

Research Article

The Median Survival Recovery Time and Associated Factors among Admitted Neonate in Intensive Care Units of Dire Dawa Public Hospitals, East Ethiopia, 2019

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OPEN ACCESS**Keywords**

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- Neonates
- Survival
- Recovery
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Abstract

Background: Neonate is any infants from the birth to 28 days. Most of the neonatal deaths occur in developing countries particularly in sub-Saharan African and south central Asian countries. The ability to predict Length of stay would be valuable to parents and families, clinicians and service providers. Timely Management and treatment of birth complication are important factors in reducing new born mortality.

Objective: To assess median Survival Recovery time and associated factors among admitted neonate in intensive care units of Dire Dawa Governmental Hospitals, East Ethiopia, 2019.

Methods: Facility based retrospective cohort study design was employed to assess median Survival recovery time and associated factors of neonate among a total of 499 selected 0-28 days of neonates from two public Hospitals and validated Checklist were used to assess data. Data were entered in to Epi-data version 3.1 and exported to SPSS window version 21.0. Descriptive data were presented by table and graph. To determine the associated factors, Cox regression model was computed with 95% CI and P-value <0.05 level of significance. Ethical clearance was taken from Dire Dawa University research and technology interchange office and given for all concerned body.

Result: The overall median survival recovery time of neonates admitted in neonatal intensive care units of Dire Dawa public hospital was 7 Days with 95% CI (6.525-7.475). Among the neonates that admitted in neonatal intensive care units, neonates those who have weight <2500g had 1.648 times higher hazard risks to recovery compared to that neonates who have weight greater than or equal to 4000g with [AHR 1.648 95% CI (1.246-2.179)]. Those neonates who were none intubated had 6.725 higher hazard risks compared to that of intubates neonates [AHR 6.725 95% CI (1.616- 27.978)], and those neonates who were not supply oxygen continuously had 1.336 times low probability of recovery [AHR 1.336 95% CI (1.030-1.733)]. But, the neonates that admitted between 1-6 days after birth had 0.521 times higher probability for recovery compared to the neonate with those admitted between 7-28 days of after birth [AHR 0.521 95% CI (0.355-0.763)].

Conclusion: Overall median survival recovery time was 7 Days and Birth weight of neonates, Oxygen supply, and Intubation and admission time of neonate between 1-6 days of after birth were factors that significantly associated with recovery time of neonates. Compared to the other study the recovery time of neonates in this study were short and better.

ABBREVIATIONS

AHR: Adjusted Hazard Ratio; CI: Confidence Interval; CMHS: College of Medicine and Health Science; DDHB: Dire Dawa Health Bureau; DRH: Dilchora Referral Hospital; EDHS: Ethiopia Demography Health Survey; FMOH: Federal Ministry of Health; HR: Hazard Ratio; IPPS: Infection Prevention and Patient Safety; MNCH: Maternal Neonate and Child Health; OR: Odd Ratio; NAS: Nursing Assessment and Study; NICU: Neonatal Intensive Care Unit; RTI: Research and Technology Interchange; SDG: Sustainable Development Goal; SPH: Sabian Primary Hospital; UNICEF: United Nation Child Fund; WHO: World Health Organization

BACKGROUND

A neonate is any infant aged less than 28 completed days. Neonatal units may provide care for infants up to 6 months postnatal or two months of age corrected for prematurity. Either new born All babies in hospitals are admitted patients and are defined as qualified or unqualified [1]. Worldwide there is 6.3 million Neonatal deaths a year, almost all occurs in developing countries, and 27% of them in the least developed countries alone [2]. More than 40% of all under five Deaths occur during the neonatal period at the first month of life [3]. Among 140 million babies born worldwide, 90% were born in low developing countries and 10% in high-developed countries

while approximately 99% neonatal death occurs in low-income countries. Every minute seven new born babies die worldwide and 415 new born babies every hour. The vast majority of neonatal death occurs in South Asian and Sub-Sahara Africa [4].

Most of the neonatal deaths occur in developing countries particularly in sub-Saharan African and south central Asian countries. 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 [5]. SDG had sets a goals by the end of 2030, end preventable newborns and child under 5 years of age, with all countries aiming to reduce neonatal mortality to at least as low as 12 per 1000 live births and under 5 mortality to at least as low as 25 per 1000 live births [6]. But, EDHS 2016 report showed that, in Ethiopia the under-5 mortality rate is 67 deaths per 1,000 live births, and the infant mortality rate is 48 deaths per 1,000 live births. This means that 1 in 15 children in Ethiopia dies before reaching age 5, and 7 in 10 of the deaths occur during infancy. Results showed that the neonatal, infant, and under-5 mortality rates for the 5 years before the survey are 29, 48, and 67 deaths per 1,000 live births, respectively.

In other words, in Ethiopia 1 in every 35 children dies within the first month, 1 in every 21 children dies before celebrating the first birthday, and 1 of every 15 children dies before reaching the fifth birthday. However, the change in neonatal mortality is not as significant as the change in post-neonatal and child mortality. Even in Dire Dawa the neonatal mortality rate remain 36/1000 live birth which is higher compared to Harari and Tigray regions and 2time higher than Addis Ababa [7]. Preterm newborns had hospital stays averaging 14.3 days. Among newborns with low birth weight, those who weighed less than 1500 grams had hospital stays 42.6 days compared to 10.9 days 1500 grams or more. Newborns with respiratory distress syndrome had hospital stays averaging 31.3 days. Newborns that died after birth had hospital stays averaging 7.4 days [8]. The ability to predict Length of stay would be valuable to parents and families, clinicians and service providers, but it is a complex issue.

Inherent factors appear to be the most important and this information from the first day of life is informative for predicting Length of stay in a simple model and these estimates are a useful early indicator of Length of stay [9]. Timely Management and treatment of birth complication are important factors in reducing newborn mortality. To give newborn access to life saving care, standard guidelines recommend that all births take place in a health facility under the care of skill health provider [10]. The ability that accurately predicts length of stay in Neonatal care is vital in resource planning, commissioning services and to aid clinician in their counseling of parents. It is vital information about the factors which predict length of stay is identify from multiple studies for the future research [11]. Therefore this study aims to assess median survival recovery time and associated factors that lead to compromise the recovery of neonate in the intensive care unit.

METHODS

Study Area and Period

The study was conducted at DilChora Referral and Sabian

primary Hospitals, in Dire Dawa, which is located 515 kilometers away East of Addis Ababa. A Dilchora referral hospital had 24 functional NICU Beds, 2 functional Incubators and 18 total staff working the neonatal intensive care units. Among the total of 18 staff, One Neonatal Bsc Nurse, 8 Intensive neonatal cares trained and 2 untrained nurses, 1 General Practitioner, 2 runners and 4 cleaners were working a full time in the unit. Sabian Primary had 15 Neonatal Beds, 3 functional Incubators, 1 neonatal nurse and 3 trained nurses. Dilchora Referral hospital neonatal intensive care unit established ten years ago, but Sabian primary hospital neonatal intensive care unit established in 2014/15. Data was collected from May 20/05/2019-June 15/06/2019.

Study Design

Facility Based retrospective cohort study design was implemented and standardized checklist was used to assess the neonatal recovery time and risk factors associated with neonatal recovery.

Inclusion and Exclusion Criteria

Inclusion Criteria: Neonates admitted in Dilchora referral and Sabian primary Hospital's Intensive Neonatal care units in any case from January 10/01/2017 to January 10/01/2019.

Exclusion Criteria: Neonates with incomplete charts January 10/01/2017 to January 10/01/2019. Neonates admitted for less than 24hrs in neonatal intensive care units.

Operational Definitions

'Recovery': were neonates that declared as improved or recovered by physician.

Median Survival Recovery time: is the median survival recovery of time of neonates that declared recovered from illness by physician working in the units.

Admission: neonate admitted by physicians and wait for more than 24hrs.

'Defaulters'- were those neonates who leaves from treatment unit against medical advice and declared as defaulter or against in the treatment.

'Death'- Refers to the neonates that has die while he/she is in the therapeutic units and declared as Death in the treatment logbook by physician.

Recovery rate = $\frac{\text{Number of neonates discharged for recovery or improve}}{\text{Total admission cases with in the study period}} \times 100$

Defaulter rate = $\frac{\text{Number of defaulters/against from the treatment unit}}{\text{Total admission cases with in the study period}} \times 100$

Death rate = $\frac{\text{Total number of death in the therapeutic units}}{\text{Total admission cases with in the study period}} \times 100$

Censor = Refers to Defaulter from treatment, transfer out, referred neonates, those who died with indirect and direct causes

and those cases not known the result at the end of the study period.

The event (outcome of interest) =was considered survival median recovery time of neonate while in the neonatal intensive care units.

Data Quality Control

The data was collected by using standardized checklist and reviewing a chart which was adopted from previous Literature and Data collection checklist was also, developed from the existing register of the Hospitals to address the study variables [12,13]. The data collection checklist was checked for consistency and during data collection the discrepancies of the data was manage by third person. Data clearance, Completeness, range and logic checks carry out regularly to ensure the quality of data before data entry. Any data that were incomplete and inconsistent was excluding from the data and checks with the supervisors.

Data Collection Procedure

Data source was neonatal care unit registration logbook and charts of each case from the units Data was collected by Nurses who took training on the management of NICU from the other hospitals and they were collect data by standardized checklist. Six data collectors and two supervisors were trained for two day about how and what information was collected. The investigator was monitoring the data collectors to ensure the quality of data that was collected.

Data Processing and Analysis

The data were entered into Epi data version 3.1 and analysis was done by using SPSS Version 21 software. Variable associated with time to recovery at 0.2 significant levels was included in the multivariate Cox proportional Hazard model. The associated factors was compared by hazard function risks and data was presented by Log survival function Graphs. Variables having $p < 0.05$ was considered as significant.

RESULT

Socio-Demographic characteristics of recovery time of neonate admitted in Dire Dawa Governmental Hospitals, 2019

Among the neonates age between 0-28 days, majority 66.5% were age group from zero to 1 days with the mean age of 1.44 days ± 0.675 SD. There were 64.7% (323), male and 35.3% (176), female neonates admitted to neonatal intensive care units in both hospitals. The majority 55.1% of admitted neonate in intensive care units were from rural area and the rest 44.9% were from the urban (Table 1).

Place of Delivery, referral made and type of neonatal sepsis, in Dire Dawa Administration governmental hospitals

Among admitted neonates in Neonatal care units 66.1% (330), were delivered in hospitals and 9% were delivered at Home (Figure 1). The majority 61.1% (305), referred to neonatal intensive care units from the same Facility, 22 % (110), from Health Centre, 8.8 (44), from other hospitals and 8% (40), were referred from home. The predominant form of sepsis 87.6% (n=315), was early onset of sepsis and 12.4% was late onset of neonatal sepsis.

Admission Case and treatment Outcome of neonates admitted in Dire Dawa Governmental hospitals in Intensive care Units

The main neonatal treatment outcome indicators in this study were recovery rate, Death rate, Defaulter and transfer out rate. Among 499 admitted neonates in neonatal intensive care units, 84.4%, 8.8%, 3% and 3% were recovered, died, Defaulted and transferred respectively. Most of the neonates were recovered 421(84.4%), and 44(8.8%), were died. The predominant cases of admission were early onset of neonatal sepsis 168(33.7%).

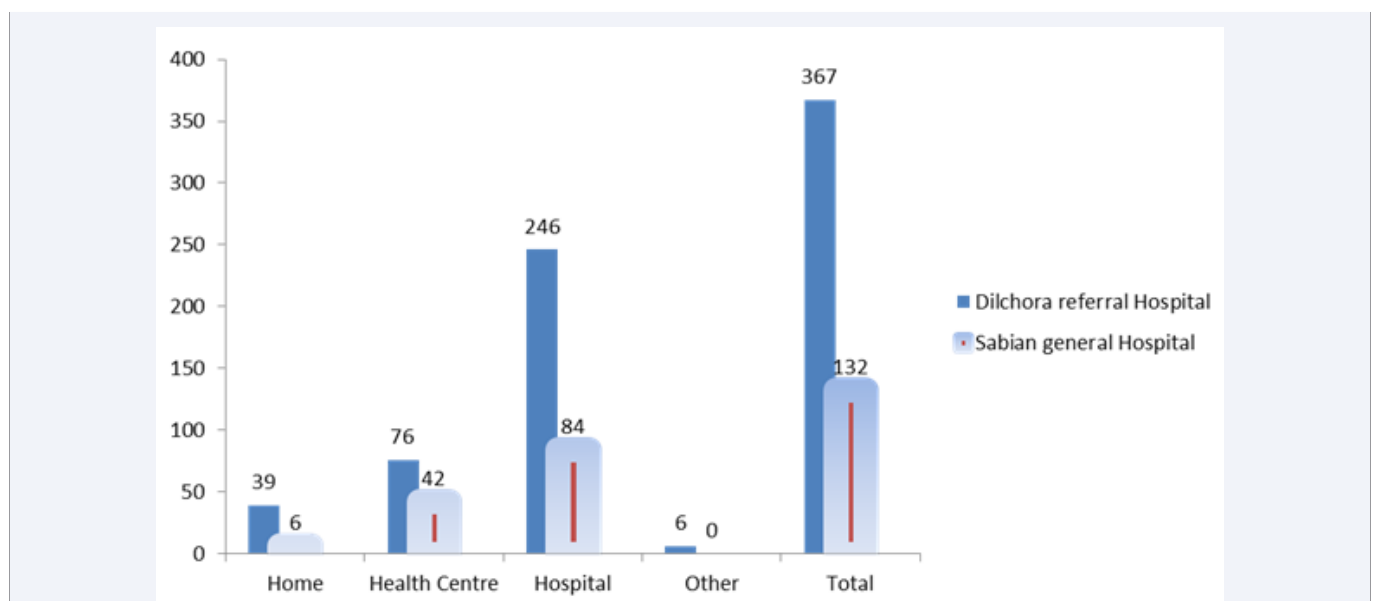


Figure 1 Place of Delivery for Neonates admitted in Dire Dawa public Hospitals from January 2017 to January 2019.

Prematurity 10(22.7%), and the complicated cases 10(22.7%), had higher deaths rate compared to the others (Table 2).

Mode of delivery and admission time of neonates after birth in neonatal intensive care units in Dire Dawa Governmental hospitals from January 2017 to January 2019

The predominant 77 %(n=499), neonates were vaginal delivery and other 20.8%, 2.2% were C-section and Instrumental assisted delivery respectively. The majority 278(55.7%), n=499), of the neonates were admitted with in 24Hrs. Most of the neonatal death 33 (75%), occurs in the first 24hrs of birth (Figure 2).

The median survival recovery time of neonates admitted in Dilchora referral hospital was 6 days with 95% CI (5.472-6.528) and the median survival recovery time of neonates admitted in neonatal intensive care unit of Sabian primary Hospital was 8 days with 95% CI (6.99-9.001). The overall median survival recovery time of neonates admitted in neonatal intensive care

units of Dire Dawa Governmental hospital was 7 Days with 95% CI (6.525-7.475) (Table 3).

Log survival function Estimate of recovery time and admission time after birth

The log rank test showed that admission time after birth and recovery time has a significant association with p-value (0.019). The log survival function graph showed that, there is a significant difference for survival of neonates based on admission time after birth and with length of stay. Mortality and censoring was higher with in 24rs. The log survival function graph indicates, 75% death occurred in the first 24 hours of birth and Neonates admitted between 7-28 days had a lower probability for death (Figure 3).

Factors associated with median survival recovery time of neonates admitted to in neonatal Intensive care units

The Final Backward conditional steps of cox regression analysis showed that, Birth weight of neonates, Presence of

Table 1: Socio-Demographic characteristics of neonate's 0-28days admitted in neonatal intensive care units of in Dire Dawa governmental hospitals, 2019.

Characteristics		Frequency (n=499)	Percent
Age	0-24hrs or with in 24hrs	332	66.5
	1-6 days	115	23
	7-28 days	52	10.5
Sex	Male	323	64.7
	Female	176	35.1
Residence	Rural	224	44.9
	Urban	275	55.1

Table 2: Outcome of Neonates * Admission cases of the Neonate

Treatment Outcome of neonates	Admission cases of the Neonate							Total
	Prematurity n (%)	Complicated cases n (%)	Birth Asphyxia n (%)	Neonatal sepsis n (%)	Respiratory Distress n (%)	Congenital Abnormality n(%)	Others n(%)	n (%)
Recovered	34(8%)	85(20%)	26(6.2%)	157(37.3%)	38(9%)	8(1.9%)	73(17.3)	421(84.4%)
Died	10	10	6	5	4	3	6	44(8.8%)
Transferred		3		3		5	4	15(3%)
Defaulted	1	1	3	3	3	3	1	15(3%)
Others	2	2						4
Total	47(9.4%)	101(20.2)	35(7%)	168(33.7%)	45(9%)	19(3.8%)	84(16.8%)	499

Table 3: Median survival recovery time for neonates admitted in neonatal intensive care units of Dire Dawa Governmal hospitals, from January 2017 to January 2019.

Means and Medians for Survival Time												
Hospital Name	Total N	N of Events	Censored		Mean				Median			
					Estimate	Std. Error	95% Confidence Interval		Estimate	Std. Error	95% Confidence Interval	
			N	%			Lower Bound	Upper Bound			Lower Bound	Upper Bound
DRH	367	306	61	16.6%	7.76	.367	7.04	8.474	6.0	.269	5.47	6.528
SPH	132	115	17	12.9%	10.06	.659	8.76	11.346	8.0	.511	6.99	9.001
Overall	499	421	78	15.6%	8.436	.339	7.77	9.100	7.00	.243	6.53	7.475

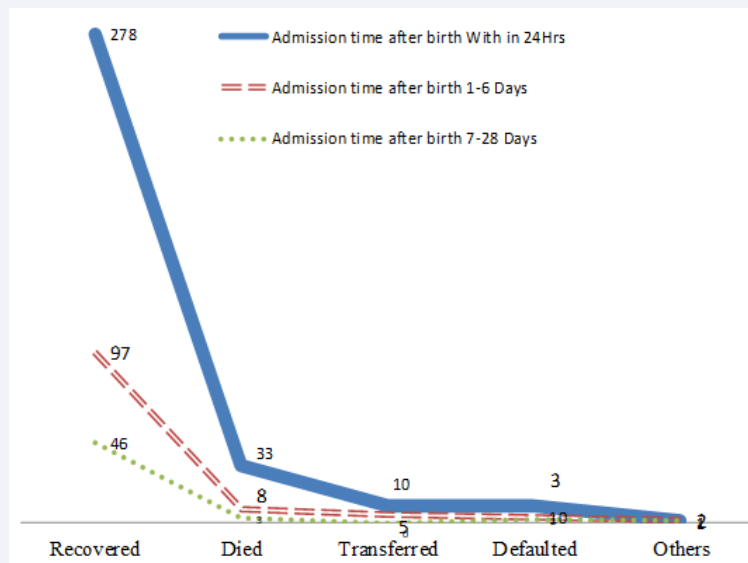


Figure 2 Admission time after birth and treatment outcome of neonates that were admitted in neonatal intensive care of Dire Dawa Public hospitals from January 2017 to January 2019.

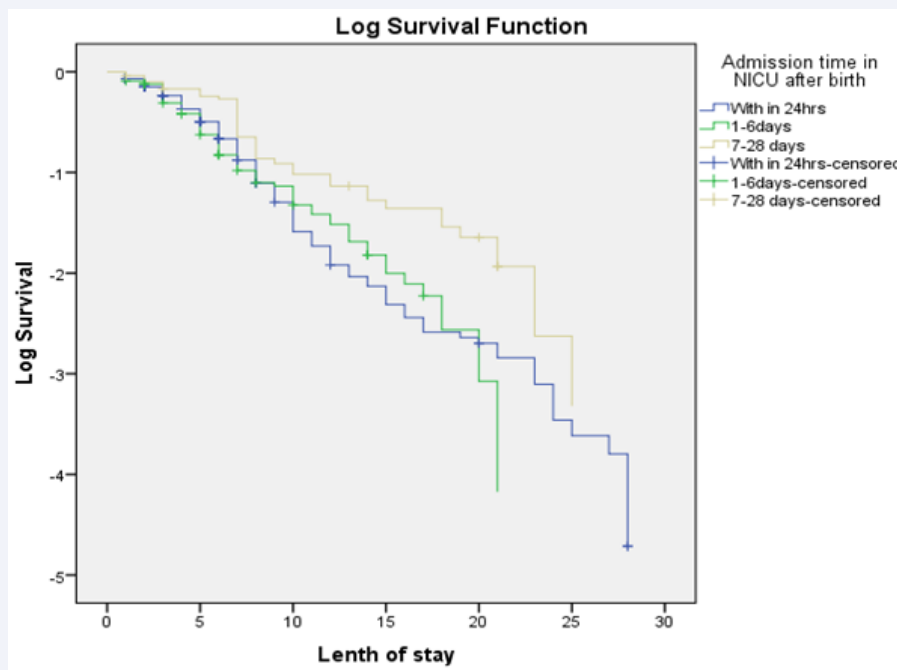


Figure 3 Hazard function estimates graph for neonates admitted to neonatal intensive care units with admission time after births in Dire Dawa Public hospitals, from January 2017 to January 2019.

hypothermia, low birth weight, provision of antibiotic, and Hypothermia, Intubation and admission time of neonate after birth were factors that significantly associated with recovery time of neonates admitted in the neonatal intensive care units. Among the neonates that admitted in neonatal intensive care units, neonates those who have weight <2500g had 1.648 times higher hazard risks to recovery compared to that neonates who have weight greater than or equal to 4000g with [AHR 1.648 95% CI (1.246-2.179)]. Those neonates who were none

intubated had 6.725 higher hazard risks compared to that of intubates neonates [AHR 6.725 95% CI (1.616- 27.978)], and those neonates who were not supply oxygen continuously had 1.336 times low probability to for recovery [AHR 1.336 95% CI (1.030-1.733)]. But, the neonates admitted between 1-6 days after birth had 0.521 times higher probability for recovery compared to the neonate with those neonate admitted between 7-28 days of after birth [AHR 0.521 95% CI (0.355-0.763)]. Birth weight 2500g-3999g [AHR 3.047 95% CI (1.439-6.451)] were also significantly associated with recovery time (Table 4).

Table 4: Adjusted Hazard ratio with 95% confidence intervals and p-value of the backward conditional Cox regression model for the variables associated with median survival recovery time in Dire Dawa Public Hospitals, from January 2017 to January 20.

Variables	Adj.HR(95%CI)	p value
Birth weight		
>=4000g	1	000
2500g-3999g	3.047(1.439-6.451)	0.004*
<2500g	1.648(1.246-2.179)	000*
Presence of congenital abnormality	3.799 (0.526-27.419)	0.186
Presence of Hypothermia	0.741(0.534-1.028)	0.073
Oxygen supply	1.336(1.030-1.733)	0.029*
Intubation	6.725(1.616- 27.978)	0.009
Admission time after birth		
Admission between 7-28 days after birth	1	000
Admission between 1-6 days after birth	0.521(0.355-0.763)	0.001*
Admission with in 24hrs of after birth	0.980 (0.734-1.308)	0.891
Variables	Adj.HR(95%CI)	p-value
Birth weight		
>=4000g	1	0
2500g-3999g	3.047(1.439-6.451)	0.004*
<2500g	1.648(1.246-2.179)	000*
Presence of congenital abnormality	3.799 (0.526-27.419)	0.186
Presence of Hypothermia	0.741(0.534-1.028)	0.073
Oxygen supply	1.336(1.030-1.733)	0.029*
Intubation	6.725(1.616- 27.978)	0.009
Admission time after birth		
Admission between 7-28 days after birth	1	000
Admission between 1-6 days after birth	0.521(0.355-0.763)	0.001*
Admission with in 24hrs of after birth	0.980 (0.734-1.308)	0.891

DISCUSSION

This study showed that, most of neonates admitted in neonatal intensive care units were from rural area 55.1%(n=499), and there were 64.7% (323), male and 35.3% (176), female. The study conducted in university of Gonder Specialized hospital showed similar finding, there were 448 (58.3%), male neonates. Regarding the residency, 398 (51.8%), neonates were from rural area [12]. Most of admitted neonates in Neonatal care units 66.1% (330), were delivered in hospitals and 9% (45), were delivered at Home. The predominant form of sepsis 87.6% (276), was early onset of sepsis and the other 12.4% (39), were late onset of sepsis. The study conducted in University of Gonder showed that, more than two-thirds of the 587 deliveries (76.3%), were performed in hospital. On the other hand the finding from Shashemene governmental hospital among 244 neonates who were admitted in NICU, 190(77.9%) had neonatal sepsis. From this were 123 (64.7%) who had early onset neonatal sepsis and 67 (35.3%), who had late onset neonatal sepsis [12,13].

The result shows a difference, this may be due to time gaps and sepsis prevalence is highly depends on the IPPS Implementation practice of each hospitals. Out of 499 admitted neonates, in neonatal intensive care units 84.4%, 8.8%, 3% and 3% were recovered, died, Defaulted and transferred respectively.

Predominant cases of admission were early onset of neonatal sepsis (33.7%), more than one case (20.2%), prematurity (9.4%), and respiratory distress (9%). The finding from Addis Ababa showed that, the most common primary diagnoses during admission to the neonatal care unit were prematurity with respiratory problem (36.6%), neonatal sepsis (22.7%), and asphyxia (16.2%) which was different with this study. But, the study from Ghana Tamale teaching hospital showed that, the commonest cause of neonatal admission was sepsis (29.2%), followed by prematurity/low birth weight (26.9%), birth asphyxia (16.2%) and congenital anomalies (7.1%). Majority 82.7% (3220), of the neonates were successfully treated and discharged [14,15].

The treatment success of this study was better compared to Tamale teaching hospital. This may be due to the difference of the strategic focus of these two countries and available human skill as well as Geographical variation. The majority 278(55.7%), n=499) of the neonates were admitted with in 24Hrs. Most of the neonatal death 33 (75%), occurs in the first 24hrs of birth and as the length of stay increase the probability of neonate recovery also increase. The study find from university of Gonder indicate, The overall mortality was 110 (14.3%; of which 69 (62.7%), deaths occurred in the first 24 hours of age which indicate high number

of early mortality rate, but show a difference in magnitude [12]. This may be due to sample size and study time difference. The overall median survival recovery time of neonates admitted in neonatal intensive care units of Dire Dawa Governmental hospital was 7 Days with 95%CI 0.243(6.525-7.475).

The study finding from Brazil indicate that the mean newborns stay length among those who were discharged was 19 days, while the mean stay length for those who died was 8 days, Which show very different result compared to this study [16]. The variation may be due to Geographical difference and admission case difference. The Final Backward conditional steps of cox regression analysis showed that, Birth weight of neonates, oxygen supply, Intubation and admission time of neonate 1-6 days of after birth were factors that significantly associated with recovery time. Univar ate Analysis from Iran Conducted to evaluate the risk factors associated with complications revealed that gestational age of <37weeks, mean birth weight, and Intubation before transfer had a significant association with transfer complication [17]. On the other hand, study finding in Nigeria showed that, neonatal admission in the first 24 hours of birth, Neonates with low birth weight ($p<0.05$) and neonates birth weight were significantly associated with neonatal mortality [18].

CONCLUSION

The most commonly admitted age groups of neonates were between 0-24 Hours old age. The predominant case of admission in neonatal intensive care units was Neonatal sepsis. The majority of neonates admitted in intensive care units were delivered in hospitals. The recovery rate of this study was 84.4%. Hazard function graph indicates, 75% death occurred in the first 24 hours of birth and Neonates admitted between 7-28 days had a lower probability for death. Finally, overall median survival recovery time of neonates admitted in neonatal intensive care units of Dire Dawa public hospitals was 7 Days. The Final Backward conditional steps of cox regression analysis this study showed that, Birth weight, Intubation, Oxygen supply and admission between 1-6 days after birth were significantly associated with recovery time. The finding showed that the recovery time of neonates in this study is better than the other studies conducted in different part of sub-sahara countries.

DECLARATION

Ethics Approval and Consent to Participate

Official support letter was obtained from Dire Dawa University Research and technology Inter-change office and the letter was given to Dire Dawa town administration Health Bureau, then for Dilchora and Sabian Hospitals chief executive officer, finally for unit coordinators.

During data collection, the purpose of the study was explained for the data owners. The permission of Hospitals medical room coordinators was obtained before chart review and street confidentiality was kept by reviewers. No information disclose to any third person that obtain from the medical records. Each medical chart was review and returned carefully by checking the list of each medical record numbers with proper care.

Consent for Publication

Consent for publication is not necessary, because this manuscript did not contain any personal detail like photo, image and video data.

Availability of Data and Material

The data sets used or analyzed data currently availed in the hand of corresponding author and can be asked any time for reasonable request.

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AUTHOR'S CONTRIBUTION

TD develops, organized the materials and designs the study, perform analysis and interpret the data. ZT assists the methods and YB evaluates the contents. TD also writes the manuscript and all the authors read and approved the final manuscript.

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REFERENCES

1. Department of Health and Western Australia. Framework for the care of neonates in Western Australia. Perth: Health Networks Branch, Department of Health, Western Australia. 2009.
2. World health organization. Neonatal and perinatal mortality, country, regional and global estimates. 2006.
3. Jayani P, Flor M, Vectoria A, Bhat N, Harris T, Kapoor A, et al. Neonatal death: Case definition, guideline for data collection, analysis and presentation of immunization safety data. 2016; 34: 6027-6037.
4. Sajjad UR Lahman, Walid El Alsari. Neonatal mortality: Incidence, correlates and improvement strategies. Perinatal Mortality. 2012.
5. Mekonnen Y, Tensou B, Telake DS, Degefe T, Bekele A. Neonatal mortality in Ethiopia: trends and determinants. BMC Public Health. 2013; 13: 483.
6. UN: The 2030 agenda for sustainable Development Goals.
7. Central Statistical Agency (CSA) [Ethiopia] and ICF. Ethiopia Demographic and Health Survey 2016. Addis Ababa, Ethiopia, and Rockville, Maryland, USA: CSA and ICF. 2016.
8. Kowlessar NM, Jiang HJ, Steiner C. Hospital Stays for Newborns, 2011. HCUP Statistical Brief #163. Agency for Healthcare Research and Quality. 2013.

9. Seaton SE, Barker L, Jenkins D, Draper ES, Abrams KR, et al. What factors predict length of stay in a neonatal unit: a systematic review. *BMJ Open*. 2016; 6: e010466.
10. UNICEF and Safe the children. New born health in humanitarian settings. 2015.
11. Flynn JT, Kaelber DC, Baker-Smith CM, Blowey D, Carroll AE, et al. Clinical Practice Guideline for Screening and Management of High Blood Pressure in Children and Adolescents. *Pediatrics*. 2017; 140: e20171904.
12. Demisse AG, Alemu F, Gizaw MA, Tigabu Z. Pattern of admission and factors associated with neonatal mortality among the neonate admitted to the neonatal intensive care unit of University of Gondar Hospital, North West Ethiopia. *Pediatrics health, medicine and therapeutics*. 2017; 8: 57-64.
13. Ayteneu Getabelew, Mihret Aman, Endashaw Fantaye, Tomas Yeheyis. Prevalence of Neonatal Sepsis and Associated Factors among Neonates in Neonatal Intensive Care Unit at Selected Governmental Hospitals in Shashemene Town, Oromia Regional State, Ethiopia. 2017. 2018.
14. Atnafu MT, Amaru GM, Tefera YA. Reasons for admission and neonatal outcome in the neonatal care unit of a tertiary care hospital in addis ababa: a prospective study: *Research and Reports in Neonatology*. 2016; 6: 17-23.
15. Walana W, Acquah Ekuban KS, Abdul-Mumin A, Naafu B, Aruk E, et al. Pattern, Causes and Treatment Outcomes of Neonatal Admission in the Tamale Teaching Hospital. *Clinics Mother Child Health*. 2016; 13: 252.
16. Susana DP, Luiz F. Risk factors for neonatal death in neonatal intensive care unit according to survival analysis. *Rev Bras Ter Intensiva*. 2010; 22: 19-26.
17. Sabzehei MK, Basiri B, Shoukahi M, Torabian S, Razavi Z. Factors affecting the complications of interhospital transfer of neonates referred to the Neonatal Intensive Care Unit of Besat Hospital in 2012-2013. *J Clin Neonatol*. 2016; 5: 238-242.
18. Ike E, Mudupe O. Pattern of disease and care outcomes of neonates admitted in the special care baby unit of University college hospital, Ibadan, Nigeria from 2007-2011. *IOSR J Nursing Health Sci*. 2015; 4: 62-71.

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