Research Article

Neonatal Intensive Care Unit (NICU) status survey in and around Hyderabad, Telangana

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Abstract

Introduction: Neonatal mortality rate (NMR) is considered a global burden. To decrease the NMR is a challenge, there are specific programs of maternal and child health focusing on reduction of neonatal mortality launched in recent years in our country. **Aim:** We conducted a study to evaluate the current status of neonatal intensive care units in the state of Telangana in terms of infrastructure, equipment, staffing, functioning and other facilities available. **Methods:** The survey was conducted from March 2014 to February 2015. Thirty three units participated in the study of which four were government and twenty seven were private. **Results:** Over last two decades there is humongous difference in the newborn facilities. Majority of the units had a wide range of equipments. Some units had the availability of support from the allied departments and sub-specialities. NNF accreditation criteria were not met in some of the units. Ventilation support was available in most of the units but was not found enough. **Conclusion:** There is scope of better achievements in future to further decrease the Neonatal mortality.

Keywords: NICU, Equipment, Infrastructure, Faculty, Survey

Introducion

Perinatal-neonatal period carries the highest risk of mortality and morbidity in the entire lifespan of a human being. It lays the foundations of the future health of individuals and determines the health and development of the nation as a whole. Poor neonatal care leads to high incidence of disabilities in the survivors. In fact, death and disease in the first month of life results in126 million disability adjusted life years (DALYs) lost annually, or 8.3 % of the global disease burden, compared to 63 million DALYs for ischemic heart disease [1].

India contributes to more than 25% of the global burden of 4 million annual neonatal deaths [2]. Currently, about 28% of babies are born LBW, thereby contributing 7.5 million LBW babies annually [3]. Premature delivery occurs in 13% of pregnancies in our country, accounting for 3.5 million preterm births per annum [4]. The neonatal mortality rate (NMR) in our country is 7 to 8 times higher as compared to the developed nations. The infant mortality rate (IMR) in the country has declined steadily from 165 per1000 live births in 1950s to 44 in 2011 [5]. On the other hand, NMR has shown a much slower fall in-spite of a surge of government interest in neonatal survival [6]. Two-thirds of neonatal mortality occurs within first week of life and is related to perinatal and birth events. As a result, the NMR has been forming an increasing proportion of IMR over the years and currently accounts for two-thirds of the infant deaths and more than half of under-5 mortality [7].

The specific programs of maternal and child health focusing on reduction of neonatal mortality have been launched only in the recent years. A prerequisite to decrease mortality is the availability of Neonatal

Manuscript received: 15th August 2016
Reviewed: 25th August 2016
Author Corrected; 5th September 2016
Accepted for Publication: 19th September 2016

Intensive Care Units (NICUs) and Special Care Newborn Units (SCNUs) for care of sick infants. In the last 2 to 3 decades, the number of NICUs and SCNUs in the country has increased exponentially. This has been due to the inputs provided by and progress made by the National Neonatology Forum (NNF) and in recent years the Government's drive to have at least one SCNU in each district with the help of National Rural Health Mission (NRHM), UNICEF and other agencies. An increasing number of neonatologists trained through subspecialty programs like Doctorate in Medicine (DM), Diplomate of National Board (DNB) and fellowships, and an easier availability of affordable neonatal care equipment have been the other catalysts for this growth. Even though the number of NICUs and SCNUs has increased, their actual operational status is not clearly known.

In this review, the authors describe the current status of NICUs in the country not only with respect to their infrastructure, staffing and equipment but also their functional aspects. Based on the findings of this survey, the authors also discuss the way forward.

Material and Methodology

The survey was conducted from March 2014 to February 2015 in Hyderabad, Telangana, India. A structured questionnaire was prepared by the researchers to extract all possible data from each NICU. The questionnaire includes the demographic details like location, district and organisation (private/government), structure of the unit, bed strength, infrastructure details like provision of side-lab, feeding room; separate kangaroo mother care (KMC) unit, out-patient department and area designated for counselling. The survey also looked at number of doctors, nurses, other supportive staff like lactation counsellors, infection control team, respiratory therapist, pharmacist, nutritionist, occupational therapist, biomedical engineer/ technician, quality control nurse/personnel, social worker/counsellors, data entry operator for patient data and their qualifications and experience.

We also looked at the infrastructure and equipment like open care systems, incubators, ventilators, continuous positive airway pressure machines (CPAP), high frequency nasal cannula, inhaled nitric oxide therapy, blood gas machine, laminar flow, in-house x-ray, ultrasound and Echocardiogram (ECHO)s, machines for therapeutic hypothermia, transilluminators and monitoring facilities like Electroencephalogram(EEG), invasive blood pressure, transcutaneous and total serum bilirubin measurements, hand held Oto Acoustic Emission (OAE)/Automated Auditory Brain stem Response (AABR), O2 blender and pulse oximeter in delivery room.

The survey also included the availability of paediatric sub-speciality care like paediatric surgery, cardiology, neurology, ophthalmology, audiologist, radiology, child psychology, blood bank, autopsy and genetics. The other facilities details are also included in survey like milk bank, transport facilities, total parenteral nutrition, unit protocols, blood transfusion facilities like pentabag, pedibag and CMV screens. The questionnaire also looked at the teaching, training and research facilities in each unit.

The research team has personally gone to each unit and filled the survey form. If some details are not available at the time of survey, then those details were later taken by phone facilities. The units have participated voluntarily and no undue influence was used to get the data. The data was collected from both government and private institutions. The governments units include medical colleges, district hospitals and special care newborn units (SCNU).

Observations & Results

A total of 35 neonatal intensive care units are present in Hyderabad and Secunderabad region and surroundings. Out of 35 units, we were able to approach 33 administration offices. Out of 33, 31 units have agreed to participate in the survey. Two units have denied giving information and participating. Both the units were private organisations. Out of 31 units, 27 units belong to private organisations while 4 units belong to government. Six units were located in hospitals attached to medical colleges (4 in government and 2 in private medical college).

Unit characteristics- Out of 31 units 7 (22.58%) were established below 3 years; between 4-5 yrs: 3 (9.67%) units; 6-10 yrs: 8 units (25.8%) and more than 10 years, 13 units (41.93%). A total of 873 beds are available among these units. Out of 873 beds, 203 (23.23%) and 618 (70.79%) are provided with level 3 and level 2 facility respectively. Average area of each unit is 1660sq.ft. Three units have area to bed ratio more than 100. Seventeen units (54.83%) are attached to maternity facilities while only 8 units (25.8%) are attached to fetal medicine services. In 9 units, delivery room is located

in the same floor as NICU. Twenty three (74.19%) units have facilities of separate KMC and side-lab facilities. Separate counselling and KMC room facilities were available in 28 (90.32%) and 30 (96.7%) units respectively (Table 1).

Table-1: Demographic details of NICU.

Variable	N=31 (%)
Age of the institute	
< 3 yrs	7 (22.58)
4-5 yrs	3 (9.67)
6-10 yrs	8 (25.80)
>10	13 (41.93)
Number of beds	
Total	873
Level III	203 (23.25%)
Level II	618 (69.64%)
Area per unit (average)	1660sq.ft
Area per bed	62 sq ft
Attached to	
Maternity Services	17 (54.83)
Fetal medicine service	8 (25.80)
Other services	
Sidelab	23 (74.19)
KMC	23 (74.19)
Counselling	28 (90.32)
Feeding room	30 (96.70)
Delivery room in same floor	9 (29.30)
Transfer mode from delivery room/ward	
Bassinet/Cradle	23 (74.19)
Incubator	7 (22.58)
Embrace	1 (3.03)

Personnel details- A total of 303 doctors are working in these units. Out of 303, 102 are working as full-time doctors while 201 doctors are on temporary basis (senior and junior residents and fellows). Out of 102 doctors, 50 (49%) have less than 5 years of experience while 27 (26.47%) have experience between 6-10 years. Only 25 (24.5%) of doctors are having experience more than 10 years. Fourteen units (45.16%) have at least one doctor with DM/DNB in neonatology as qualification. Seven (22.58%) units have doctors who are qualified as fellowship in neonatology. Only 3 units have doctors who had a stint in foreign countries. Average number of bed to doctor ratio is 2.7. Four units have doctors with bed to ratio >4 while 15 units have ratio less than 2.2. Twelve units have more than 30 staff nurses for work while 12 units have 15 or less number of staff nurses. Average bed to nurse ratio is 1.41. Two units have bed to nurse ratio of less than 0.66 while 12 units have ratio > 1.4. Thirteen (41.93%) units are equipped with lactation counselling services, 17 (54.83) with infection control nurses, 11 (35.48%) with respiratory therapists, 18 (58.06%) with nutritionist services, 7 with physiotherapists and 3 with occupational therapists. Twenty five (80.64%) units have employed biomedical engineers. Only 15 (48.38%) units have quality control teams (Table 2).

Equipment- Majority of the units (30/31) have open-care systems while only one unit is running with incubators alone. High frequency and conventional ventilation is available in 22 units (70.96%) while no ventilation facility is there in 3 (9.67%) units. Out of 27 units having some mode of ventilators, 4 units have ventilator to level III bed ratio ≥ 1:4. Most of the units (30/31) are using CPAP as non-invasive mode of ventilation. Out of 31, 26 units have CPAP to level II bed ratio ≥ 1:6.Nitric oxide therapy is available in only 7 (22.58%). Nearly 77.41% of the units are also equipped with blood

Table-2: Details of doctors, nursing and supportive staff.

Variable	N=31 (%)
Qualification	
DM/DNB neonatology	14 (45.16)
Fellowship in neonatology	7 (22.58)
MD/DNB (Ped)	25 (80.64)
DCH	14 (45.16)
Foreign stints	3 (9.6)
Doctors with years of experience	
< 5 yrs	50 (49%)
6-10 yrs	27 (26.47%)
>10	25 (24.50)
Units with number of staff nurses	
< 15	12 (38.7)
16-30	7 (22.58)
>30	12 (38.7%))
Lactation counselling services	13 (41.93%)
Infection control nurses	17 (51.51%)
Respiratory therapists	11 (35.48%)
Nutritionist services	18 (58.06)
Physiotherpy services1	7 (22.58)
Occupation therapists	3 (9.67)
Biomedical engineers	25 (80.64)
Quality care nurses	15 (48.38)

Table-3: Equipment details.

Variable	N=31 (%)
Instruments	
Open care system	17 (54.83)
Incubators	1 (3.22)
Open-care and incubator	13 (41.93)
Ventilators	
Only conventional	6 (19.35)
High frequency and conventional	22 (70.96)
CPAP	24 (77.41)
HHHFNC	6 (19.35)
Transilluminator	19 (61.29)
iNO	7 (22.58)
Blood gas machine	24 (77.41)
Laminar flow	13 (41.93)
In-house X-ray	29 (93.5)
In House USG	24 (77.41)
ECHO	21 (67.74)
Invasive BP	18 (58.06)
Cooling for asphyxia	10 (32.25)
EEG	11 (35.48)
In House TSB(bilicheck)ss	8 (25.8)
O2 blenders	17 (54.83)
AABR/OAE	12 (38.70)
Pulse oximertre delivery room	24 (77.41)

gas machine facility. Seventeen units are providing oxygen with blenders. In-house x-ray, ultrasound and ECHO facilities are available in 29 (93.5%), 24 (77.41%) and 21 (67.64%) units respectively. Laminar flow facility for providing aseptic environment for mixing and preparation of intravenous fluids is available in 13 (41.93%) units only. Invasive blood pressure monitoring facility is available in 18 (58.06%) units only. Therapeutic hypothermia for asphyxiated neonates and EEG facility are available in 10 (32.25%) and 11 (35.48%) units respectively. Twenty four units are using pulse oximeter while resuscitating the neonates in delivery room. Eight units (25.8%) have in-house transcutaneous bilirubin measurement equipments while 12 (38.70%) are equipped with OAE/AABR for hearing screen (Table 3).

Sub-speciality services- Paediatric surgery, neurology and ophthalmology services are available in 27 (87.09%), 24 (77.41%) and 29 (93.54%) units respectively. Only 17 units have child psychology services while 11 (35.48%) units are consulting genetics specialists for their neonates. Around 87.09% (27/31) of units have pediatric cardiology services also (Table 4).

Table-4 Other specialities available

Variable	N=31 (%)
Ped/Neonat sur	27 (87.09)
Ped neurologists	24 (77.41)
Opthalmologist	29 (93.54)
Hearing screen	23 (74.19)
Pediatric radiology	24 (77.41)
Child psychology	17 (54.83)
CT	12 (38.70)
MRI	5 (16.1)
Blood bank	8 (25.80)
Blood culture	27 (87.09)
Geneticist	11 (35.48)

Other services-In house blood bank facilities are available in 8 (25.8%) where as only one institute have milk-bank storage facility for the needy neonates. Five units have MRI facility while 12 units have CT facility. Only 13 (41.93%) units have social workers.

Transport services- All the units are transport facilities for shifting the sick neonates. However, only one unit have air-transport facility also while others transporting the neonates through ambulances by ground. Nine units have facility for transporting neonates needing mechanical ventilation (Table 5).

Table-5: Facilities for transport

Variable	N=31 (%)
Transport	
Ground	30 (96.77)
Air transport	1 (3.22)
Dedicated team for transport	26 (83.87)
Transport ventilators	9 (29.03)

Academics and Research-Two units are offering DNB in neonatology courses while only one unit is offering DM course in neonatology. Ten units are offering fellowship in neonatology courses.

Discussion

This survey covered most of the NICUs in and around Hyderabad. The survey shows that the good facilities are available in many centres. Majority of the level 3 beds are available in private sector compared to government sector. Almost half of the units are also running academic programmes.

In a study by Jayashree M et al. in 1993 found that around 80% of mothers are getting delivered in home with poor facilities by unskilled dais. Many of the units do not have even level 1 neonatal intensive care facilities for managing these newborns [8]. Meharban singh et al. in 1997 published their survey about 37 NICUs in India. Of them, 22 belonged to the government sector, the rest 15 to the private sector. The newborn care facilities, particularly the ventilation facilities, have improved in recent years. Almost 10 units were operating at or near level III standard of newborn care. Indigenous equipment of selected categories is replacing the imported equipment. However, most units continue to face problems of shortage of nursing personnel [9]. Sundarm et al. in 2010 published their survey results of 70 NICU units which are spread across India. Among the 70 units, 32 were in government sector and 38 in private sector. Overall, 26 (37%) units were accredited by NNF and 7 (10 %) by National Accreditation Board for Hospitals (NABH). Majority of units had a wide range of sophisticated equipment with open care systems and only half had incubators. All units had facilities for mechanical ventilation. However, invasive blood pressure (BP) monitoring, ophthalmology support, blood gas and in-house X-ray facilities were not available universally [10].

GHMC region consists of 8.7 million populations according to data from 2014 statistics. A total of around 1.8 lacks deliveries occur during each year in this region. According to recent guidelines, we need to have 14 NICU beds per 10,000 live births. A total of round 250 NICU beds are needed for this population.

However, this region caters too many of the districts in and around Telangana state. In view of these referrals, the number of beds needed will be more. According to NNF accreditation criteria, for unit to be labelled as level II, it should have a minimum of 12 beds, one unit Incharge with 4 medical officers, one nurse per bed and 100 sq feet area for each bed. If the unit have CPAP facility, then one CPAP for each 6 beds should be available [11]. For a level III unit, it should have 1:4 ratio of ventilator beds, doctor to bed ratio of 1:2.2, nurse to bed ratio of 0.66:1 and area of 150 square feet for each bed is mandatory [12]. In our survey, we found that though the total number of level III and level II beds are more, the personnel indicators of NNF accreditation criteria are not met by many units. There is gross mismatch of ventilator to bed and CPAP to bed ratios. Only few units are meeting these criteria.

Limitations- As this a survey, conducted by interviewing the administrators and senior consultants, the data may contain few errors. We were not able to calculate many parameters of accreditation due to paucity of data regarding, nurses and doctors per each shift and doctor responsibilities distribution among level II, level III and ward beds. Many of the units which are attached to pediatric services are sharing the ventilators and doctors for duties and care.

Conclusions

- There are many well equipped NICUs available in Telangana state
- Many units have allied specialty services
- The staffing pattern still needs improvement
- Many units have not applied for NNF accreditation to look for uniform care
- In conclusion, there is scope of better achievements in future to further decrease the Neonatal mortality.

Funding: Nil, **Conflict of interest**: Nil
Permission from IRB: Yes

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How to cite this article?

Babu M.S, Ashwani N, Rekha N.A, Murki S, O. Tejo Pratap, C. Suresh Kumar. Neonatal Intensive Care Unit (NICU) status survey in and around Hyderabad, Telangana. Int. J Pediatr Res. 2016;3(9):705-711.doi:10.17511/ijpr.2016.i09.14.

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