

Type of Article: Research Article

**Referral review of a SNCU in a district hospital in resource limited setting:
A retrospective observational study.**

Deepak Kumar¹, Sonika Gupta²

¹ Consultant Department of Pediatrics, District Hospital Udhampur.

² Medical Officer, District Hospital Udhampur.

Referral review of a SNCU in a district hospital in resource limited setting.

A retrospective observational study.

Abstract

Introduction: Special newborn care units (SNCUs) have been established in several district and subdivisional hospitals to meet the challenges of high neonatal mortality. With single digit target of infant mortality in 2030, we need to review the functioning of these SNCUs in order to strengthen them to reach the target. So this study was undertaken with primary objective to study mortality and referral pattern.

Method: This retrospective observational study was conducted in district hospital Udhampur by analysing case records from SNCU admissions over three years from 2017-2019

Results: There were total of 341, 352 and 414 admissions in 2017, 2018 and 2019 respectively with a cumulative sex ratio of 702/405(male/female) over these 3 years. Referral rate was 31.31%, 31.31% and 30.19% for 2017, 2018 and 2019 respectively, whereas mortality rate was 2.05%, 1.93% and 2.41% for these 3 years respectively. Respiratory distress syndrome (RDS), sepsis and birth asphyxia were the major causes for referrals.

Conclusion: With stagnant, non decreasing referral rates over 3 years, and ventilator support as a major cause of referrals, a lot needs to be improved as far as respiratory support at SNCU level is concerned.

Keywords: Birth asphyxia, Neonate, Referral, Sepsis

INTRODUCTION:

India has been at the forefront of the global effort to reduce child mortality and morbidity.[1] It's continuous commitment and ongoing efforts have resulted in reduction in neonatal and infant mortality over the last decade. IMR (infant mortality rate) has decreased from 47.3 to 28.3 per 1000 live births from 2009 to 2019.[2] With neonatal mortality contributing to a significant proportion of infant mortality, it has also shown a decreasing trend. It has decreased from 33 per 1000 in 2009 to 22 per 1000 live births in 2019.[3] Still India contributes more than any other country to global under-5 and newborn deaths. Despite considerable strides, progress within India has not been uniform—i.e., reduction in neonatal mortality lags behind reduction in post neonatal deaths.[4] With single digit target of infant mortality in 2030, we need to review the functioning of our existing systems in order to strengthen them to reach the target.[4]

NICUs (neonatal intensive care units), SNCUs (special newborn care units) , NBSUs(newborn stabilization units) and NBCCs(newborn care corners) under NRHM have played a significant role in reducing neonatal mortality. However with single digit target of infant mortality in 2030, significant improvement needs to be done in the infrastructure and the manpower so that maximum number of patients can be managed with a positive outcome at the basic levels. SNCUs are very important part of the existing neonatal care. Many of the existing SNCUs in the country have a high referral rate because of lack of manpower and logistics. Referrals from SNCUs cause a significant load and congestion in tertiary care centres. Referrals from SNCU's which are far off from a tertiary care centre leads to significant morbidity and mortality during the transportation hours as well. This leads to significant wastage of precious lives, resources as well as time and energy which could have been utilised for the needy.

There are many studies regarding the morbidity patterns of patients admitted in SNCUs but very few studies are available regarding the morbidity profile of referred patients. So this study was undertaken to study :

- Outcome of the babies admitted in SNCU.
- Morbidity profile of babies which could not be managed at SNCU level that is : the referred babies and those who expired
- Reasons for referral

This would be helpful to the health care providers as well as policy makers in strengthening and improving the functioning of SNCUs .

MATERIAL AND METHODS

This hospital based retrospective observational study was conducted by studying all admissions over a period of three years in SNCU of district hospital Udhampur. District hospital is a 200 bedded hospital in Udhampur district of union territory of Jammu and Kashmir which has as in house SNCU which caters to patients of not only district Udhampur but also to the neighbouring districts of Reasi and Kishtwar and Ramban. Being the only SNCU in the district, it caters to all strata of society. SNCU is looked after by the paediatricians posted in district hospital and is managed by general duty medical officer posted in the indoor wards and nursing staff looking after both SNCU and indoor pediatric wards. With no other neonatal centre either private or govt operating in the district, all referrals from our SNCU are done to NICUs of district Jammu, mostly to Government Medical College Jammu.

This study was conducted by analysing case records of all SNCU admissions for a three year period (January 2017 to December 2019) in a pre-designed proforma which included identity, clinical and demographical variables, admitting complaints, diagnosis, treatment, hospital stay and outcome. Admission criteria in SNCU included babies born to gestation less than 34 weeks, birth weight less than 1.5 kg (regardless of gestation), evidence of birth asphyxia which included Apgar score less than 6 at 1 minute or prolonged resuscitation requiring bag and mask ventilation or intubation, persisting respiratory distress, shock or CRT more than 2 seconds, central cyanosis, persistent vomiting, feeding problems, neonatal apnea or cyanotic spells, letharginess, seizures, jaundice requiring intervention or any surgical condition requiring intervention or any other neonate who is felt to be at risk by the duty staff. All neonates who were perceived to be unmanageable by the consulting pediatrician were referred to higher centre for further management after initial stabilization. This included ELBW(extreme low birth weight), congenital malformations which required diagnostic workup or surgical management, respiratory distress requiring ventilator support, severe

sepsis, neonatal hyperbilirubinemia in exchange transfusion zone, prematurity/ LBW with complications and those requiring metabolic workup. Temperature control, oxygen support, fluid management and ionotrope support was managed by the transport team wherever required. Inhouse still births and babies brought dead to the SNCU from outside were excluded from the study.

The data collected was compiled and entered in MS excel and analysed using appropriate statistical tools in software SPSS-18. Continuous variables were expressed as mean (\pm standard deviation) whereas categorical variables were expressed as frequency (in percentage).

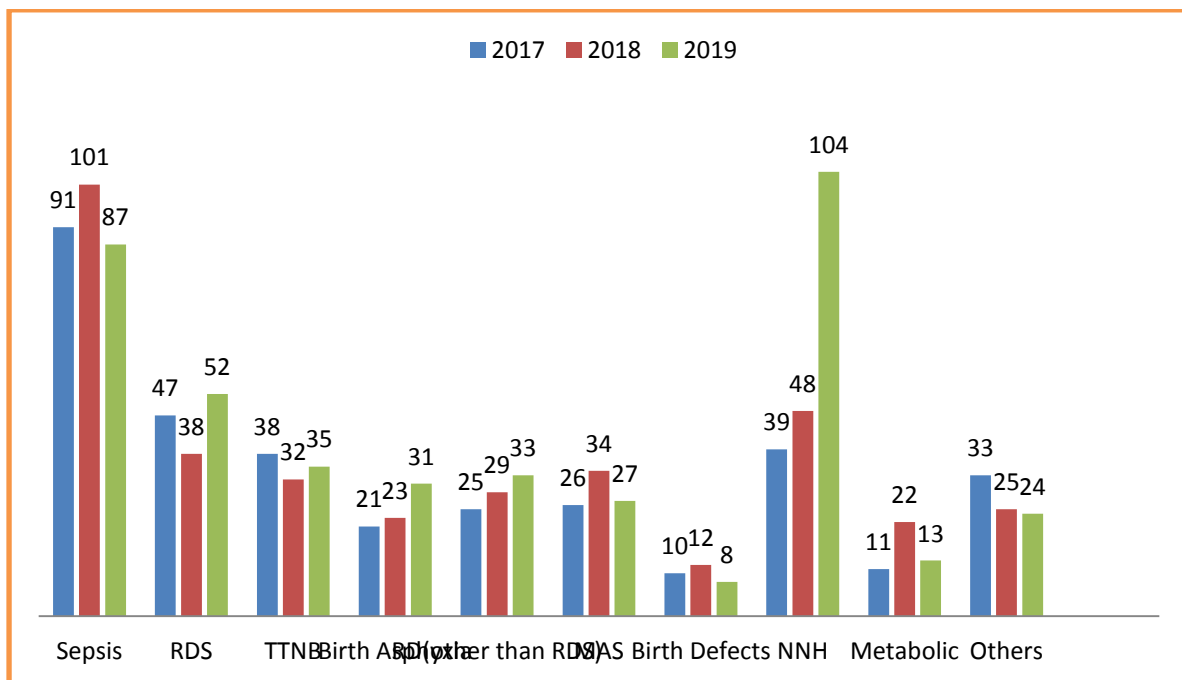
RESULTS

There were total of 341, 364 and 414 admissions in 2017, 2018 and 2019 respectively with a cumulative sex ratio of 708/411(male/female) over these 3 years (Table 1) with bed occupancy rate of 73%. Sepsis , RDS (respiratory distress syndrome) and TTNB(transient tachypnea of newborn) and NNH(neonatal hyperbilirubinemia)have been the leading cause of admissions over these three years.(Figure1)

Table 1: Sex distribution of admitted neonates .

Year	2017	2018	2019	Total
Male	226(66.28%)	220(60.44%)	262(63.28%)	708(63.27%)
Female	115(33.72%)	144(39.56%)	152(36.71%)	411(36.72%)
Total admissions	341	364	414	1119

Figure 1: Morbidity profile of admitted neonates



Out of total admissions of 1119 in 3 years from 2017-2019, 70.05% (784/1119) were of birth weight above 2500 gms whereas 29.93% (335/1119) were LBW(below 2500 gms).(Table 2)

Table 2: Weight wise distribution of admitted neonates.

	2017	2018	2019	Total
<1000gms	3	6	2	11
1000-1499 gms	11	13	15	39
1500-2499 gms	90	88	107	285
>2499 gms	237	257	290	784
Total	341	364	414	1119

Referral rate was 31.31%, 31.04% and 30.19% for 2017, 2018 and 2019 respectively with a cumulative referral rate of 30.83%(345/1119) over these three years. Of these 24 patients were referred in critical situation which included either intubation or ionotrope support. One of these critical patient died during transportation. Mortality rate was 2.05%, 3.29% and 1.93% for these 3 years respectively. Discharge rates were 65.1%, 60.71% and 66.18% for these 3 years.(Table 3).

Table 3: Outcome of admitted neonates in SNCU.

Year	2017	2018	2019	Total
Admissions	341	364	414	1119
Discharges	222(65.1%)	221(60.71%)	274(66.18%)	717(64.07%)
Referrals	107(31.31%)	113(31.04%)	125(30.19%)	345(30.83%)
Lama	5(1.46%)	18(4.94%)	7(1.69%)	30(2.68%)
Death	7(2.05%)	12(3.29%)	8(1.93%)	27(2.41%)

Out of the total referrals, 83.18%(287/345) occurred within 24 hours of admission and 16.82%(77/345) occurred after first day of admission.(Table 4)

Table 4: Day of referral for the referred patients

	2017	2018	2019	Total
Day 0	88	90	109	287(83.18%)
Day 1	16	20	9	45(13.04%)
Day 2-7	3	3	6	12(3.47%)
>7 days	0	0	1	1(0.28%)
				345

Of the total referrals, 35.36%(122/345) were LBW. RDS was the chief cause of referral accounting for 37.86 % of all the referrals followed by sepsis (17.34%) and birth asphyxia (12.07%) with NNH and congenital anomalies contributing in minute amount. (Table 5).

Table 5: Morbidity profile of referred patients.

Diagnosis/year	2017	2018	2019	Total
RDS	39	33	46	118(34.20%)
Sepsis	20	25	17	62(17.97%)
Birth asphyxia	13	14	18	45(13.04%)
Resp distress (other than RDS)	13	15	11	39(11.30%)
MAS	11	14	14	39(11.30%)
NNH	4	3	11	18(5.21%)
Congenital anomalies	7	9	8	24(6.95%)
Total	107	113	125	345

Need for respiratory support in the form of surfactant therapy, CPAP(continuous positive pressure ventilation) and invasive ventilation was the main reason for referral accounting for 68.4 % of the referrals. Metabolic workup accounted for 8.98% of the referrals whereas need for surgical intervention accounted for 5.5% of the referrals.

Table 6: Reasons for referral

	2017	2018	2019	Total
Respiratory support	75	76	85	236(68.40%)
Metabolic workup	10	9	12	31(8.98%)
Surgical intervention	5	7	7	19(5.50%)
Diagnostic workup	5	6	6	17(4.92%)
NNH in high risk zone for exchange transfusion	4	3	11	18(5.21%)
Others	8	12	4	345

Of 27 deaths over these 3 years, 15/27(55.55%) were because of RDS and 9/27(33.33%) were because of birth asphyxia.(Table 7)

Table 7: Death profile of admitted patients

	2017	2018	2019
RDS	5	5	5
Birth Asphyxia	2	5	2
MAS	0	1	0
RD(other than RDS)	0	1	0
Birth Defect	0	0	1

DISCUSSION:

Our hospital has a discharge rate of about 64.07% (60-65%) over last 3 years and mortality of about 2.41%(1.5-4 %) and referral rate of about 30.92%(30-32 %). Prinja *et al.* described four secondary-level NICUs (Vaishali, Guna, Bhubaneswar, Shivpuri) in three different states of India in 2013.[5] All four NICUs had a discharge rate between 60% and 80%, comparable to our clinical study. Referral rates from SNCU's have varied across the country with various studies reporting referral rates of 5.2% to and 22.8%[6,7] where as mortality rates in other SNCU's have been 5.53% -12%.[8,9]. Reema et al in a study from Bangladesh reported a mortality of 6%.[10] whereas Zaman S et al. in their study from Pakistan reported a mortality of 7.18%.[10,11]. High referral rate probably reflects the ease with which patients could be transported to a tertiary care centre which is within a drive of 70 mins from our place. Our study has a low mortality rate because many of the critical sick neonates were referred to the higher centre. Lack of designated staff and logistic support is also a significant contributor to it. With LBW babies as a major contributor in admissions as well as referrals, we need to improve maternal health as well as antenatal care so that more and more normal deliveries with normal birth weight are born.

The major causes of referrals were RDS, sepsis, birth asphyxia , respiratory distress and MAS (meconium aspiration syndrome) as reported in previous studies.[7] The major reasons for mortality have been RDS and birth asphyxia as reported in other studies from india as well as south asia[8,10,11,12]. The major reasons of referral as well as mortality were lack of effective respiratory support at SNCU level.

Conclusion: Appropriate antenatal care, good obstetric practices, improvement of facilities for caring for preterm babies will help in improving the morbidity and mortality associated with prematurity. With most of SNCUs working with oxygen support via head box, nasal prongs and face masks, upgradation needs to be done in the form of surfactant therapy, CPAP, high flow oxygen system and neopuffs for resuscitation so that more and more patients can be managed at SNCU level and mortality and referral is decreased thereby relieving the tertiary care centres of the excessive load. SNCUs need to be strengthened with designated manpower so that proper care can be provided to each and every neonate admitted there. Strengthening of SNCUs will decrease the load on tertiary care centres

Limitations: Being a retrospective study, this study is subjected to lack of accuracy related to documentary errors. Collaboration with referral centre needs to be done regarding the treatment given to the referred neonates and their outcome and this will determine the quality of our referral system.

DECLARATIONS

Funding: Nil

Conflict of interest: Nil

Ethical approval: Not required.

REFERENCES:

1. **INAP:** India Newborn Action Plan . Accessed 20 march 2021. Available:
https://www.newbornwhocc.org/INAP_Final.pdf
2. Infant-mortality-in-india. Accessed 02 May 2021. Available:
<https://www.statista.com/statistics/806931/infant-mortality-in-india/>
3. The world bank data. mortality rate, neonatal:Accessed 02 may 2021. Available:
<https://data.worldbank.org/indicator/SH.DYN.NMRT>
4. Sankar MJ, Neogi SB, Sharma J, Chauhan M, Srivastava R, Prabhakar PK, *et al.* State of newborn health in India. *J Perinatol* 2016;36:S3-8.
5. Prinja S, Manchanda N, Mohan P, Gupta G, Sethy G, Sen A. Cost of neonatal intensive care delivered through district level public hospitals in India. *Indian Pediatr* 2013;50:839-46.
6. Ravikumar SA, Elangovan H, Elayaraja K, Sunderavel AKK. Morbidity and mortality profile of neonates in a tertiary care centre in Tamil Nadu: a study from South India. *Int J Contemp Pediatr* 2018;5:377-82.
7. Dr. N. Manjuleswari, Dr. Anita Sethi, "Morbidity among the Referral Babies to Higher Centre from SNCU of Government Tertiary Care Maternity Hospital", *International Journal of Science and Research* .Volume 8 Issue 6, June 2019, 1879 – 1881
8. Uppal K, Ashwani N, Jeelani K *et.al.* Profile of neonatal mortality in SNCU district hospital. *Galore International Journal of Health Sciences & Research*. 2019; 4(1): 6-8.
9. Mishra AK, Panda SC. Status of neonatal death in sick newborn care unit of a tertiary care hospital. *Int J Contemp Pediatr* 2017;4:1638-43.
10. Reema Afroza Alia, Nurul Hossain, AKM Faizul Huq, Nayeema Sadia, Nazma Parvin Shabby. Disease Pattern and Health Outcome among the Neonate in A NICU at Tertiary Care Hospital, Bangladesh. *Int J Med Res Prof*. 2020 Mar; 6(2): 34-37.
11. Zaman, S., Shahzad, S., & Shah, S. (2017). Pattern of neonatal morbidity and mortality in the neonatal intensive care unit. *Pafmj*, 67(suppl-3), s272-76.

12. Sridhar PV, Thammanna PS, Sandeep M. Morbidity Pattern and Hospital Outcome of Neonates Admitted in a Tertiary Care Teaching Hospital, Mandya. *Int J Sci Stud* 2015;3(6):126-129.