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Original Research Article

Demographic profile and outcome analysis on neonatal and pediatric intensive care patients in developing country: Experiences from a secondary hospital, Nagaland India

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Abstract

Background Nagaland is one of the North Eastern Indian states with significant indigenous populations, and relatively high child mortality. The study is done to identify the demographic profile of children admitted in Neonatal Intensive Care Unit (NICU)/ Paediatric Intensive Care Unit (PICU). to strengthen the services of Neonatal Intensive Care Unit (NICU)/ Paediatric Intensive Care Unit (PICU).

Materials and Methods: The study was done as retrospective descriptive in the Christian Institute of Health Sciences and Research, Nagaland. The data was collected from Health information and management department after obtaining permission from Medical Superintendent. The data from 1 January 2019 to 31 December 2020 was analysed. A total of 401 children below 15 years, including new-born babies were treated in the NICU/PICU during the study period. The research was approved by the Institutional Review Board after seeking necessary clarifications on confidentiality, security of data, and procedures for maintaining the privacy of information. Microsoft excel sheets was used for data entry and analysed using SPSS version 21.

Results: Both males and females were equally represented. Majority 89% are from Nagaland, and 11% from neighboring state of Assam. Significant number were newborn (70%) followed by infants (14%). The most common causes of admission among newborns are neonatal sepsis (17.8%), prematurity (12.2%), depressed at birth (8.5%) and among other age groups include sepsis (3.7%), other neurological condition like ADEM, neural tube defect, etc. (3.5%), severe pneumonia (3.0%), meningitis (2.7%) and encephalitis (2.7%).

83.3% were of the patient were discharged alive from NICU/ PICU. However only 3% had died, 2% had to be referred elsewhere and 11.5% the families requested discharge against medical advice.

Conclusion In our study, children under the age of five years including newborns contributed 90% of the study population. The findings clearly showed that despite the nature of critical conditions on admission, the ICU has treated them successfully in over 80% of cases.

Keywords: Demography, Neonatal intensive care unit, Paediatric intensive care unit

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1. Introduction

Pediatric intensive care units play a vital role in reducing the mortality and morbidity rates of critically ill children through qualified staff, life-saving equipment and user-friendly approaches.[1] The Government of India has given priority to the Millennium Development Goals (MDG) 4 and 5 and SDG 3 which aim for drastic reductions in maternal and child mortality, especially in low and middle income countries.[2] The five countries with the highest under-5-year mortality rate in 2013 were India, China, Pakistan, Nigeria, and the Democratic Republic of the Congo. The majority of childhood deaths in these settings result from preventable and reversible causes.[3]

The concept of critical care developed during the poliomyelitis epidemic in the 1920–1950s when the number of critically ill patients led to the development of dedicated areas, "intensive care units," that provided continuous care and monitoring.[4] For general and specialized care several guidelines were drafted to ensure proper infrastructure for effective "intensive" care.[5]

The paediatric intensive care unit is a specialized unit designed primarily to provide qualified care for critically ill children that extends beyond its walls to include emergency department, wards, and pre hospital settings. Since it was developed in the early 1960s, the PICU has a significant role in the reduction of childhood mortality in the developed world, based on guidelines.[6]

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The last decade has witnessed marked progress in advancing paediatric intensive care to the developing world but it has been reported that many PICUs still lag behind in terms of number of qualified health care staff as well as rapid access to necessary medication, supplies, and equipment to participate effectively in reducing childhood mortality, as these require considerable financial investments.[7]

While several major hospitals have established PICUs, there is lack of reliable data of demographic profile and outcome analysis on neonatal and pediatric intensive care patients for many developing countries including those in North Eastern India. Such data form the foundation for establishing and sustaining and evaluating the effectiveness of neonatal and paediatric intensive care units. Therefore, the investigator is interested to collect the secondary data for two years, (2019 -2020) from a Secondary hospital in Nagaland to strengthen the services of NICU/ PICU. Nagaland is one of the North Eastern Indian states with significant indigenous populations, and relatively high child mortality.

1.1. Objectives of the study:

1. To identify the patient's socio demographic and clinical details
2. To analyse the treatment provided as per the records
3. To assess the outcomes in terms of mortality and survival
4. To find association between the outcome with selected socio demographic variables

2. Materials and Methods

This is a Secondary data analysis of records of admission for two years 2019 and 2020. The study was done in Christian Institute of Health Sciences and Research, Chumoukedima, Nagaland. It is a 200 bedded secondary to mid-level tertiary hospital, rendering service to people of Nagaland and neighbouring states of Assam and Manipur. The Paediatric Intensive care unit is combined with neonatal intensive care unit of 8 beds, admitting both new-born and children up to 15 years of age. There are 12 nurses who give round the clock nursing care to patient in shift wise and three Paediatricians who looks after the unit. We have a dedicated Paediatric intensivist. Individual medical records are maintained by the Medical Records Department, using Unit Record systems, describing all aspects of patient care in manual form.

A research protocol was prepared with relevant review of literature, study design, sampling plan and data analyses. The research was approved by the Institutional Review Board (Study number 010/2020/IEC-CIHSR) after seeking necessary clarifications on confidentiality, security of data, and procedures for maintaining the privacy of information.

In the study period from 2019 to 2020, 401 cases were admitted to the NICU/PICU and these records were analysed. Eight to ten records were reviewed to collect the data per day. The author personally entered the data using the Microsoft excel sheets and analysed using SPSS version 21.

3. Findings

Table 1: Sociodemographic profile of children admitted (n=401)

Characteristic		**No.**	**Percent**
Gender	Male	213	53.1
	Female	188	46.9
Age	Newborn	288	69.3
	Infant	56	14.0
	Toddler	17	4.2
	Preschooler	20	5.0
	School age	24	6.0
	Adolescent	6	1.5
Residence	Nagaland	355	88.5
	Assam	44	11.0
	Meghalaya	2	0.5
Duration of illness	< 5 days	359	89.5
	5 days or more	42	10.5
Prior Treatment before hospitalization	Yes	64	16.0
	No	337	84.0
Condition on Admission	Critical	70	17.5
	Unstable	266	66.3
	Stable	65	16.2
Vital Signs on admission	Unstable	342	85.3
	Stable	59	14.7

Both males and females were equally represented. Nearly 90% are from Nagaland, and a few from Assam (11%). Significant number were newborn (70%) followed by infants (14%). Most recorded duration of illness was of less than 5 days and over 80% had not taken any prior treatment elsewhere. Nearly 20% were brought in a critical stage and 70% in unstable condition. Less than 15% had stable vital signs.

Table 2: Clinical details of patient admitted in NICU/ PICU (n = 401)

Diagnosis		No. of patient	Percentage
1.e.	Neonatal sepsis	71	17.8
1.a.	Prematurity	49	12.2
1.j.	Depressed at birth	34	8.5
1.k.	Other neonatal conditions unclassified	31	7.7
1.i.	Perinatal asphyxia	27	6.7
1.f.	Meconium aspiration	21	5.2
2.a.	Sepsis	15	3.7
4.g.	Other neurological condition like ADEM, neural tube defect, etc.	14	3.5
3.b.	Severe pneumonia	12	3.0
4.a.	Meningitis	11	2.7
4.b.	Encephalitis	11	2.7
1.b.	Low birth weight	7	1.7
6.c.	Congenital abdominal malformation	7	1.7
12.a.	Head trauma	6	1.5
1.h.	Neonatal jaundice	5	1.2
3.a.	Pneumonia	5	1.2
4.c.	Seizures disorders	5	1.2
5.b.	Congenital heart disease	5	1.2
6.d.	Other GI disorders	5	1.2
3.h.	Bronchiolitis	4	1.0
6.b.	Diarrhoea	4	1.0
12.e.	Poisoning	4	1.0
4.d.	Status epilepticus	3	0.7
4.f.	Hydrocephalus	3	0.7
13.a.	Tetanus	3	0.7
2.b.	Septic shock	2	0.5
3.j.	Other respiratory conditions	2	0.5
7.e.	CRF	2	0.5
8.a.	Anaemia	2	0.5
9.c.	Enteric fever	2	0.5
10.h.	Hypocalcemia	2	0.5
12.d.	Poly trauma	2	0.5
12.g.	Drowning	2	0.5
1.c.	Very low birth weight	1	0.2
1.g.	Neonatal seizures	1	0.2
2.c.	Immuno compromised	1	0.2
3.c.	ARDS	1	0.2
3.f.	WALRI	1	0.2
4.e.	Cerebral palsy/ developmental delay	1	0.2
5.c.	Rheumatic heart disease	1	0.2
7.a.	UTI	1	0.2
7.d.	ARF	1	0.2
8.e.	Other haematological condition	1	0.2
9.e.	Staphylococcal sepsis	1	0.2
11.b.	IEM	1	0.2
12.b.	Chest trauma	1	0.2
12.f.	Foreign body aspiration	1	0.2
12.h.	Burns	1	0.2
13.b.	Tuberculosis	1	0.2
13.d.	Dengue	1	0.2
14.a.	Failure to thrive	1	0.2
15.a.	Septic arthritis	1	0.2
16.a.	SLE	1	0.2

16.b	Other dermatology disorders	1	0.2
17.a.	Faulty feeding	1	0.2
18.a.	Down syndrome	1	0.2
Total		**401**	**100.0**

The table shows that most common cause of admission in NICU/ PICU among the newborn were neonatal sepsis (17.8%), prematurity (12.2%), depressed at birth (8.5%) and for other age group include sepsis (3.7%), other neurological condition like ADEM, neural tube defect, etc., (3.5%), severe pneumonia (3.0%), meningitis (2.7%) and encephalitis (2.7%).

Table 3: Specific treatment given in NICU/ PICU (n=401)

S. No.	Care/Treatment	No. of patient	Percent
1.	Antibiotics	372	92.8
2.	Oxygen therapy	355	88.5
3.	Anti-pyretics	154	38.4
4.	Anti-epileptic	101	25.2
5.	Inotropes	75	18.7
6.	Ventilator	67	16.7
7.	Steroids	57	16.2
8.	Anti-oedema	32	8.0
9.	3rd line Antibiotics	23	5.7
10.	Surgery	22	5.5
11.	Anti-viral	14	3.5
12.	Anti-Fungal	8	2.0

Nearly 90% required oxygen support and 90% were administered antibiotics, and about 38.4% needed anti-pyretics. A quarter of the patients needed anti-epileptic treatment (25.2%), and nearly 20% were put on the Ventilator. Another 20% needed inotropes and steroids.

The outcomes of patient are displayed in **Table 4**

Table 4: Outcome of patient

Outcome at discharge	No	Percent
Alive	334	83.3
Died	13	3.2
DAMA	46	11.5
Referred	8	2.0
Total	401	100.0

83.3% were of the patient were discharged alive from NICU/ PICU. The Mortality rate was 3% and 2% had to be referred elsewhere and in 46 out of 401 cases (11.5%), the families requested discharge against medical advice.

Table 5: Association of outcome of patient with selected demographic

Sl. No.	Demographic variables	Calculated Pearson Chi square	df	P Value
1.	Condition on admission	67.125	6	$p<0.001$
2.	Vital signs on admission	4.340	3	$p>0.05$
3.	Duration of illness	16.313	3	$p<0.01$
4.	Prior treatment taken before hospitalization	10.923	3	$p<0.05$

The above table shows that calculated probability of the given variables is significant statistically except for the variable vital signs on admission.

4. Discussion

4.1. Sociodemographic profile of children admitted

Both males and females were equally represented. This finding is supported by study done in tribal area in Odisha where the gender of newborns admitted in NICU were equally represented8. Majority 88.5% are from Nagaland, and some from 11.5% neighboring State Assam. Significant number were newborn (70%) followed by infants (14%). Most recorded duration of illness was of less than 5 days and over 80% had not taken any prior treatment elsewhere. Nearly 20% were brought in a critical stage and 70% in unstable condition. Less than 15% had stable vital signs. On admission, every patient was immediately given necessary nursing care and routine medical treatment to stabilize the condition and revive the vital signs. The delay in recognition, late presentation, lack of resources, and illness severity make the first 24 hours of hospitalization the most vulnerable period.[11]

4.2. Clinical details of patient admitted in NICU/ PICU

The most common cause of admission in NICU/ PICU among the newborn are neonatal sepsis (17.8%), prematurity (12.2%), depressed at birth (8.5%) and for other age group

include sepsis (3.7%), other neurological condition like ADEM, neural tube defect, etc (3.5%), severe pneumonia (3.0%), meningitis (2.7%) and encephalitis (2.7%). Significant numbers had multiple conditions.

A study done NICU in a secondary level Neonatal Intensive care Unit in Tribal region in Odisha shows that predominant indication for admission were prematurity and related complication (RDS, apnea, hypothermia, feeding difficulty) 22%, neonatal hyperbilirubinemia 20.5%, Birth asphyxia 18%, neonatal sepsis 16%, neonatal hypoglycemia 14.5%, Term IUGR (LBW <1800 g) 5.5%, meconium aspiration syndrome3.5% an transient tachypnea of newborn is 2.3%.[8]

A retrospective study conducted in PICU in the sub Himalayan region of North Bengal showed that LRTI comprised of maximum percentage of cases 27.8%, followed by sepsis (21.6%) and meningo-encephalitis (16.7%).[9]

4.3. Specific treatment given in NICU/ PICU

Nearly 90% required oxygen support and 90% were administered antibiotics, and about 38.4% needed anti-pyretics. A quarter of the patients needed anti-epileptic treatment (25.2%), and nearly 20% were put on the Ventilator. Another 20% needed inotropes and steroids.

4.4. The outcome on discharge from NICU/ PICU

83.3% were of the patient were discharged alive from NICU/ PICU. However only 3% had died, 2% had to be referred elsewhere and 11.5% requested discharge against medical advice. We have only 3% mortality rate in our study population which is relatively low compared to other NICU/ PICU set up in the region; this could be due to patients going on discharge against medical advice when given a poor prognosis, another reason could be the policy of admitting newborns who are not very critical but needing oxygen and continuous monitoring. A study done NICU in a secondary level Neonatal Intensive Care Unit in Tribal region in Odisha, India, shows that mortality rate was 11%8 and a study conducted in PICU in the sub Himalayan region of North Bengal showed mortality rate of 29.9%.[9]

Those requesting discharge against medical advice cited the reasons like poor prognosis, try for other form of treatment like traditional method of treatment and financial constraint could have been the reason though not told openly. The relatively large numbers of cases seeking discharge against medical advice need further enquiry and perhaps more observational study needed to identify the exact causes for DAMA.

Out of 13 deaths among children admitted in NICU/ PICU, 10 children were critical at the time of admission. Some parents whose children who were admitted in critical condition 17.5% on admission cited that they have taken homecare and other traditional treatment from non-medical personnel. This finding is supported with the study done by Cáceres ÁL, Ramesh RM, Newmai P, Kikon R, Deckert A on perceptions, health seeking behaviour and utilization of maternal and newborn health services among an indigenous tribal community in Northeast India—a community-based mixed methods study reveals that the tendency to use homecare or traditional local practitioners are responsible for much delay or wrong treatment especially among the newborn and infants.[10]

4.5. Association of outcome of patient with selected demographic

There was association between outcome of the patient with condition on admission, duration of illness and prior treatment before hospitalization. Neonatal and Pediatric Intensive Care Units management have been reviewed through several studies and guidelines drawn for better outcome, which includes training of staff, additional resources and public education.[6,12] A study comparing Egypt and Japan with relatively poor and good ICU facilities emphasize the value of competent human and material resources to handle critical cases.[13] These are helpful in further strengthening existing ICU especially in low and middle income countries, who also suffer from resource constraints. Suitable preventive measures and counselling efforts during antenatal, natal and postpartum periods are essential to encourage early reporting of problems, reducing preventable delays and seeking expert care.

4.6. Limitation of the study

The main limitation of the study was that there was no record of PIM (Paediatric Index of mortality) score in our ICU during the study period. Hence we could not compare the data for predicting mortality and outcome with other ICU. We have just recently started using PIM score for all our patient admitted in our ICU.

5. Conclusion

In our study, children under the age of five years including newborns contributed 90% of the study population. The findings shows that despite the nature of critical conditions on admission, the ICU has treated them successfully in over 80% of cases.

Other studies also have mentioned that increasing the number of qualified staff and providing cost-effective equipment may help in improving the mortality outcome and the quality of care, but efficiency may depend more on continual monitoring of care and outcome analyses on a routine basis through medical audits or quality assurance systems.[13-15] Continuing education of both nursing, medical and other ancillary staff of the ICU becomes an essential requirement for sustaining the unit at a high level and boosting the confidence of the public. At the same time, there is also the need for educating the public, especially the mothers and parents on many preventive aspects of illness among children.

6. Source of Funding

None.

7. Conflict of Interest

None.

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