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AN EVALUATION OF OF INPATIENT NEONATAL CARE THROUGH SPECIAL NEWBORN CARE UNITS (SNCU) IN BIHAR

Neonatology

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ABSTRACT

A cross-sectional survey was conducted to assess the availability of human resources, equipments, and quality care. Descriptive statistics was used for analyzing the inputs (resources) and outcomes (morbidity and mortality). The rate of mortality among admitted neonates was taken as the key outcome variable to assess the performance of the units. The trend of case-fatality rate over a period of 3-5 years considering the first year of operationalisation as the base was determined. Correlation coefficients were estimated to understand the possible association of case-fatality rate with factors, such as bed:doctor ratio, bed:nurse ratio, average duration of stay, and bed occupancy rate, and the asepsis score were determined. This survey was followed by collection of online follow up data for next 3 year 2017-20. The rates of admission was found to be increased from a median of 3.7 per 100 deliveries in 2010 to 14.2 per 100 deliveries in 20015. The case-fatality rate reduced from 40% to 18% within one year of their functioning. Proportional mortality due to sepsis and low birth weight (LBW) declined significantly over two years . The major reasons for admission and the major causes of deaths were birth asphyxia, sepsis, and LBW/prematurity. The units had a varying nurse: bed ratio (1:1.5-1:2.3). The bed occupancy rate ranged from 18% to 65% (median 33%), and the average duration of stay ranged from two days to 14 days (median 4.75 days). Follow up over 2017-2020 showed deaths, Bihar still has highest death percentage of 11.3% which is more than entire country (7%). Repair and maintenance of equipment, deficiency of staff, maintenance of asepsis were a major concern in operating SNCUs . By solving these issues, it is possible to set up and manage quality SNCUs and improve the survival of newborns .

KEYWORDS

Neonatal mortality rate, Newborn care, SNCU.

BACKGROUND-

Globally, newborn health is now considered as high-level national priority. According to UNICEF, 2.3 millian children died in first month of life in 2021, and approximately 6400 neonatal death every day. It is estimated that 26 million children are born in India [1] and reducing neonatal mortality is one of the major thrust areas in public health for India. India contributes to one-fifth of global live births and more than a quarter of neonatal deaths. The current neonatal and infant mortality rate in India is 20 per 1000 live births(2020) and 26.619 per 1000 live births (2023), respectively (1). Four states including Bihar contribute to 56% of total neonatal deaths in India and 14% of the global neonatal deaths [2] From the National Family Health Survey-4 (NFHS-4) data, it is estimated that India's neonatal mortality rate is on average 2.4 times higher than the target for Sustainable Development Goal 3. However, district-wise estimates show wide disparities with some areas already having achieved much lower levels than the target whereas districts such as in Bihar requiring five times the current reduction level to reach the target by 2030.

Neonatal care in India has witnessed a revolution in the last 10 years under the auspices of National Rural Health Mission (NRHM). Under NRHM, Special Newborn Care Units (SNCU) were established across the country. These units helped in a great reduction in Neonatal Mortality Rate (NMR) in the country. The rate of decline in NMR, and to an extent Early NMR, has accelerated with the introduction of National Rural Health Mission in mid-2005. Almost all states have witnessed this phenomenon, but there is still a huge disparity in NMR between and even within the states. The recommended NICU bed strength per million populations is 30. A total of 507 SNCUs with 6408 beds were available across the country in late 2013. Analysis of a district SNCU functioning showed a promising role in the reduction of neonatal mortality by 14% in the first year and by 21% in the second year. The effect on the country's NMR after the evolution of SNCU/NRHM is accelerated; NMR declined from 37 to 20 per 1000 live births (2005-2020).(2)

Time series SRS data suggests that though Bihar has achieved significant reduction in Under Five Mortality Rate (U5MR) in last five years (U5MR declined from 64 per 1000 live births in 2010 to 56.4 per 1000 live births in 2015 , however there was only a marginal decline in neonatal mortality rate (31/1000 live births to 28/1000 live births.(3) In spite of a number of ongoing interventions, there is slow progress in reduction of Neonatal Mortality Rate. During the Year of Newborn, 2010, the state government undertook a number of initiatives aimed at improving the newborn care facilities in the Bihar. Setting up Special Care Newborn Units (SCNU) in Govt. medical colleges & district hospitals, New Born Stabilization Units (NBSU) at referral hospitals (RU) and Newborn Care Corners (NBCC) in primary health centers (PHC) has been a part of these initiatives. So far there are 38 SCNUs, 39 NBSU and 550 NBCC have been set up in the state. 4 SCNU, 2 NBSUs and 300 NBCCs are in the process of getting set up by the state government.

This study highlights the current scenario of inpatient neonatal care in low resource setting as Bihar with a suggested plan for the way forward to achieve better neonatal care. Improvement of the neonatal survival demands the availability and adequacy of trained personnel providing quality neonatal care at sick newborn care units (SNCUs) in secondary and community level hospitals which are accessible to populations at risk in remote areas. As most of the studies on SNCU outcomes in India are from tertiary care centers in cities, there is a need to document the challenges and opportunities that SNCUs face in remote areas. Therefore, this study was designed with the objective to assess the profile of neonates admitted to an SNCU in a secondary level hospital in Bihar and follow them to assess the outcome of the care provided at the end of their neonatal period.

The Aims and objectives of the this study, to assess the units for clinical care against common norms and standards, knowledge & skill level of SNCU staffs, to identify gaps/weaknesses in the quality of care and to provide onsite corrective actions followed by determining impact of these initiatives on neonatal care in Bihar.

Methodology–

To find out quality of services, supportive supervision and quality mentoring model was conceptualized, and this project was undertaken under the aegis of NNF Bihar in collaboration with UNICEF and SHSB. In this context, as a new initiative Unicef Bihar engaged a team of 20 different Medical college faculties to provide technical support for facilitating the process of Quality Assurance at SNCUs. In the month of October 2016 it was planned to implement this supportive supervision model all across Bihar. At the outset, mentors of Medical College Faculties and oriented on SNCU Guidelines, SNCU Supportive supervision checklist and SHSB Guidelines for management of SNCU. In July 2017- december 2017, A cross-sectional survey was conducted across Bihar, in which pre set questionnaires were asked and checked to SNCU staff including nurses, doctors, management staffs working in neonatal intensive care

units At the end of supportive supervision & mentoring the team members discussed with SNCU Nodal Person about the gaps of SNCU and accordingly corrective actions shared.

The following input/process and output parameters were incorporated in the QA tool.

Inputs:
Infrastructure ,Staff- turnover , Equipment- breakdown, Drugs-supply.

Process:
Hand washing- before entering and after touching every baby , Record Keeping , Adherence to protocol and guidelines , Training of staff , Actions taken to repair the equipment, Twin sharing of beds ,Breast feeding & KMC of admitted babies.

Output:
Providers' perspective- Admission rates, Morbidities, Mortality , Referral to higher centres, LAMA and Client s' perspective-Satisfaction, Treatment, Behavior.

Descriptive statistics were used for analyzing the inputs (resources) and outcomes (morbidity and mortality). Chi-square test was used for analyzing the trend of case-fatality rate over a period of 3 years considering the first year of operationalization as the base. Correlation coefficients were estimated to understand the possible association of case-fatality rate with factors, such as bed:doctor ratio, bed:nurse ratio, average duration of stay, and bed occupancy rate, and the asepsis score was determined.

Online reporting data collected over3 from 2017-2020 from all SNCU from Bihar and The whole data were analyzed statistically with help of Supportive Supervision Team members & UNICEF Consultants.

OBSERVATIONS/ RESULTS:

Major observations noted were related to infrastructure, equipment maintenance, manpower, supply of drugs and consumables, adherence to protocols and record keeping. Data related to management of newborn in SNCU were taken from the Online SNCU Report submitted to SHSB. This part of the report contains the comparative SNCU status of the 38 SNCUs visited during the supportive supervision period from July 2017- december 2018 as per the visit data . Out of the total 38 SNCUs visited 37 were functioning in the new building except Supaul, because handing over of building is still awaited. Only 25 SNCUs were having a designated Breast Feeding area and majority (35) SNCUs were having a designated Step down area except Supaul for stay of mother and baby before discharge. Designated Hand wash & gowning rooms were present in 37 SNCUs . 23 SNCUs were having a designated autoclaving area, None of the SNCU had a designated Emergency Exit point. 33 SNCUs had a separate space for electronic medical record keeping . Only 23 (%) SNCUs had Fire extinguisher with instructions for its use.

Equipment Status:
14% Radiant Warmers were nonfunctional during the time of visit. 32% Pulse Oxymeters were nonfunctional during the time of visit. 22% Suction Machines were nonfunctional during the time of visit. 12% Electrical Weighing Machine were nonfunctional during the time of visit, 23% Radiant Warmer were nonfunctional during the time of visit 14% Photo therapy units were nonfunctional during the time of visit. 16% Syringe Infusion Pumps were nonfunctional during the time of visit. 34% Oxygen Concentrators were nonfunctional during the time of visit (table-1)

Manpower:
Most of the SNCUs had not adequate Medical officers & Staff nurses as per the SNCU HR norm. Only 72% of Medical officers and 67% of SN/ANM were trained in FBNC. Only 13 SNCUs had a data entry operator except Jamui & Saran SNCU. Out of the 13 DEOs posted Bhojpur SNCU DEO had not trained in Online SNCU follow up system (table-2)

Recording & Reporting:
Based upon SNCU online data & field visit data analysis: Only 3 SNCUs were conducting Neonatal death review. Only 73% of SNCUs were regularly tracking the SNCU discharged babies. Except Saran SNCU all other were regularly updating the SNCU data online and generating report for action.Proportion of female babies admitted were very low and approximately 36%.Only around 62% of the admitted babies were discharged successfully.Mortality rates in SNCU admitted babies are very high i.e. 14.48% against the norm of less than 10%. Similarly the LAMA rate is also very high i.e. 6.13%. Average duration of stay is very less (3.42%) against the norm of 4-7 days. Average Bed Occupancy Rate is very less (67.15%) against the norm of more than 75%.

Protocols display & Safety manual -
None of SNCU had display of Protocol or safety manual.

Drugs And Consumables Supplies:
Out of 38 SNCUs only one SNCU i.e. Bhojpur all the essential lifesaving drugs during the time of visit. Normal saline was the only drug present in all 38 SNCUs during the time of visit. Out of 15 SNCUs only four SNCU had all the essential lifesaving supplies .Gloves, Slippers & disposable consumables were present in all 15 SNCUs during the time of visit.

Secondary Data-
This part of the report contains the comparative SNCU status of the 38 SNCUs derived from previous years online data. The rates of admission increased from a median of 6.7 per 100 deliveries in 2010 to 14.5 per 100 deliveries in 20015. The case-fatality rate reduced from 40% to 14% within one year of their functioning. Proportional mortality due to sepsis and low birthweight (LBW) declined significantly over two years (LBW <2.5 kg). The major reasons for admission and the major causes of deaths were birth asphyxia, sepsis, and LBW/prematurity. The units had a varying nurse: bed ratio (1:1.5-1:2.3). The bed occupancy rate ranged from 18% to 65% (median 33%), and the average duration of stay ranged from 2 days to 15 days (median 4 days). Repair and maintenance of equipment were a major concern with average duration to get repaired were 2 months. Referral rate to higher centre was 8% and from periphery 4.5% that is very low hence referral system need to be strengthened.

Follow up data (2017-2020)
The total SNCU admission for the entire country is recorded as 3361376 includes both inborn and outborn cases, for all the three consecutive years from 2017-2020. The maximum cases have been admitted in the year 2018-19 of about 37% (1147206) and least of about 29% (976474) were admitted in 2019-20.

The inborn SNCU admission against the outborn are shown in figure 2.4 the 59% of the total cases recorded are inborn SNCU admission wherein 41% of the total neonate admitted are outborn i.e. 1987943 inborn against 1373433 outborn. Sex ratio is determined using the data sheet for entire country demonstrates that the maximum neonates admitted are males i.e. 58% against 42% of females for entire nation. In terms of percentage of deaths against admission, Bihar has highest death percentage of 11.3% which is more than entire country (7%).

DISCUSSION-

The results of the assessment of 38 SNCU suggest that quality level II newborn care can be provided at the district level within the public-health system. According to the estimates, about 10-15% of all newborns have a complication requiring level II care. In the present study, the proportion was highly skewed. It was less (6%) in units, where strict admission criteria were in place or people preferred to visIt private doctors. On the other hand, high admission rate (35%), SNCUs were keeping newborns for observation and admitting without indication.

The mean proportion of babies admitted to the SCNUs compared to the number of livebirths was 24.7% (range 14-47%) in Thames in 1975 (6). Over one-third of the workload of the typical unit was generated by infants of normal or near normal birthweight, who were admitted for a short stay and received no special medical treatment. Few babies who were admitted needed intensive care. This is similar to our observations from many surveyed units . This increased the workload and the bed occupancy rate, and the quality of care suffered. Experiences from many countries indicate that care gets compromised as a result of admission overload (7).

The rule of thumb method based on the guidelines of the National Neonatology Forum considers only the proportion of babies requiring special care and the average duration of stay. The admission policy of a

unit is also a key indicator that can influence the performance. Except for medical college SCNU and one unit where it was very stringent, in none of the units these were followed despite having the clear cut guidelines.

Table 1-Infrastructure:

Name of SNCU	1	2	3	4	5	6	7	8	9	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	Total
Functioning in New Building	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	Y	Y	Y	Y	Y	Y	Y	Y	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	36
Total no of beds	12	14	5	14	12	13	13	12	12	12	12	17	12	8	6	8	12	10	12	14	8	8	10	8	10	13	12	10	8	10	12	10	12	10	12	13	10	372
Breast feeding room	N	Y	N	N	Y	Y	Y	N	Y	Y	Y	Y	Y	Y	N	Y	Y	N	Y	N	Y	N	Y	N	Y	Y	Y	N	Y	Y	Y	N	N	N	Y	N	N	23
Step down Area	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	Y	Y	Y	Y	Y	Y	N	Y	N	Y	Y	N	N	Y	Y	Y	Y	Y	Y	Y	N	Y	33
Hand wash & Gowning room	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	Y	Y	Y	Y	Y	Y	Y	N	Y	N	Y	Y	N	Y	Y	Y	Y	Y	N	Y	N	Y	Y	35
Space for hand wash instructions	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	Y	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	Y	Y	Y	Y	Y	36
Area for Boiling and Autoclaving	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	N	Y	Y	N	Y	Y	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	N	Y	N	31
Area for electronic record keeping	Y	N	Y	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	Y	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	Y	33
Emergency exit	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	Y	N	Y	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	18
Power back up	Y	Y	Y	Y	Y	Y	Y	y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	38
Biomedical Waste Segregation (colour codes)	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	38
Fire extinguisher	Y	N	N	Y	Y	N	Y	N	N	Y	Y	Y	Y	Y	N	N	N	Y	N	Y	N	Y	N	Y	Y	N	Y	Y	N	N	Y	N	Y	N	Y	Y	N	21

Table 2-Equipment Status:

Equipment	RW		PO		SM		EWM		PT		SIP		OC	
	A	F	A	F	A	F	A	F	A	F	A	F	A	F
1	23	13	6	4	2	2	1	1	7	6	6	4	14	3
2	14	13	6	5	3	3	1	1	5	5	6	6	3	3
3	5	5	1	1	1	1	1	1	1	1	2	2	5	5
4	14	13	6	6	0	0	1	1	4	4	6	6	4	4
5	12	12	2	2	2	2	1	1	4	4	7	7	4	3
6	10	8	3	1	4	4	3	3	3	3	7	7	3	3
7	13	13	13	13	2	2	2	2	4	4	7	7	5	3
8	12	11	7	5	3	0	1	1	4	4	7	7	4	2
9	10	9	2	2	2	2	1	1	4	3	4	4	3	3
10	12	11	6	0	4	1	1	1	4	4	6	0	7	7
11	14	13	7	3	1	1	2	2	5	5	7	3	9	2
12	14	13	7	5	2	2	2	2	5	5	7	5	7	6
13	14	13	7	5	2	2	2	2	5	5	7	7	7	6
14	8	3	6	2	2	2	2	2	4	3	7	7	7	6
15	5	5	0	0	2	1	3	1	2	2	0	0	3	0
16	10		6	5	2	1	1	1	1	1	4	4	4	3
17	12	10	7	7	3	3	1	1	1	1	6	4	4	3
18	14	17	7	6	1	1	1	1	1	1	2	2	3	3
19	8	6	4	4	0	0	1	1	1	1	4	3	5	3
20	12	12	5	4	2	2	3	2	3	3	3	2	4	3
21	13	11	6	4	4	3	2	1	2	2	3	2	3	3
22	14	10	6	4	2	2	1	1	1	1	4	2	7	5
23	8	6	2	2	3	2	1	1	1	0	7	4	9	6
24	10	9	4	2	2	2	1	1	1	0	4	2	4	3
25	12	11	4	2	4	2	2	1	2	1	6	3	4	2
26	88		4	3	2	2	2	1	2	2	6	6	4	
27	12	9	6	5	3	3	1	1	1	1	2	1	4	3
28	14	10	6	3	1	1	1	1	1	1	6	5	3	2
29	6	6	4	4	0	0	1	1	1	1	4	3	5	3
30	12	9	5	5	2	2	1	1	1	1	5	3	4	2
31	13	10	8	6	4	3	3	2	3	2	3	2	3	2
32	6	6	4	3	2	2	1	0	6	6	4	3	4	3
34	12	11	6	4	3	2	1	1	7	6	6	3	4	2
35	16	13	7	6	1	1	1	1	5	4	2	2	3	2
36	10	8	4	2	0	0	1	1	4	4	4	4	5	3
37	8	7	4	4	2	1	3	2	5	4	3	2	4	2
38	12	11	6	4	4	3	2	2	4	4	3	2	3	2

RW= Radiant Warmar, PO= Pulse Oxymeter, SM= Suction Machine, EWM= Electrical Weighing Machine, PT= Photo Therapy, SIP= Syringe Infusion Pump, OC= Oxygen Concentrator

Table 3-Recording & Reporting:

Name of SNCU	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	Total
SNCU register	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	38
Neonatal Death Review	N	N	N	N	Y	N	N	N	N	N	N	Y	Y	N	N	N	N	Y	N	N	N	N	N	Y	N	N	N	N	N	N	Y	N	Y	Y	N	N	N	Y	6
Follow up of Discharged	Y	Y	Y	Y	N	Y	Y	N	Y	Y	Y	Y	Y	N	N	Y	Y	Y	Y	N	Y	Y	N	Y	Y	Y	Y	Y	N	N	Y	Y	Y	Y	Y	Y	Y	Y	31
Monthly Online Report	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	Y	Y	Y	Y	Y	Y	Y	37

Table -4 Follow up data (2017- 2020)

Cases reported		
Outborn	63693	
Inborn	48125	
SEX RATIO		
Bihar	605	
INDIA	733	
Admission and death		
Bihar	111818	12687(11.3%)
INDIA	3361376	235428(7%)

The number of nursing staff is a critical parameter to ensure the quality of care. A critical observation was that, in none of the SCNUs, neonates were work overload demands (direct and indirect care). Amount of nursing care that an infant needs was fixed somewhat unrelated to how sick that infant is . With the increased beds:nurse ratio, handwashing practices also get compromised to a great extent, directly influencing the quality of care. The Special Care Baby Unit, Kampala in Uganda, lacked nursing staff qualified in neonatal care. Over a period under study (1984-1989), the unit was staffed by 10-12 midwives, and only one midwife caring for 20-30 neonates was a common observation (8). In an investigation carried out in a neonatal special care unit in the USA, the newborn:nurse ratio and newborn census in SNCU were the key determinants of nosocomial infections (9). In a neonatal unit in Barbados, the shortage of staff had fostered deterioration in handwashing technique leading to outbreaks of nosocomial infections (9). Maintaining an ideal bed: nurse ratio is a real challenge, in the most of SCNUs, trained nursing staff were transferred to another departments like labour room.

The findings of our study revealed that the CFR strongly correlated with the practices of nurses and doctors in following aseptic precautions. The environmental survey in one of the neonatal units in the UK indicated that transmission of infection was due to inadequate handwashing of nurses and mothers (10). A problem-based and task-oriented education programme has been shown to improve hand-hygiene compliance in Hong Kong, where over all hand-hygiene compliance increased from 40% to 53% before patient contact and from 39% to 59% after patient contact.(11) More marked improvement was observed for high-risk procedures. This type of education training is required on time to time basis in our SNCU too. A statewide, quality-improvement project targeting hospital staff was effective in improving newborn preventive services.

None of SNCU had emergency exit or display of safety manual. Vermont-Oxford Network, random safety audits were introduced in a level 3 NICU in the UK to improve infection control and routine neonatal care (12) but none of the SNCU from bihar is included in this network.

The duration of stay in the intensive care units is well-dependent on birth weight. The average duration of stay in an SCNU is usually 5-7 days . The average duration of stay for preterm babies or VLBW is usually long, and the proportion of LBW babies affects the average duration of stay. It varied between 2- 15 days in our assessment. The average stay of patients varied from 12 days at 32-33 weeks to 4 days at term, according to a study in New Zealand on level II and III units (12). In California, the average hospital stay for LBW infants ranged from 6.2 days to 68.1 days whereas the average hospital stay for infants who weighed >2,500 g at birth was 2.3 days. Infants who weighed >1,249 g had progressively shorter hospital stay (13)

Adequate and trained manpower is the backbone of NICU care and the key to better outcome. The ideal nurse–patient ratio is 1:1 for ventilated babies and 1:3–4 for all other babies. This analysis has shown that only 50% of units were adequately staffed. Many trained doctors do not wish to work in SNCU due to hectic schedule and few leave jobs for PG courses. Many nuses do not want to go outside for training for different reasons. Thus, Apart from training, retaining doctors and nurses is a big challenge. These issues can be overcome by securing good salary , choice posting/ permanent jobs, compulsory medical service following training and improving the future prospects.

Equipment shortage, high cost of capital expenditure, maintenance issues, costly repairs, delayed arrival of newer technology etc major issues. However, the situation has significantly changed in the last decade with easy supply and indigenisation. Indigenous equipment have led to cost reduction in NICUs in the country.(14) . Recently, a thermal device to keep VLBW neonates warm was found to be non-inferior to standard of care in a multicentre trial carried out in Bangalore.(15) Also, Mira -Cradle' for neonatal hypoxic encephalopathy with a low-cost model has been shown to work in resource-poor settings.(16) These trials show that indigenisation is the way to go ahead for optimal care in resource-poor areas.

Neonatal research has accelerated in India in the last decade. Its contribution in major indexed Indian journals is approximately 9–12% and nil from Bihar. (17) because majority are from one centre . Few multicentric trials, such as the use of 'room air' during neonatal resuscitation, skin-to-skin contact care, Kangaroo care, vitamin D and zinc supplementation in LBW infants are globally accepted (18), so there is need of strong neonatal network in Bihar.

CONCLUSION

India has launched NRHM, JSY and several new initiatives to improve neonatal care. The SCNUs are a critical investment to decrease the neonatal mortality rate in Bihar. There is difficulty in establishing maintaining their performance. Initial results in the form of reduction in the CFRs are encouraging but there are challenges that SNCU in follow up are not found to be maintaining their performance .Neonatal death rates are still higher then whole country. Having an adequate number of personnel, right policies to facilitate timely repair of equipment, provision of an adequate number of beds, and imparting skills to maintain asepsis are the key recommendations that will circumvent the existing challenges. It is hoped that lessons learnt from this assessment would assist in scaling up of such units with quality of newborn care facilities in other similar settings

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REFERENCES

1. SRS Bulletinship://www.censusindia.gov.in/vital stastics/vital –rates/vital-rates.aJPerinatol. 2016 Dec; 36(Suppl 3): S3–S8.
2. Fernandez A, Mondkar JA. Status of neonatal intensive care units in India.J Postgrad Med 1993;39:57–9
3. Lawn JE, Cousens S, Zupan J. Lancet Neonatal Survival Steering Team.; 4 million neonatal deaths: when? Where? Why? Lancet. 2005;365:891–900. [PubMed] [Google Scholar]
4. Published online 2016 Dec 7. doi: 10.1038/jp.2016.183State of newborn health in India, M J Sankar, S B Neogi, J Sharma, M Chauhan, R Srivastava, P K Prabhakar, A Khera, R Kumar, S Zodpey,2 and V K Paul1spx
5. Registrar General of India. Sample registration system (SRS) statistical report 2013. New Delhi: 2013.
6. Vaizey J, Oppe TE. Study of special-care baby services in North-west Thames region.Bri Med J. 1979;1:583–5. [PMC free article] [PubMed] [
7. Mukasa GK. Morbidity and mortality in the Special Care Baby Unit of New Mulago Hospital, Kampala. Ann Trop Pediatr. 1992;12:289–95.
8. Narang A, Kiran PSS, Kumar P. Cost of neonatal intensive care in a tertiary care center.

Indian Pediatr 2005;42:989–97.
9. Indian Council of Medical research .NNPD network. National neonatal perinatal database, New Delhi.2002–03. New Delhi: Indian Council of Medical Research; 2005. pp. 24–37. (www.newbornwhocc.org, accessed on 20 February 2011).
10. Riser E, Noone P, Howard FM. Epidemiological study of *Klebsiella* infection in the special care baby unit of a London hospital. J Clin Pathol. 1980;33:400–7.
11. Lam BC, Lee J, Lau YL; Hand hygiene practices in a neonatal intensive care unit: a multimodal intervention and impact on nosocomial infection. Pediatrics.2004 Nov;114(5):e565-71. Epub 2004 Oct 18.
12. Cust AE, Darlow BA, Donoghue DA, Australian and New Zealand Neonatal Network Improved outcomes for very low birth weight infants: evidence from New Zealand national population based data. Arch Dis Child Fetal Neonatal Ed. 2003;88:F15–22.
13. Schmitt SK, Sneed L, Phibbs C. Costs of newborn care in California: a population based study. Pediatrics. 2006;117:154–60.
14. Singh M, Paul VK, Deorari AK. The state of India's neonatal units in the mid-nineties. Indian Pediatr 1997;34:696–701.
15. Bhat SR, Meng NF, Kumar K, et al. Keeping babies warm: a non-inferiority trial of a conductive thermal mattress. Arch Dis Child Fetal Neonatal Ed 2015;100:F309–12.
16. How two low-cost, made-in-India innovations Mira Cradle & Embrace Nest are helping save the lives of newborns;The machines — MiraCradle & Embrace Nest — that would help cool the newborns cost over Rs 15 lakh and most hospitals in India do not have them.By *Indulekha Aravind KP Narayana Kumar* ET Bureau| Aug 02, 2015,
17. Thomas N, George KC, Sridhar S, et al. Whole body cooling in newborn infants with perinatal asphyxial encephalopathy in a low resource setting: a feasibility trial. Indian Pediatr 2011; 48:445–51.
18. Narang A, Murki S. Research in neonatology: need for introspection. Indian Pediatr 2004;41:170–4. 23 Darmstadt GL, Kumar V, Yadav R, et al. Introduction of community-based skin-to-skin care in rural Uttar Pradesh, India. J Perinatol 2006;26:597–604