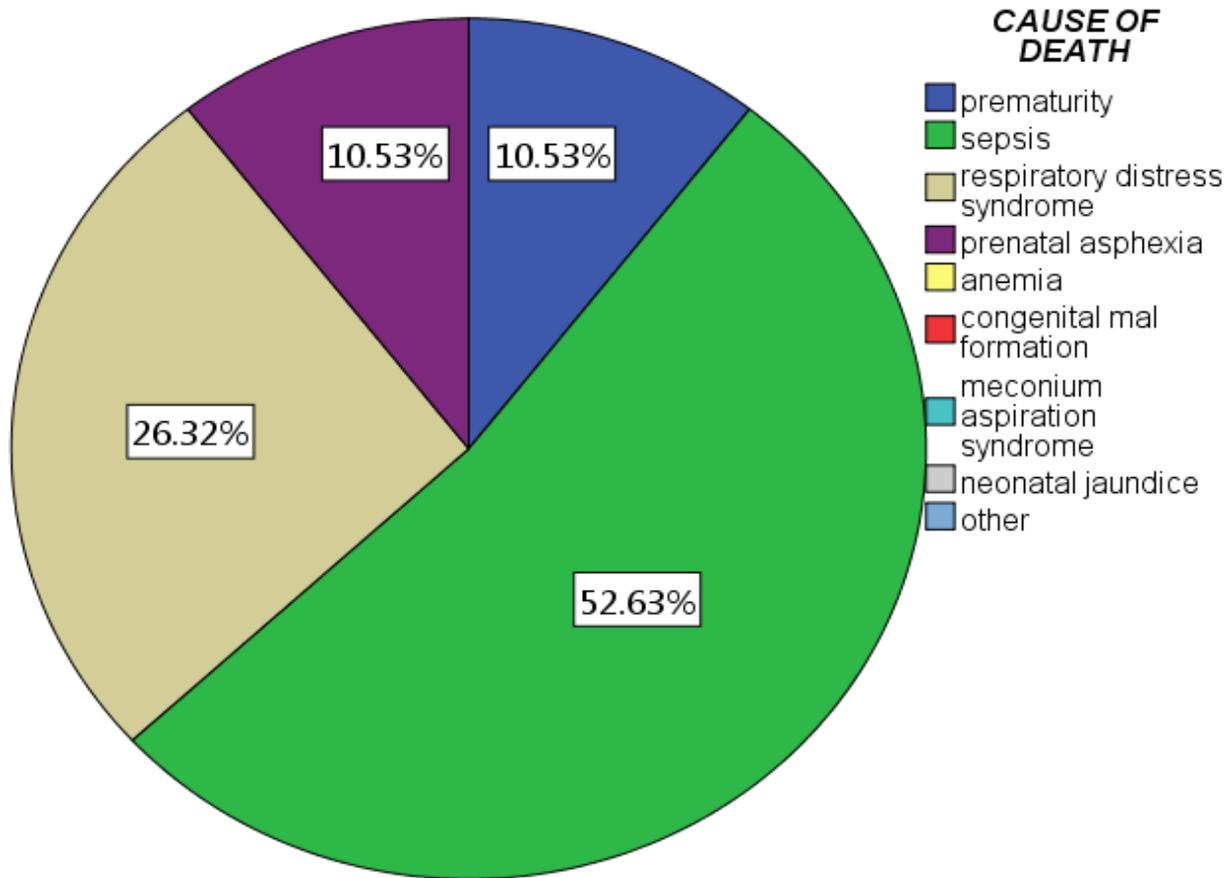
**Table 4:** Treatment given to neonates admitted to NICU, (2016)

| <b>Treatment Given</b> | <b>Frequency</b> | <b>Percent%</b> |
|------------------------|------------------|-----------------|
| Oxygen                 | 298              | 77.6            |
| KMC                    | 26               | 6.8             |
| Antibiotic             | 352              | 91.7            |
| Glucose                | 111              | 28.9            |
| Blood transfusion      | 5                | 1.3             |
| Phototherapy           | 30               | 7.8             |

**Abbreviation:** KMC, Kangaroo Mother Care

**Table 5:** Treatment outcome of neonates after admitted to AHMC NICU, (2016)

| <b>Outcome</b>              | <b>Frequency</b> | <b>Percent %</b> |
|-----------------------------|------------------|------------------|
| Improved                    | 353              | 91.9             |
| Died                        | 19               | 4.9              |
| Referred                    | 7                | 1.8              |
| Left against medical advice | 5                | 1.3              |



**Figure 1:** Percentage of cause of death of neonates after admission to AHMC NICU, (2016)

**3.6. Duration of neonates stayed in NICU**

As the result shown in table 5, majority of neonate 142 (37%) were stayed in NICU for four to seven days, 138 (35.9%) were stayed for greater than seven days and 104 (27.1%) were stayed up to three days of duration.

**Table 6:** Duration of neonate stayed in AHMC NICU, (2016)

| Duration  | Frequency | Percent % |
|-----------|-----------|-----------|
| to 3 days | 104       | 27.1      |
| 4-7days   | 142       | 37.0      |
| >7days    | 138       | 35.9      |

**3.7. Associations of variables among neonates**

Variables like age at admission, birth weight, gestation and gestational age are significant in Binary logistic regression, but they are not significantly associated in Multivariate logistic regression as shown in table 6 & 7

respectively.

**Table 7:** Binary logistic regression table that shows significance of variables among neonate admitted to AHMC NICU, (2016)

| Characteristics/Variables                   | Significance | Odds ratio (95% C.I.) |
|---|--------------|-----------------------|
| Step 1 <sup>a</sup> AGE AT ADM AFT DELIV(1) | .142         | 2.242(7.3-6.583)      |
| Step 1 <sup>a</sup> BIRTH WT(1)             | .028         | .436(.208-.912)       |
| Step 1 <sup>a</sup> GESTATION(1)            | .043         | .409(.173-.972)       |
| Step 1 <sup>a</sup> GEST AGE(1)             | .067         | 2.074(.951-4.519)     |

**Table 8:** Multi-logistic regression table of neonate admitted to AHMC NICU, (2016)

| Characteristics/Variables                   | Significance | Odds ratio (95% C.I.) |
|---|--------------|-----------------------|
| Step 1 <sup>a</sup> AGE AT ADM AFT DELIV(1) | .250         | 1.901(.636-5.686)     |
| GEST AGE(1)                                 | .951         | 1.035(.348-3.076)     |
| BIRTH WT(1)                                 | .231         | .554(.211-1.455)      |
| GESTATION(1)                                | .215         | .538(.202-1.433)      |

#### 4. Discussion

This year long retrospective study was undertaken in order to document pattern of neonatal admission and their outcome in the neonatal intensive care unit of Adama Hospital Medical College, Adama, Ethiopia.

Our finding show that a total of 1550 neonates were admitted in NICU, of those 384 were studied. From selected neonates, 239 (62.2%) were males and 145 (37.8%) were females. This result was in line with the study done in Nigeria, of which 549 (53.8%) were males and 468 (45.9%) were females [19]. The male predominance, in this study, is also consistent with other studies conducted in Ethiopia, Kenya and India (14,15,20). This indicates that male neonates are more vulnerable during the neonatal period; this might be due to higher biological survival rate of girls in the neonatal period [19].

It was observed in the study that majority of the neonates 292 (76%) were admitted within 24 hours after birth. The result in this study is consistent with other studies [14,15,19]. This indicates that most of the neonatal

problems occur during the first 24 hours of life. It could be because of that the first 24 hours of life is the transitional period from intrauterine to extra uterine life [19].

The disease pattern shows that sepsis 301 (78.4%) was the most common cause of admission to NICU followed by prematurity 54 (14.1%) and respiratory distress 32 (8.3%). However, the proportion attributable to each cause varies from center to center. A study done in Srilanka shows that neonatal jaundice 115 (54%), prematurity 27 (13%), birth asphyxia 25 (13%) and infections 13 (6%) were major causes of admission [21].

The Study done in Pakistan shows that preterm low birth weight babies (24.6%), sepsis (19.9%), respiratory distress syndrome (18.9%), birth asphyxia (17.02), meconium aspiration syndrome (15.2%) and neonatal jaundice (9.44%) were common causes of admission [6]. Other study conducted in Bangladesh revealed, Birth asphyxia 55 (37.7%), sepsis 30 (20.5%), preterm low birth weight babies 28 (19.2%) and respiratory distress syndrome 9 (6.2%) were the major causes of admission [17]. When compared to our study sepsis contributes lower in the study conducted in both countries (Pakistan and Bangladesh) but, prematurity and respiratory distress were higher.

Moreover, study from Nigeria shows prematurity low birth weight 559 (54.9%), birth asphyxia 196 (19.2%), respiratory distress 68 (6.7%), sepsis 54 (5.3%), congenital abnormality 12 (1.2%), neonatal jaundice 11 (1.1%) were the major causes of admission [19]. Another study conducted in Kenya shows that perinatal asphyxia, sepsis and respiratory distress syndrome were the major causes of admission [15]. Also the study done in Addis Ababa revealed prematurity with respiratory problem (36.6%), sepsis (22.7%), asphyxia (16.2%), meconium aspiration (13.9%) and neonatal jaundice (6.0%) were the most common causes for admission [14]. Sepsis, prematurity, asphyxia and respiratory distress were common causes of neonatal morbidity in neonatal care centers of developing countries including ours. This could imply the lack of appropriate interventions in the antenatal, intrapartum and post-partum neonatal care and lack of appropriate health care facilities/services.

It is essential to know the outcome of the admissions for evaluating the effectiveness of care provided in a hospital setting. There is a great variation in neonatal death statistics between NICUs from different parts of the world. This variation probably reflects the difference in the attending population, antenatal care, admission criteria, specific exclusion and inclusion criteria and level of neonatal care provided.

In our study it was observed that out of 384 neonates studied, 353 (91.9%) of the neonates were improved and discharged, 19 (4.9%) died, 7 (1.8%) referred and 5 (1.3%) left against medical advice (LAMA).

In this study the overall mortality was 19 (4.9%) which was satisfactory in comparison to reports of other studies, in Ethiopia, such as Tekleab and his colleagues 50 (23.1%) [14] and Gerense H. 1606 (9.7%) [5]. The most common cause of death was sepsis 10/19 (52.6%) followed by respiratory distress 5/19 (26.3%). When compared to studies conducted in other centers like Kenya 24/80 (30%) [15], Tigray Region 720/1606 (45%) [5] and Addis Ababa 2/50 (4%) [14] of deaths were because of sepsis; the contribution of sepsis as a cause of neonatal death in our unit was high.

In our finding the high rate of mortality because of sepsis might be related to low quality service provided by

NICU. Respiratory distress and prematurity were 2<sup>nd</sup> and 3<sup>rd</sup> highest causes of mortality. This might be related to the lack of appropriate treatment modalities, such as mechanical ventilation, surfactant administration and parenteral nutrition.

The type of diseases contributing of neonatal death provides us an indication for the area of neglect and the need to take corrective measures in this regard.

#### **4.1. Study Limitations**

The study had some limitations. We used secondary data (Patients' Chart) which had its own limitation like incomplete documentation (maternal residency, inborn or out born, type of congenital anomaly). In addition to this, the outcome of neonate that referred and left against medical advice was not known.

#### **5. Conclusion**

Almost 90% of neonatal morbidity and mortality are caused by three easily preventable and manageable problems; that are sepsis, prematurity and respiratory distress syndrome. The trend of neonatal morbidity and mortality will remain as a burden of NICU unless great effort and focus are giving for the three most leading cause of morbidity and mortality

#### **6. Recommendations**

- Implement proper infection prevention and appropriate treatment of maternal infection during labor and delivery or after delivery and encourage women to deliver in formal health facilities.
- Providing proper training for health care provider who attends labor and delivery is also very important in timely resuscitation of babies at birth and early detection and prevention of asphyxia and sepsis during labor and delivery.
- In our study, since the leading causes of neonatal admissions are sepsis and prematurity, further extensive studies should be conducted in order to determine the risk factors particularly involved in these two problems.

#### **Acknowledgement**

We would like to thank Adama Hospital Medical College, Research and Publication Office, for the ethical review and funding the research. We would also like to forward our thanks to all who took part in this study.

#### **Competing interests**

No competing interest to declare.

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