

Original Article**Analysis of Neonatal Admission Patterns and Clinical Profiles in a Tertiary Care Center: Focus on Neonates Transferred from the Delivery Room to the Neonatal Intensive Care Unit****Babita Khanal¹, Sunil Kumar Yadav¹, Sandip Pokhrel¹, Sandip Kumar Singh¹, Gehanath Baral², Prakash Kafle³**¹Department of Pediatric, Nobel Medical College Teaching Hospital, Biratnagar, Nepal, ²Department of Obstetrics and Gynecology, Nobel Medical College Teaching Hospital, Biratnagar, Nepal, ³Department of Neurosurgery, Nobel Medical College Teaching Hospital, Biratnagar, NepalArticle Received: 12th February, 2023; Accepted: 5th May, 2023; Published: 30th June, 2023DOI: <https://doi.org/10.3126/jonmc.v12i1.56390>**Abstract****Background**

Neonatal mortality rate is very high in developing countries despite of advancement in perinatal and neonatal care with reduced neonatal mortality rate in many developed countries. This study aims to identify the reasons of admitting neonates for intensive care after vaginal delivery and their outcome.


Materials and Methods

This is an observational descriptive study conducted for over a year at Nobel Medical College Teaching Hospital which included newborns delivered vaginally within the hospital. Demographic data of newborn and mother was obtained, birth weight, reason for admission and final outcome were documented. Outcomes were classified as improved with recovery, mortality and discharge on request prior to recovery. Descriptive statistics such as mean, percentage and standard deviation were obtained.

ResultsTotal 117 neonates were admitted to intensive care out of 3452 vaginal deliveries with male to female ratio of 1.9:2. There were 60 (51.3%) preterm, 55 (47%) full term and 2 (1.7%) post term; and 68 (58.1%) were low birth weight. Prematurity with respiratory distress syndrome was the most common cause of admission (34.2%) along with birth asphyxia (29, 24.8%) and meconium aspiration syndrome (20, 17.1%). Positive Airway Pressure was required in 42 (35.9%). Blood Culture positive growth was seen in 17.9% with most common organism being *Staphylococcus aureus*. Mean stay was 3.75±2.49 days and mortality in the study population was 6.8%.**Conclusion**

Prematurity with respiratory distress syndrome, birth asphyxia and meconium aspiration syndrome were major indications for admission of newborns delivered via vaginal deliveries to neonatal intensive care unit. One-fourth required mechanical ventilation.

Keywords: *Low birth weight, Neonates, Neonatal intensive Care Unit, Respiratory distress syndrome*

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Citation

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Introduction

Neonatal Mortality Rate (NMR) have been reduced in developed countries due to advancement in perinatal and neonatal care, but the NMR is still high in many developing countries [1]. Neonatal period (up to 28 days of life) is the most vulnerable period of life because of various problems / diseases which a neonate faces [2]. Globally, the most common causes of neonatal mortality are preterm birth (27%), infections (26%), perinatal asphyxia (23%) and congenital anomalies (7%) [1]. Almost 50% of deaths in our country occur in the neonatal period [3]. Neonatal mortality rate of Nepal by 2015 was 23 per 1000 live births which is planned to be reduced to 12 per 1000 live births by 2030 [4].

Diseases and cause of neonatal mortality may differ in between places and with time, so regular update on such information is necessary but is very rare in developing countries like ours [1]. Documentation and publications for intensive care is scarce.

Thus, the aim of this study is to find out reasons for admission for intensive care and their outcome. So that the data may be of use to improve perinatal care.

Materials and Methods

An observational descriptive study was conducted from February 2022 to January 2023 in the Department of Pediatrics and the Department of Obstetrics and Gynecology at Nobel Medical College Teaching Hospital (NMCTH). Ethical approval was obtained from the institutional review committee (IRC) of the institute. Last year around total of 4000 vaginal delivery were recorded at Department of Obstetrics and Gynecology at Nobel Medical College Teaching Hospital. Taking the prevalence (P) from previous study as 18% of newborn admission following delivery and with finite population of 4000, 7% absolute precision and 95% confidence interval, the calculated sample size came to be 113 [5]. Taking non-response rate into consideration, 117 samples were included in this study.

Among total of 3452 vaginal delivery during our study period; 117 neonates born vaginally and admitted directly to NICU from labor room were included in the study. Thus, all inborn neonates delivered vaginally in labor room were included. Other newborn received in our neonatal intensive care unit (NICU) from outside our Centre were excluded. Data collected from neonatal intensive care unit (NICU) and traced back to the labor ward records. Demographic data of newborn and mother were obtained, birth weight, rea-

son for admission and final outcome were documented. Clinical approach with support of some specific laboratory and radiological evidences as indicated were used to diagnose the disease. Sepsis and meningitis were diagnosed based on clinical and laboratory background. Congenital heart disease was confirmed by echocardiography. Birth Asphyxia was diagnosed clinically and based on arterial blood gas analysis. Prematurity was diagnosed clinically by menstrual age and Ballard scoring. Pneumonia was diagnosed mainly on clinical examination and radiological findings. Neonates were diagnosed with Meconium aspiration syndrome (MAS) when neonate with the signs of respiratory distress had history of meconium stained liquor with chest radiographic changes in lung and other possible causes excluded. Gestational age of less than 37 weeks is considered as preterm and 42 weeks or more as post term. Based on birth weight categorized as Macrosomia (4001gm and more), Normal birth weight (2501gm to 4000gm), Low birth weight (1501gm to 2500gm), Very Low birth weight (1001gm to 1500gm) and Extremely Low birth weight (1000gm and less). Outcomes were classified as improved with recovery, mortality and discharged on request either due to poor prognosis or financial or social issue. Descriptive statistics such as mean, percentage and standard deviation were obtained using SPSS (statistical package of social sciences) version 16.0.

Results

There were 6794 of total deliveries with 3452 vaginal delivery and 3342 Cesarean Sections in a year; and 117 neonates born vaginally were admitted in NICU. Preterm and term neonates were almost equal. Two-third (77, 65.8%) were male and rest (40, 34.2%) were female. [Table-1]

Table 1: Distribution of NICU admitted newborns by gestational age [N=117]

Weeks	n	%
<37	60	51.3%
37	5	4.3%
38	10	8.5%
39	17	14.5%
40	18	15.4%
41	5	4.3%
=42	2	1.7%

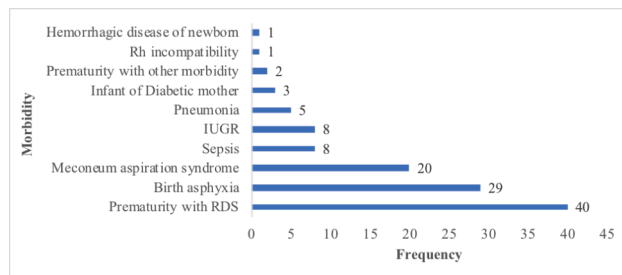
Majority (68, 58.2%) of neonates were of low birth weight and few macrosomia [Table-2].



Table 2: Birth weight of admitted neonates [N=117]

Birth weight Category	n	%
≥4 Kg (Macrosomia)	4	3.4%
2.5-4 Kg (Normal birth weight)	45	38.5%
1.5-2.5 Kg (Low birth weight)	43	36.8%
1-1.5 Kg (Very low birth weight)	22	18.8%
<1 Kg (Extremely low birth weight)	3	2.6%

Prematurity with RDS (40, 34.2%), birth asphyxia (29, 24.8%) and meconium aspiration syndrome (MAS, 20, 17.1%) were the common reason of admission followed by sepsis and IUGR 8 each [Figure-1].

**Figure 1: Indications for NICU admission [N=117]**

One-fourth required mechanical ventilation (29, 24.8%) and one-third each received Continuous Positive Airway Pressure (CPAP, 42, 35.9%) and Oxygen support only (40, 34.2%) followed by observation under room air for few cases (6, 5.1%).

Blood samples were sent for culture and there were different organisms isolated after 72 hours of incubation in 21 cases (17.9%) and most common isolate was *Staphylococcus aureus* 11 (9.4%) followed by *E. coli* 6 (5.1%), *Pseudomonas* 2 (1.7%), *Klebsiella* species 2 (1.7%).

Only 11 cases (9.4%) had demonstrable congenital anomalies [Table-3].

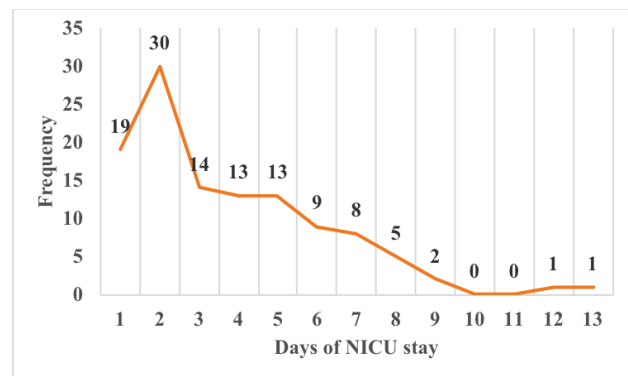
Table 3: Congenital anomalies identified in newborns [N=11]

Congenital anomaly	n	%
Downs syndrome	2	1.7%
Gastrosciasis	1	0.9%
Anorectal malformation	1	0.9%
Cleft lip and palate	1	0.9%
Tracheo-oesophageal fistula	1	0.9%
Spina bifida	1	0.9%
Postauricular dermoid cyst	1	0.9%
Cystic adenomatoid malformation	1	0.9%
Club foot	1	0.9%
Heart disease	1	0.9%

Different procedures and interventions were done for diagnostic and therapeutic purpose

such as Lumbar Puncture for CSF analysis in 22 (18.8%), double volume exchange transfusion in 5 (4.3%) and chest tube insertion in 1 (0.9%) case.

Mean duration of NICU stay was 3.75 ± 2.449 (Range: 2-13) days; one-fourth (25.6%) stayed for two days only and majority (90.6%) were discharged by a week [Figure-2].

**Figure-2: NICU stay by days**

Equal number of cases were discharged after improvement and discharged on request prior to recovery i.e. 54 (46.2%) improved and were discharged normally, 54 (46.2%) were discharged on request. There were 8 neonatal deaths of which 5 were due to RDS, 1 due to sepsis and 1 due to birth asphyxia. One (0.9%) case was referred out for cardiac surgery due to transposition of great vessels.

Discussion

The result from our study was compared with other related studies done at other centres of our country and other developing nations. Similar to other study there is male predominance in newborns admitted to NICU [1,4,6]. Based on gestational age most of the newborn admitted were preterm (51.3%) which is more compared to other centres (10.8%-33.9%) [1,2]. Our centre is well equipped tertiary centre with better obstetric and neonatal care because of which many complicated obstetric cases from different part of Eastern Nepal are referred resulting in increase number of preterm birth in our present series.

Majority of the newborns were of normal birth weight (38.5%) which was similar but less compared to birth weight of newborns in other centre (42.2%-57.1%) [1,6]. There was 36.8% of newborns with low birth weight comparable to birth weight of newborn in related study (23.1%-41.2%) [1,6,7]. 18.8% very low birth weight newborns which is more in compare to other centre in developing countries which is likely due to



increased percentage of preterm birth at our centre [1, 6].

Prematurity with respiratory distress syndrome is the most common indication for admission of newborns from delivery room to NICU at our centre (34.2%) which is more compared to other study (18.4%-23.8%) where infection is the major indications [3, 6].

Respiratory support with intubation and ventilation provided to 24.8% newborn under study which was found to be 30.74%-32% in other tertiary centre [2,8]. This reduction in rate of intubation is mainly due to refusal for intubation by parents of the child and due to availability of other non-invasive respiratory support like Continuous Positive Airway Pressure (CPAP). CPAP was provided to 34.2% newborns while a study in other tertiary centre had 11.8% CPAP [9]. This difference is due to more number of newborns with Respiratory distress syndrome.

Many cases of congenital anomalies (9.4%) were identified in our centre compared to other centre of Eastern Nepal (2.7%) and other international centre (0.62%) [3, 10]. This shows the poor antenatal diagnosis and counselling to the parents in developing countries like ours.

Blood culture report showed growth of micro-organism in 17.9% which is better compared to study reports at other centre where blood culture was positive in 32.4%-35.5% sample [12, 13]. Growth of *Staphylococcus aureus* was predominant which is in agreement with other study. This predominance of *Staphylococcus aureus* signifies skin contamination or source as skin flora.

Lumbar puncture was common procedure (18.8%) among newborns in NICU comparable to other study where Lumbar puncture was done only in 13.85% newborns in NICU [3]. Similarly, double volume exchange transfusion, chest tube insertion were other procedure done in newborns the percentage of which is comparable to other study [3].

Newborns admitted to NICU stayed for maximum of 13 days with mean days of stay being 3.75 while mean days of stay was 6.34 in a study conducted at other tertiary centre [13]. Among all the newborns admitted, 46.2% improved and were discharged whereas in other similar studies the improvement rate ranged from 64.2% to 86.7% in different series [1,3,4,6]. Similarly, 46.2% newborns were discharged on request either due to poor prognosis or due to poor economical condition which is very high compared to other center which was different in different literature (4.97%-13.33%) [3,4,6]. This increase in discharge on request and decreased mean days of stay com-

pared to other centre is due to poor economic status. 6.8% of newborns under study died in the centre during the course of treatment which is comparative to other Centre (6.7%-20%) [3,6].

Conclusion

Prematurity with respiratory distress syndrome, birth asphyxia and meconium aspiration syndrome were major indication for admission of newborns delivered via vaginal deliveries to neonatal intensive care unit. Common procedure done in our neonatal intensive care unit is lumbar puncture and exchange transfusion. Most common organism in blood culture was *Staphylococcus aureus*. Discharge on request is also very common either due to poor prognosis or economic status.

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Conflict of interest: There is no conflict of interest to be declared.

References

- [1] Nepal D, Agrawal S, Shrestha S, Rayamajhi A, Morbidity Pattern and Hospital Outcome of Neonates Admitted in Tertiary Care Hospital, Nepal, J Nepal Paediatr Soc 40:2 (2020) 107-13. DOI:10.3126/JNPS.V40I2.29469.
- [2] Shakya A, Shrestha D, Shakya H, Shah SC, Dhakal AK, Clinical profile and outcome of neonates admitted to the Neonatal Care Unit at a teaching hospital in Lalitpur, Nepal. J Kathmandu Med Coll. 3:4 (2015) 144-8. DOI: 10.3126/jkmc.v3i4.13370.
- [3] Shah GS, Yadav S, Thapa A, Shah L, Clinical Profile and Outcome of Neonates Admitted to Neonatal Intensive Care Unit (NICU) at a Tertiary Care Centre in Eastern Nepal. J Nepal Paediatr Soc. 33:3 (2013) 177-81. DOI: 10.3126/jnps.v33i3.8447.
- [4] Chapagain RH, Basaula YN, Kayatha M, Adhikari K, Shrestha SM, Disease profile and hospital outcome of newborn admitted to neonatal intermediate care unit at tertiary care center in Nepal, Kathmandu Univ Med J. 15:58 (2017) 126-9. PMID: 34547843.
- [5] Rowe R, Soe A, Knight M, Kurinczuk JJ, Neonatal admission and mortality in babies born in UK alongside midwifery units: a national population-based case-control study using the UK Midwifery Study System (UKMidSS), Archives of Disease in Childhood-Fetal and Neonatal Edition. 106:2 (2021) 194-203.
- [6] Adhikari S, Rao K, BK G, Bahadur N, Morbidities and Outcome of a Neonatal Intensive Care in Western Nepal, JNHRC. 15:2 (2017) 141-5. DOI:10.3126/jnhrc.v15i2.18203.
- [7] Koirala AK, Bhatta DN, Low-birth-weight babies among hospital deliveries in Nepal: A hospital-based study, Int J Womens Health. 7 (2015) 581-5. DOI:10.2147/IJWH.S84559.
- [8] Shrestha P, Basnet S, Shrestha L, Clinical profile and outcome of mechanically ventilated neonates in a tertiary level hospital, J Nepal Paediatr Soc. 35:3(2015) 218-23. DOI:10.3126/jnps.v35i3.13328.
- [9] Shrestha M, Basnet S, Shrestha PS, Bubble-CPAP in



- neonatal unit of TUTH, J Nepal Paediatr Soc. 30:1 (2010) 64-8. DOI:10.3126/jnps.v30i1.2465.
- [10] Mekonnen D, MollaTaye, Worku W, Congenital anomalies among newborn babies in Felege-Hiwot Comprehensive Specialized Referral Hospital, Bahir Dar, Ethiopia, Sci Rep 11:1 (2021) 1-8. DOI:10.1038/s41598-021-90387-0. PMID:34040058.
- [11] Kanodia P, Yadav SK, Singh RR, Bhatta NK, Bacteriological Profile of Blood Culture Positive Sepsis in Newborn at BPKIHS, Dharan Nepal, J Coll Med Sci. 13:1 (2017) 193-6. DOI:10.3126/jcmsn.v13i1.16663.
- [12] Sah R, Bhattarai S, Basnet S, Pokhrel BM, Shah NP, Sah S, et al., A Prospective Study on Neonatal Sepsis in a Tertiary Hospital, Nepal, J Pure Appl Microbiol. 15:4 (2021) 2409-19. DOI:10.22207/JPAM.15.4.66.
- [13] Sharma S, Chapagain RH, Pathak OK, Gupta A, Rai KR, Karn S, et al., The economic burden of neonatal intensive care unit admission at a community hospital of central Nepal, J Nepal Paediatr Soc. 40:1 (2020) 41-7. DOI:10.3126/jnps.v40i1.28600.

