

Assessment of Newborn Care Facilities in District
Lakhisarai, Bihar

By

Bhawna Agarwal

*Dissertation submitted in partial fulfillment of the requirements of the degree
MBA Hospital and Health Management*

Academic year, 2017-2019



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TO WHOMSOEVER MAY CONCERN

This is to certify that Bhawna Agarwal, student of MBA Hospital and Health Management from The IIHMR University, Jaipur has undergone internship training at CARE INDIA, BIHAR from 04th Feb'19 to 03rd May'19.

The Candidate has successfully carried out the study designated to her during internship training and her approach to the study has been sincere, scientific and analytical.

The Internship is in fulfillment of the course requirements.

I wish her all success in all his future endeavors.



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CERTIFICATE

The certificate is awarded to
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In recognition of having successfully completed her
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and has successfully completed her Project on

ASSESSMENT OF NEWBORN CARE FACILITY IN LAKHISARAI
DISTRICT, BIHAR
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She comes across as a committed, sincere & diligent person who has a strong drive
and

zeal for learning

We wish her all the best for the future endeavors


Deputy Director-Human Resources

THE IIHMR UNIVERSITY, JAIPUR

CERTIFICATE BY SCHOLAR

This is to certify that the dissertation titled ASSESSMENT OF NEWBORN CARE FACILITY IN DISTRICT LAKHISARAI, BIHAR and submitted by Bhawna Agarwal Enrolment No 0551 under the supervision of Dr. P.R. Sodani for award of MBA in Hospital and Health Management in Health and Hospitals of the University carried out during the period from 04th Feb'19 to 03rd May'19 embodies my original work and has not formed the basis for the award of any degree, diploma associate ship, fellowship, titles in this or any other institute or other similar institution of higher learning.

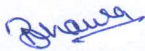


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CERTIFICATE BY SCHOLAR

This is to certify all ethical issues have been considered while collecting data for my dissertation titled Assessment of Newborn Care Facilities In District Lakhisarai, Bihar (February 2019).



Signature of student

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Bhawna Agarwal

22nd BATCH

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ABBREVIATIONS

AMC	Annual Maintenance Contract
ANM	Auxiliary Nurse Midwife
CHC	Community Health Center
FBNC	Facility Based Newborn Care
LBW	Low birth weight
FRU	First Referral Unit
HBNC	Home Based Newborn Care
IMR	Infant Mortality Rate
INAP	Indian Newborn Action Plan
JSY	Janani Suraksha Yojana
JSSK	Janani Shishu Suraksha Yojana
LBW	Low Birth Weight
NBCC	Newborn Care Corner
NBSU	Newborn Stabilization Unit
NICU	Neonatal Intensive Care Unit
NMR	Neonatal Mortality Rate
NRHM	National Rural Health Mission
SNCU	Sick Newborn Care Unit
U5MR	Under 5 mortality Rate

ABSTRACT

Background:

Neonatal mortality in India is high (25-30% of global NMR) and stagnant. There has been an increased emphasis on institutional deliveries, which demands improvement in facility based newborn care and client satisfaction. (S B Neogi et/al, 2011) Public facilities provide newborn care at every point of childbirth. Newborn Care Corner (NBCC) at every point of child birth, Newborn Stabilization Unit (NBSU) at community health centers, Sick Newborn Care Unit (SNCU) at district hospitals. SNCU unit undergo several issues like deficiency of human resource, lack of adherence to protocols, overload of admissions and shortage of equipments. The aim of the study was to assess the readiness of the Newborn Care facility in district Lakhisarai of Bihar. (FBNC Guidelines)

Methodology: The study was conducted in the public health facilities (PHC, Referral hospital, District Hospital) of Lakhisarai district, Bihar. Parameters selected for the study were infrastructure, availability and quality of drugs and consumables, availability and functionality of the equipments, review of records, human resource and infection control practices. Data were collected in structured observation tool.

Result: As per to the data, the survey was conducted in the Lakhisaria district of Bihar. Considering 6 facility, the study reveals that availability of pediatricians is lacking behind in 4 facility which is the major issue because pediatrician is most important part in facility to support NBCC, NBSU and SNCU. For infection control, functionality of Autoclave practice is very poor in all facility except one. All the necessary equipments are available with low functionality. Maximum drugs are not available but emergency drugs are all available. Documentation of records and register is maintained.

Conclusion:

The new born care facility are a critical investment to reduce the neonatal mortality rate in India. It is not only the establishment of the NBCC, NBSU and SNCU but also maintain their performance. Initial result in the form of reduction in IMR are encouraging but there are also some challenges need to be looked before scaling up the newborn care facility. Assessment of the NBCC, NBSU and SNCU shows that there is need to

strengthen the SNCUs under NHM to provide the quality of the care to the community, especially on providing adequate number of the trained human resource.

About Lakhisarai district

Lakhisarai town is the administrative headquarters of Lakhisarai district in Indian state of Bihar. The town has a Population of 1000912 (2011 Census). It is well connected by road and rail routes. It is situated 50 Km west of the town of Munger. The Town hosts small scale industrial units, including rice mills and iron rod, sindur (vermilion), drugs and insecticides factories. The Ganga, Harohar and Kiul rivers flow through the district. There is a popular Hindu temple named Ashok Dhaam. It consists of 7 blocks and 102 HSC.

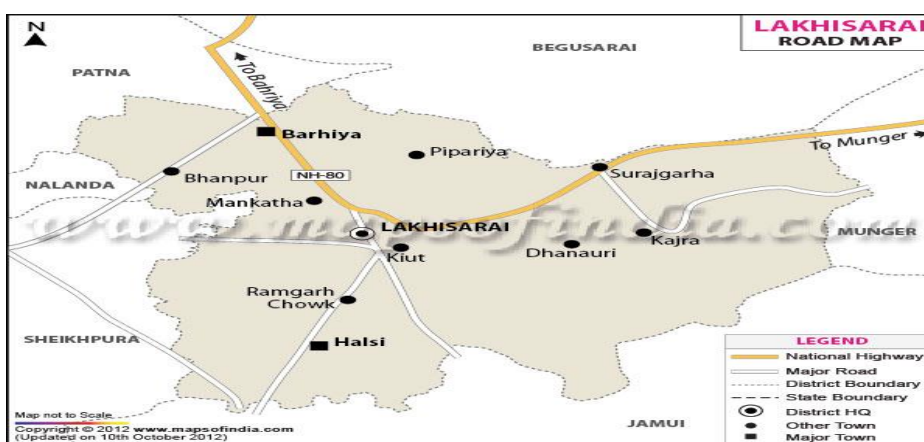


FIGURE 1: Map of Lakhisarai

CHAPTER 1

INTRODUCTION

1.1Background

“An estimated 130 million babies are born each year” globally and out of that in the neonatal period approx. 4 million of them die. “Neonatal deaths are increasing as a proportion of child deaths. Most of the neonatal deaths occur in low- and middle-income countries ratio is nearly 99% (Lawn JE et.al, 2005). 90% coverage has been assessed by the “combination of outreach and community care intervention” and it avoid 18 to 37% of neonatal deaths. These intercessions incorporate care of the infant at home, basic infant care, revival of the infant, “care for low birth weight children”, and crisis infant care. Be that as it may, extension and scaling-up of office based consideration for wiped out infants is basic to accomplish the decrease in neonatal mortality (Darmstadt et.al, 2005).

In India, 26 million babies born every year and out of that 940,000 neonates die before completing their one month of life. The neonatal period is 28 days with a neonatal mortality rate (NMR) of 24/1000 live births (SRS 2016), neonatal deaths contributes to about two-thirds of all infant deaths (Infant mortality rate 34/1000 live births(SRS 2016) and “about half of all deaths in children younger than 5 year” of age (Under 5 mortality rate 39/1000 live births (SRS 2016).Infant mortality rate (IMR) in India has declined from 58/1000 live births in 2004 to 34/1000 live births in 2016. However, there is slow progress in reduction of NMR which declined from 37 in 2004 to 25 in 2015. Reduction of deaths in the first week of life has shown the least progress. Bihar is a state considered to be a part of Eastern as well as Northern India. It is the 13th-largest state of India according to area with IMR 38/1000 live births; NMR 28/1000 live births (SRS 2016). Preventable morbidities such as hypothermia, asphyxia, infections and respiratory distress continue to be the main causes of mortality in neonatal period.

After the launching of the “National Rural Health Mission (NRHM) in 2005, the newborn care became central focus to the child health strategy of the government”.Some intervention under National Health Mission focusing on newborns such as Janani Suraksha Yojana (JSY) and “Janani Shishu Suraksha Karyakram”(JSSK) lead to increase institutional deliveries. The roll out of Home Base Newborn Care (HBNC)

programme has also lead to increased contact with newborn at their households and improved

detection and referral of sick newborns to health facilities. Bringing this all together has resulted in an increased number of sick newborns presenting to referral hospitals. Service delivery of newborn care including essential and sick newborn care has found lacking in the district and sub district level.”Facility based newborn care (FBNC) has a significant potency for improving newborn survival.” It has been predicted that intervention in health facility can reduce neonatal mortality by as much as 25-30% (Lancet

NMR among the newborns who was admitted reduced by 14% in the first year and after SNCU become functional NMR reduce by 21% in the second year.”At the population level, this was estimated to led to a reduction in NMR by ~ 10% in the district in 2 years”(Sen A et.al, 2009).

Main causes reported worldwide for neonatal mortality are preterm (40.8%), intra partum complication (27%), congenital disorder (10.6%), sepsis (8%), others (7.3%), pneumonia (4.8%), tetanus (1%) and diarrhea (0.3%) (Oza et al, 2015)but in India most dominant causes are infections(sepsis), premature delivery and birth asphyxia which contribute to 32.8%, 16.8% and 23% of the total neonatal deaths, respectively (SNCU tool, IPGMER Kolkata) (Rakholia et al, 2014) (Saziya et al, 2016). Almost 3 million babies can be saved by facility based or home based newborn care. If all proven interventions are implemented effectively than 70% deaths could be prevented with high coverage.

In India, public health care system provides Facility Based Newborn Care (FBNC) under NHM by establishing “ NBCC”Newborn care corner” at every delivery point of child birth, and NBSU “Newborn stabilization Unit” at first referral unit, SNCU “Sick newborn care unit” at all district hospitals and NICU “Neonatal intensive care” at every tertiary level for surgical interventions.

In cases of institutional delivery, Stay of mother and baby is 48 hours they are discharged after 48 hours, it is expected that care for the newborn during this period must provided in the institution. After 48 hours When baby return home,the newborn has crossed the critical first day, but there is still the reminder of the first week and month during which neonatal mortality could be as high as 54%, and for which care has to be provided. As this period is very critical any illness during this period result in the newborn death at home, unless the baby is provided with appropriate care or referred to a facility that

is equipped to treat sick newborns. Home based newborn care needs to be available as significant proportion of mother after delivery prefer to return home within few hours. (HBNC Guidelines).

“The neonatal mortality rate in India is high. Special Newborn Care Units (SNCUs) have been set up to provide newborn-care services” for the sick babies in several district hospitals to solve this burning issue of neonatal mortality in the developing countries like India. The units need to be reach in the remotest districts where the burden of neonatal deaths is high, and access to special newborn care is poor (B Neogi et.al,2011).

“Strengthening the clinical services within the health care system is therefore a much needed and neglected components of a comprehensive intervention for reducing neonatal deaths”.

In India, one time establishment cost of 12 bedded SNCU is around 51,00,000 INR which includes resources like ancillary services, drugs, consumables, investigation etc. The running cost of SNCU excluding staff salary comes to 10,00,000 INR. “The average cost of per neonate treatment is 4581 INR, while 818 INR is per day bed cost. Level 2 care of newborn comprise 0.8% of the country’s health budget. Health outcomes highly depend upon monetary inputs (Neogi, 2013).

In 2014, UNICEF in partnership with the Madhya Pradesh government developed an online monitoring system that records information related to mother and care in the SNCU and auto generates a follow up visit at designated intervals. This data helps staff, managers and policy makers take evidence based decisions. It was scaled up nationwide in 2015 because it is user friendly and feasible.

1.2 RATIONALE

In India, around lakhs of newborns die every year due to various reasons such as delivery in home, infections, lack of antenatal and postnatal care etc without completing one year of life.”Infant mortality rate and neonatal mortality rate in”India has been the major concern of the government. According to SRS 2011, Infant mortality rate was 47 per thousand live births and it has reduced to 42 per thousand live births in 2013 (according to SRS 2013) and Neonatal mortality of India in the year 2011 was 31 per thousand live birth (SRS 2011) and it declined slowly to 28 per thousand live birth in the year 2013 (SRS 2013)(2). Bihar being on 7th position in the year 2013 had infant mortality rate as 43 per thousand live birth and neonatal mortality rate as 28 per thousand live birth (SRS 2013)(2).

Morbidities such as hypothermia, birth asphyxia, neonatal jaundice, respiratory distress and infection were found out to be the main cause of infant mortality and neonatal mortality in India. All these morbidities are preventable if proper care is taken of the newborn infant.

U5MR of India according to NFHS-4(2015-16) was 50/1000 live birth whereas Bihar was on 4th position with U5MR of 58/1000 live birth as per NFHS-4(2015-16).

Many programmes / Scheme had been started specially for newborn by government such as NSSK, JSSY, F-IMNCI, Facility Based Newborn and Child Care, Janani and Bal Suraksha yojana to lower down the infant and neonatal mortality rate. But there has been minimal improvement to reduce IMR and NMR.

This study aims to ensure that the Newborn healthcare facility in Bihar follow the guidelines and strengthen the facility to reduce the neonatal mortality.

CHAPTER 2

Literature Review

India carries the single largest share 25-30% of neonatal deaths in the world”and within the first 2 days of life 50 % of neonatal death occur. About 4 million babies die each year worldwide in the first month after birth and India alone accounts for 0.76 billion neonatal deaths. Major reasons of neonatal deaths are birth asphyxia, sepsis, LBW and prematurity. The global prevalence of LBW neonates is 15.5% and in India 27% of live births are LBW. LBW comprises about 1/3rd of SNCU admission, half of perinatal and 1/3rd of neonatal deaths (Shaziya et al, 2016). The greatest success of life saving intervention occurs when, hospital and community based activities are interlinked. If proven interventions are implemented around 70% of deaths can be prevented effectively with high coverage. These interventions included exclusive breastfeeding, warmth and prevention of the infection. 90% coverage has been assessed by the “combination of outreach and community care intervention” and it avoid 18 to 37% of neonatal deaths. These interventions include family care of the newborn, essential newborn care, resuscitation of the newborn, care for LBW and emergency newborn care.

On 18thSept”2014, India Newborn Action Plan was launched in response to global newborn action plan”

“INAP lays out a vision and a plan for India to reduce preventable newborn deaths, accelerate progress and scale up high impact yet cost effective interventions. INAP has a clear vision supported by goals, strategic intervention packages, priority actions and a monitoring framework. INAP for the first time articulates the Government of India’s specific attention on preventing still births”.It is expected that all stakeholders working towards improving newborn health in India and the attainment of the goals of “Single digit NMR by 2030” and “Single digit still birth by 2030” (Indian Newborn Action Plan,2014). For achieving this goal of single digit neonatal mortality GoI focus on strengthening of facility based newborn care as well as community based newborn care. To reinforce the facility based newborn care, government provide newborn care center at all the delivery point i.e.NBCC is mandatory for all health facilities where the delivery has conducted. NBSU is close proximity to ward where immediate care to sick and LBW babies is provided for short duration. SNCU, which provides special care (except assisted ventilation and major surgeries) for sick newborn. Any facility conducting more than 3000 deliveries per year should have SNCU in hospital.

The study showed that there was inadequate infrastructure facilities and poor utilization of equipment like neonatal resuscitation sets, radiant warmer, lack of training of service providers were evident. It was also reported that most of the deliveries and immediate Neonatal resuscitation was done by nurses (94.9%) in first referral level hospitals in six Districts of West Bengal (AB Visvas et.al, 2004).

If we look into the history, the care of weak and sick newborn babies in the facility began in the early

1960s in a few teaching hospitals and established there neonatal nurseries; however, the expansion of these services were delayed until the 1980s (Mehrbani Singh et.al, 1997). During 1990 to 2000, Country recognized the importance in the public health facilities having newborn health care facility. Under a national programme, the intervention for Essential Newborn Care including breast feeding, warmth cleanliness and hygien was introduced at different levels of the health system was introduced. This package was expanded at both community and institutional level under NRHM in 2005 (Siddhartha Ramji et.al, 2013). In 2003 first unit was established in Purulia district of West Bengal . With the help of local staff and officials of UNICEF the first unit was established and known as Sick Newborn Care Unit (Sen A et.al, 2005).

Study establish the “mortality effect of strengthening sick newborn care at a leading teaching hospital of India. The model of new born care may be replicated in teaching hospitals with preexisting SNCUs (mainly a handful of teaching hospitals in India), it is not relevant for the majority of the district hospitals in India which have no separate newborn care unit. Clinical care for sick neonates in remote district hospitals has reported with positive impact on neonatal mortality”(Agrval et.al, 2007).

One study reported shortage of equipment, essential drugs and poor infection prevention in public hospitals of Congo and also showed shortage of staff in public hospitals of Congo (Sara E casey et.al, 2009).

The study found that the facility based neonatal interventions and advancements in neonatal care practices can contribute to reduce neonatal deaths. Strengthening and scaling up facility-based newborn interventions and strategies to address unfinished agenda can provide a big role to lower down the neonatal mortality (S B Neogi et.al, 2012).

Health outcomes highly depend upon monetary inputs.”To improve the cost-effectiveness, the outcome of admissions”should be analyzed. In India bulk admissions were because of birth asphyxia, LBW & sepsis. Birth asphyxia can be very well tackled at NBCC (Neogi, 2013).`

In India, number of beds proposed by National Neonatology Forum. It is based on the number of deliveries taking place in the district hospital, the proportion of babies who would require special care and

average length of stay in hospital. Calculations made on the assumption that on an average 3000 deliveries per year are conducted in the district hospital. As under JSY institutional deliveries increases, so there is a need to calculate bed requirement based on current deliveries.

A study conducted by Sutapan BandopadhyayNeogi reveals that increase in admission in SNCU and shortage of bed handled by accommodating more than one neonate in each bed. The primary reason for this was increasing demand of community side and improve neonatal outcome through facility based care. The study also focuses on the fact that discharge and admission criteria were not followed strictly, which result in premature discharge of babies, which affect their outcome adversely (Neogi, 2014).

In1994, FBNC became functional in “26 districts. Inpatient care of small and sick newborns in the public health system comes into existence under National Rural Health Mission with the launch of the national programme on facility-based newborn care (FBNC). This has led to the creation of Newborn Care Corners (NBCC) at every delivery point, newborn stabilization units (NBSUs) at First Referral Units (FRUs) or Community Health Centers(CHCs) and Sick Newborn Care Units (SNCUs)” at district hospitals (B Neogi et.al, 2016).

Studies done in different setting uncover the problems faced by facilities like lack of trained staff, lack of adherence to the hygiene protocol, repair and maintenance of equipment, validation of data available were major concern. To track the newborn after discharge from SNCU, NHM joined with UNICEF to create an online portal. SNCU online project is the joint venture of UNICEF and state government to protect newborn babies by providing specialized care after birth until the neonatal period, especially to reduce the mortality of sick neonates. SNCUs are established at the district level, these units are connected to this web application hence to the central database.

Salient features of web application:

- Vital basic information (address and mobile number etc) of admitted newborns.
- Detailed information about admitted neonates and their mother.
- Outcome and treatment profile.
- Strong community and facility follow up tracking system.
- Reports and analytical graphs on 250+ parameters.

This portal contains the largest database of newborn babies for Ministry of Health and Family Welfare department. This size of the application is grown in just 3 years. To date it contains almost 0.3 million newborn babies' record and their analytical data. Presently, it is functional in all established SNCUs in public facilities.

Maternal and newborn bonding care can be improved through breastfeeding and skin to skin contact and kangaroo mother care. It creates confidence; improve self esteem of mother and making them feel close and responsible to take care of newborn. If staff updates them about condition of newborn time to time it helps in reducing anxiety and encourage them to participate in decision making.

Most common problems experienced by parents seemed to be the negative attitude of the health care personnel's, unfavorable hospital conditions, extensive procedures, insufficient information about their newborn and visit restrictions, posttraumatic stress disrupts parents lives as well as infant life in negative manner. It may disturb physical, developmental and behavioral outcome of their highrisk newborn. This negatively affects family process and can cause neglect of other children in the family. Attitude and the way health professional communicate to the parent about diagnosis of baby affect them psychologically. A study done in turkey reveals that parents were not aware about the diagnosis of their newborn or gets inappropriate information regarding their newborn health status.

CHAPTER 3

RESEARCH METHODOLOGY

3.1 RESEARCH QUESTION

What gaps are to be fulfilled to strengthen the existing Newborn care facility in Lakhisarai district of Bihar?

3.2 OBJECTIVES FOR ASSESSMENT OF NEWBORN CARE FACILITY

General Objective

- To assess new-born care Facilities in Lakhisarai district of Bihar.

Specific Objective

- To assess the human resource of the newborn care Facilities
- To assess the infrastructure of the newborn care facilities
- To check the record registers of the newborn care facilities
- To assess the availability of essential equipment in the newborn care facilities
- To assess the availability of drugs in the newborn care facilities
- To make recommendation to strengthen the Newborn Care facilities in Lakhisarai district of Bihar.

Study Design:

An cross sectional study involving the functional NBCC, NBSU and SNCUs of the Lakhisarai district, Bihar

Study Area

LEVEL	HEALTH FACILITY	NEW BORN CARE FACILITY AVAILABLE
District	District Hospital, Lakhisarai	SNCU,NBCC
Block	First Referral Unit Barhaiya	NBSU,NBCC
Block	Community Health Centre, Surayagarha	NBCC
Block	Primary Health Centre, Ramgarhchawk	NBCC
Block	Primary Health Centre, Halsi	NBCC
Block	Primary Health Centre, Piperiya	NBCC

TABLE1: District Newborn Care facility

Study was carried out in the Lakhisarai district including all the newborn care facilities available in district hospital,FRU,CHC,PHC

Duration of the study

Study was conducted during 3 month period of dissertation, 4TH February 2019 to 4TH May 2019

Type of Data collection

Primary data collection:- primary data collection was done through structure questionnaire from all the Newborn care facility in Lakhisarai district of Bihar.

Sample size

Study has been done in 8 Newborn care facilities available in district hospital, first referral unit Unit,Community health centre and primary health centre.

Method of data collection

Data collection was done by observing and interaction with MOIC and Nursing staff of Newborn Care Facility (NBCC,NBSU and SNCU) through structure questionnaire

STUDY FINDING

ASSESSMENT OF HUMAN RESOURCE IN NEWBORN CARE FACILITY

ASSESSMENT OF HUMAN RESOURCE AT SNCU

	Number as per standard	Availability	Gaps
Paediatricians	3	1	2

TABLE2: Human Resource in SNCU

This table represent 3 Paediatrician is required in NCU as per standard but there is only 1 Paediatrician is available

ASSESSMENT OF HUMAN RESOURCE AT NBSU

	Available	Gaps
Paediatrician	1	0

TABLE3: Human Resource in NBSU

Table represent Paediatrician is available in NBSU as per standard

ASSESSMENT OF HUMAN RESOURCE AT NBCC

FACILITY	Paediatrician availalble	GAPS
District Hospital Lakhisarai	1	0
First Referral Unit Barhaiya	1	0
Community Health Centre, Surayagarha	0	1
Primary Health Centre, Ramgarhchawk	0	1
Primary Health Centre, Halsi	0	1
Primary Health Centre, Piperiya	0	1

TABLE4:Human Resource in NBCC

This table represent only in two NBCC there is Paediatrician available and in 4 Facility there is no Paediatrician available.

ASSESSMENT OF INFRASTRUCTURE OF NEWBORN CARE FACILITY

All the facility have NBCC in labour room as per guidelines and NBSU is established in first referral unit Barhaiya and SNCU is established within the campus of district hospital and as per guideline it is at 100meter distance from labor room.

ASSESSMENT OF RECORDS IN NEWBORN CARE FACILITY

AVAILABILITY OF RECORDS IN SNCU

RECORDS AND REGISTER IN SNCU	AVAILABLE	NOT AVAILABLE
Cash record/ sheet	Yes	
Doctor progress record	Yes	
Nurse's monitoring record	Yes	
Treatment sheet	Yes	
Discharge card	Yes	
Investigation slip	Yes	
Death certificate		Yes
Indent register	Yes	
Phototherapy register	Yes	
Oxygen register	Yes	
Laundry/ linen register		Yes
Handover and take over for equipment/consumable	Yes	
Referral card	Yes	

TABLE5:Records in SNCU

SNCU have all the records and register and maintained as per standard but Laundry Register and Death Certificate is not available in SNCU.

AVAILABILITY OF RECORDS IN NBSU

Records and Register	Available	Not Available
Case record / Sheet	Yes	
Doctor's Progress record		Yes
Nurse's monitoring record	Yes	
Treatment Sheet		Yes
Discharge card		Yes
Investigation slip		Yes
Death certificate		Yes
Indent Register		Yes
Phototherapy register		Yes
Oxygen register		Yes

TABLE6: Records in NBSU

From the records status it can gather that only nurse's monitoring and case record sheet is maintained rest all records are totally absent. We assess that record maintaining in NBSU is not upto the mark.

ASSESSMENT OF EQUIPMENT AVAILABILITY IN NEWBORN CARE FACILITY

	AVAILABLE	NOT AVAILABLE
Radiant warmer	YES	
Focus Light		YES
Oxygen concentrator	YES	
Single surface phototherapy	YES	
Double surface phototherapy		YES
Electric suction machine	YES	
Air conditioner	YES	

TABLE 7: Equipment availability in SNCU

This Table represents the availability of Equipment in SNCU which reveals that all the important equipments are available like Radiant warmer, Oxygen Concentrator, Single surface phototherapy, Electric surface phototherapy, Electric Suction Machine and Air conditioner are available.

EQUIPMENTS AVAILABILITY IN NBSU:

	AVAILABLE	NOT AVAILABLE
Radiant warmer	YES	
Focus Light		YES
Oxygen concentrator	YES	
Single surface phototherapy	YES	
Double surface phototherapy		YES
Electric suction machine	YES	
Air conditioner	YES	
Oxygen Concentrator	3	2
Syringe hub Cutter	1	0

TABLE8: Availability of equipments in NBSU

This figure represents requirement, availability and non functionality of equipment in NBSU which reveals that 3 Radiant warmer are available as per to the quantity but few of them are not functioning. In the same way by satisfying the requirement ,the equipments which is available in NBSU- Phototherepy, Air conditioner and Syringe hub cutter; hub cutter find out as a non functional but other two are functional. Number of Focus light and Oxygen concentrator required is 4 (not available) and 3 respectively.

EQUIPMENTS AVAILABILITY IN NBSU

	AVAILABE	NOT AVAILABLE
Ambu Bag (500ml)		Yes
Ambu Mask (size 0)	Yes	
Ambu Mask (Size 1)	Yes	
Boiler		Yes
Baby weighing scale Digital/ Manual	Yes	
BP Apparatus with paedia cuff Digital/ Manual		Yes
Electric Suction Machine		Yes
Suction machine (Foot operated/ Electrical)		Yes
Glucometer with strip		Yes
Hub Cutter		Yes
Needle Burner		Yes
Infanto Meter		Yes
Infusion Pump		Yes
Laryngoscope set (Neonate)	Yes	Yes
Pulse Oximeter (Infant)		
Thermometer (Digital)	Yes	Yes
Thermometer (Clinical)		Yes
Thermometer (Room)		Yes
Syringe Pump		Yes
Oxygen Cylinder	Yes	
Oxygen Cylinder with humidifier	Yes	

TABLE 9:Availability of equipment in NBSU

This figure represents the availability of equipments in NBSU. Equipments like ambu mask (size 0, size 1), Laryngoscope set (Neonate) and Thermometer (Digital) are available but in scarce quantity. Lastly oxygen cylinder and also with humidifier are readily available. The important equipments that must be present in NBSU to prevent infection like boiler, hub cutter, needle burner and others which are not available.

EQUIPMENT AVAILABILITY IN NBCC:

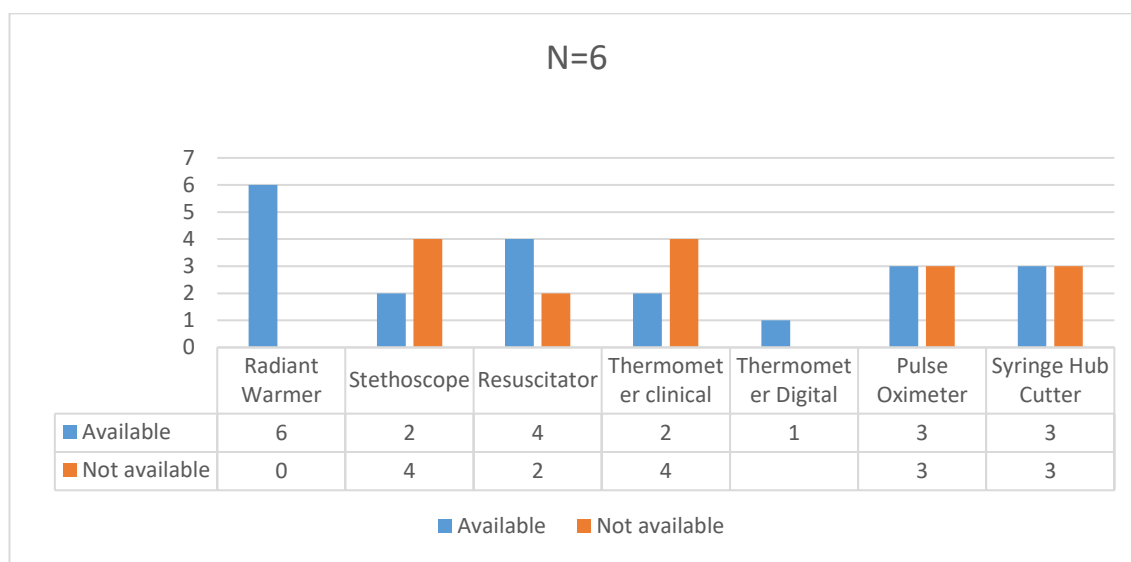


FIGURE2:Availabilityof equipments in NBCC

This figure represents the availability of equipments in the SNCU. Total number of each equipments should be available in SNCU is 6.Out of the total surveys done only radiant warmer is available in all place,2 Stethoscope, 4 Resuscitator, 2 clinical Thermometer ,1 digital thermometer, 3Pulse Oximeter and 3 Syringe hub cutter. There is some shortage of equipments which must be recover.

ASSESSMENT OF DRUGS AVAILABILITY IN NEWBORN CARE FACILITY

AVAILABILITY OF DRUGS IN SNCU

IV FLUIDS

	AVAILABLE	NOT AVAILABLE
5% Dextrose		Yes
10% Dextrose	Yes	
Ringers Lactate		Yes
Normal saline (NS)	Yes	
Isolyte P	Yes	
25% Dextrose vials		Yes
Glucose 50% (Injection)		Yes

TABLE10:IV fluids availability in SNCU

This data reveals that availability of IV fluids. 10% Dextrose , Normal Saline, Isolyte p are available rest no other IV fluids is available

ANTIBIOTICS

	AVAILABLE	NOT AVAILABLE
Inj. Ampicillin		Yes
Inj. Cefotaxime	Yes	
Inj. Gentamicin		Yes
Inj. Amikacin	Yes	
Inj. Amoxycillin + Cloxacillin		Yes
Metronidazole (Injection)		Yes
Inj. Vitamin K1	Yes	NOT AVAILABLE

TABLE 11:Availability of Drugs in SNCU

This data represents antibiotics are important drugs , Data reveals that among Antibiotics only Inj. Cefotaxime , Inj Amikacin and inj. Vitamin k1 are available.

DRUGS AVAILABILITY IN NBSU

	AVAILABLE	NOT AVAILBLE
Inj. Amikacin		Yes
Inj. Amoxycillin	Yes	
Inj. Ampicillin		Yes
Inj. Calcium Gluconate		Yes
Inj. Ceftriaxone		Yes
Inj. Dexamethasone Sodium Phosphate		Yes
Inj. Gentamycin		Yes
Inj. Phenobarbitone		Yes
Inj. Vit K1(Phytonadione)	Yes	
Dextrose 10% IV Fluid		Yes
Dextrose 05% IV Fluid		Yes
Isolyte P IV fluid		Yes
Ringer Lactate (RL)		Yes
Normal Saline		Yes
Water for Injection(2ML)		Yes
Water for Injection(5ML)		Yes
Isoniazid		Yes
Syrup Paracetamol		Yes

TABLE 12:Drugs availability in NBSU

This figure represents that 2 drugs i.e Inj. Amoxycillin and Inj. Vit k1 are available in NBSU and no other medicine are available.

CONSUMABLES SUPPLY IN NBSU

	AVAILABLE	NOT AVAILABLE
Meconium aspirator	Yes	
Infusion pump line	Yes	
Multistix urline 5parameter, glu		
Prot, eryt, spc, grav, Ph	Yes	Yes
Cuvettes		Yes
Vacuum tube		Yes
Needle for vacuum tube 22g	Yes	
Lancet		Yes

TABLE13:Consumables Supply in NBSU

INFECTION CONTROL:

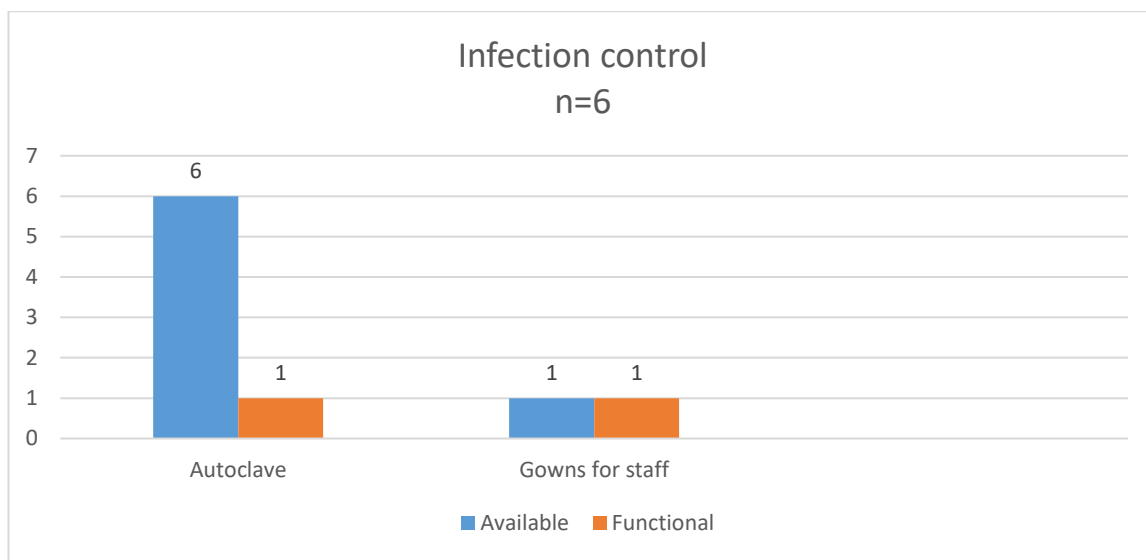


Figure3 :Availability of infection control measures

This figure represents the Infection control. Autoclave is most essential infection control equipments. Out of the 6 provided Autoclave only 1 is functioning whereas only one gown was provided and it's in good condition rest 5 don't have gown.

CHAPTER 5

CONCLUSION

In Bihar, majority of institutional deliveries are conducted in public facilities (HMIS 2018-19). According to global reviews, roughly 15% of new-born require facility based care (NIPI SNCU brochure). Thus, NBCC, NBSU and SNCU in these facilities must be able to provide special care to neonates to improve neonatal health indicators. Basic infrastructure including availability of equipments and essential drugs must be ensured for quality services at Newborn care facility. Quality indicators should be strictly adhered to provide best possible services. Institutional delivery should be encouraged to reduce birth related complications and associated mortality. Similarly, Aseptic procedures must be followed strictly to reduce sepsis and infection related mortality.

There is also a need to review the quality of intrapartum care in labour rooms and quality of care at functional NBCC . Periodic inspection and audit are required to assess the availability and functioning of these units. This will help in channelizing resources more efficiently.

CHAPTER 6

RECOMMENDATION

- Human resource is a big issue for every health facility to provide service round the clock. Promoting partnership with private sector in providing human resource.
- Improve the skills and motivation of the care providers.
- Lab services should be provided at the SNCUs.
- Cleaning of all equipment at least once on daily basis in NBCC ,NBSU and SNCU should be ensured.
- Ensure the quality of care and ensure follow up of all the babies after discharge from the SNCU
- There was acute shortage of all the important equipment needed in an NBSU. Essential consumables were also missing in majority of the NBSU
- There was improper maintenance of record and registers which are essential for any health facility.

Annexure 1 – NBCC Assessment tool

Newborn Care Corner				
Block-				
Type of Facility				
PHC ☐	DH ☐	CHC ☐	RH ☐	
Is NBCC established in labour room?				
Yes ☐	No ☐			
Is NBCC established operation theatre.				
Yes ☐	No ☐			
Detail of human resources				
Paediatricians (MD/ DCH)	Yes	☐	No	☐
Medical Officer (MBBS)	Yes	☐	No	☐
Staff Nurse	Yes	☐	No	☐
Staff nurse of labour room take training in NSSK				
Yes ☐	No ☐			
Equipment & Accessories				
• Radiant warmer	Yes	☐	No	☐
• Stethoscope	Yes	☐	No	☐
• Resuscitator	Yes	☐	No	☐
• Pump Suction Foot operated	Yes	☐	No	☐
• Thermometer Clinical	Yes	☐	No	☐
• Thermometer Digital	Yes	☐	No	☐
• Light for examination	Yes	☐	No	☐
• Syringe Hub Cutter	Yes	☐	No	☐
• Pulse Oximeter	Yes	☐	No	☐

Infection Control		
• Sterilising Drum	☐	☐
• Auto Clave	☐	☐
• Gowns for staff and mother	☐	☐
What is the frequency of cleaning the canopy and bassinet of Radiant Warmers?	Once a day	☐
	Twice a day	☐
	Thrice a day	☐
	Before every use	☐
	Irregular	☐
	Other	☐
What is used for cleaning canopy and basinet for Radiant warmers?	Water	☐
	Detergent/ Phenyl	☐
	Hypochlorite Solution	☐
	Phenol/ Lysol	☐
	Other	☐
Number of radiant warmer (RW) mattress covered with linen?	No of RW having mattress linen	☐
What is the frequency of changing the linen covering the RW mattress	Every Shift	☐
	Once every day	☐
	Before and after every admission	☐
	Once a week	☐
What is the frequency of cleaning the floor?	Once a day	☐
	Twice a day	☐
	Thrice a day	☐
	Before every use	☐
	Irregular	☐
	Other	☐
What is used for cleaning the floor?	Water	☐
	Detergent/ Phenyl	☐
	Hypochlorite Solution	☐
	Phenol/ Lysol	☐
	Other	☐

Annexure 2 – NBSU Assessment Tool

NEW BORN STABILIZATION UNIT (NBSU) TOOL			
- District - Block			
Name of health facility SDH ☐ RH ☐ CHC ☐			
NEW BORN STABILIZATION UNIT (NBSU) DETAIL			
Is the NBSU established in the facility? Yes ☐ No ☐			
HUMAN RESOURCES			
- Paediatricians (MD/ DCH) - Medical Officer (MBBS) - Staff Nurse grade- A Nurse - ANMS			
Essential equipment and instruments			
Name of Equipment	Total number of equipment of available	Total number of equipments non functional	
- Radiant Warmer - Focus Light - Oxygen Concentrator - Single Surface Phototherapy - Double Surface Phototherapy - Air Conditioner (AC) - Ambu Bag (250ml)			

Name of Equipment	Total number of equipment of available	Total number of equipments non functional
• Ambu Bag (500ml)		
• Ambu Mask (size 0)		
• Ambu Mask (Size 1)		
• Boiler		
• Baby weighing scale Digital/ Manual		
• BP Apparatus with paedia cuff Digital/ Manual		
• Electric Suction Machine		
• Suction machine (Foot operated/ Electrical)		
• Glucometer with strip		
• Hub Cutter		
• Needle Burner		
• Infanto Meter		
• Infusion Pump		
• Laryngoscope set (Neonate)		
• Pulse Oximeter (Infant)		
• Thermometer (Digital)		
• Thermometer (Clinical)		
• Thermometer (Room)		
• Syringe Pump		
• Oxygen Cylinder		
• Oxygen Cylinder with humidifier		
Flow meter & key		

DRUG			
Drug Name	Status		Status
Inj. Amikacin	Available		Not Available
Inj. Amoxycillin	Available		Not Available
Inj. Ampicillin	Available		Not Available
Inj. Calcium Gluconate	Available		Not Available
Inj. Ceftriaxone	Available		Not Available
Inj. Dexamethasone Sodium Phosphate	Available		Not Available
Inj. Gentamycin	Available		Not Available
Inj. Phenobarbitone	Available		Not Available
Inj. Vit K1(Phytonadione)	Available		Not Available
Dextrose 10% IV Fluid	Available		Not Available
Dextrose 05% IV Fluid	Available		Not Available
Isolyte P IV fluid	Available		Not Available
Ringer Lactate (RL)	Available		Not Available
Normal Saline	Available		Not Available
Water for injection(2ML)	Available		Not Available
Water for injection(5ML)	Available		Not Available
Isoniazid	Available		Not Available
Syrup Paracetamol	Available		Not Available

GENERAL INFECTION CONTROL		
Is fresh 0.5%hypochlorite solution prepared in every 24 hours?	Yes ☐	No ☐
What is the frequency of cleaning the canopy and bassinet of Radiant Warmers?	Once a day	☐
	Twice a day	☐
	Thrice a day	☐
	Before every use	☐
	Irregular	☐
Number of radiant warmer (RW)mattress covered with linen?	No. Of RW having mattress linen	

GENERAL INFECTION CONTROL			
What is the frequency of cleaning the cups, spoon, palada ?	Once a day	☐	
	Twice a day	☐	
	Thrice a day	☐	
	Before every use	☐	
	After every use	☐	
	Irregular	☐	
	Other		
What is mainly used to clean cups, spoon, palada ?	Normal water	☐	
	Normal water + detergent	☐	
	Boiling water	☐	
	Boiling water + detergent	☐	
Is 2% Glutaraldehyde solution available?	Yes	☐	
	No	☐	
Are needles recapped after use?	Yes	☐	
	No	☐	
Are needles burnt/ cut in hub cutter before disposal	Yes	☐	
	No	☐	

RECORDS AND REGISTER			
Type of register	Status		Status
Case record/ sheet	Available		Not Available
Doctor's progress record	Available		Not Available
Nurse's monitoring record	Available		Not Available
Treatment sheet	Available		Not Available
Discharge card	Available		Not Available
Investigation slip	Available		Not Available
Death certificate	Available		Not Available
Indent register	Available		Not Available
Phototherapy register	Available		Not Available
Oxygen register	Available		Not Available

Annexure 3 – SNCU Assessment Tool

SPECIAL NEW BORN CARE UNIT			
Is the SNCU established in the health facility? Yes ☐ No ☐			
Where the SNCU is established? Within the vicinity of the maternity complex ☐ Within the hospital campus ☐ Outside the hospital campus ☐			
Detail of Human Resources			
- Paediatrician (MD/DCH) - General duty medical officers (MBBS) (Staff Nurse/ Grade-A Nurse) - ANMs - Lab Assistant - Data entry operator	Yes No	☐ ☐	☐ ☐
Infrastructure			
- Is there a centralized servo stabilizer? Yes..... No..... - Does the SNCU have following room/demarcated space In born unit (separate room) ☐ Out born unit (separate room) ☐ In born unit and Out born unit part of single room (divided by partition) ☐			

- Does the SNCU have following room/ demarcated space (components) of Ancillary Service area? Doc/ Nurse Room / Changing Room Yes ☐ No ☐ - Storage Unit Yes ☐ No ☐ - Demarcated space/room for Autoclaving/ Sterilization Yes ☐ No ☐ - Demarcated space/room for Lab Yes ☐ No ☐ - Demarcated space/room for Breast feeding Yes ☐ No ☐ - Demarcated space for KMC Corner/Area Yes ☐ No ☐ - Demarcated space for Triaging room Yes ☐ No ☐			
- Does the SNCU have following room/ demarcated space (components) of Add-on service? Teaching/ training room Yes ☐ No ☐ - Special <u>new born</u> care ward Yes ☐ No ☐ - Step down unit Yes ☐ No ☐ - Waiting area Yes ☐ No ☐			
Electricity, electrical equipment and lighting			
- Does the room have a inverter? Yes ☐ No ☐ - Is the room connected with the generator Yes ☐ No ☐ - Are these equipments in the patient care area of SNCU in available or not. Radiant warmer Yes ☐ No ☐ - Focus light Yes ☐ No ☐ - Oxygen concentrator Yes ☐ No ☐ - Single surface Phototherapy Yes ☐ No ☐ - Double surface phototherapy Yes ☐ No ☐ - Electric surface Phototherapy Yes ☐ No ☐ - Electric suction Machine Yes ☐ No ☐ - Air conditioner Yes ☐ No ☐			

Consumables Supply			
- Needle, <u>dispo</u>, 24g - Needle, <u>dispo</u>, 26g - IV cannula 24g - Gloves - IV set disposable <u>pediatric</u> - Cotton wool - Gauze piece - Betadine - Adhesive tape - Scalpel blade - Umbilical venous catheter - Blood transfusion set - Nasal prongs - Shoulder roll - Eye patches - Distilled water for humidification 3 Way catheter - Pad (made for cotton and gauze) - ID tags - Splints <u>Pediatric</u> burette sets - Examination gloves boxes - NG feeding tubes size 6 and 8	Yes No	☐ ☐	☐ ☐

Medicine Availability				
IV Fluids				
Medications Enter Quantity	Yes	No	Quantity	
5% Dextrose	Yes	No	Quantity	
10% Dextrose	Yes	No	Quantity	
Ringers Lactate	Yes	No	Quantity	
Normal saline (NS)	Yes	No	Quantity	
<u>Isolyte P</u>	Yes	No	Quantity	
25% Dextrose vials	Yes	No	Quantity	
Glucose 50% (Injection)	Yes	No	Quantity	
Antibiotics				
Inj. Ampicillin	Yes	No	Quantity	
Inj. Cefotaxime	Yes	No	Quantity	
Inj. Gentamicin	Yes	No	Quantity	
Inj. Amikacin	Yes	No	Quantity	
Inj. Amoxycillin + Cloxacillin	Yes	No	Quantity	
Metronidazole (Injection)	Yes	No	Quantity	
Inj. Vitamin K1 (Phytonadione)	Yes	No	Quantity	
Analgesic				
Inj. Paracetamol	Yes	No	Quantity	
<u>Diclofenac</u> sodium (Injection)	Yes	No	Quantity	
Emergency Medicine				
<u>Inj. Aminophylline</u>	Yes	No	Quantity	
Inj. Phenobarbitone	Yes	No	Quantity	
Inj. Phenytoin	Yes	No	Quantity	
Inj. Calcium gluconate	Yes	No	Quantity	
Inj. Dopamine	Yes	No	Quantity	
<u>Inj. Midazolam</u>	Yes	No	Quantity	
Diazepam	Yes	No	Quantity	
Inj. Adrenaline	Yes	No	Quantity	
Tab. <u>Perinorm</u> for mother	Yes	No	Quantity	
<u>Inj. Dexamethasone</u>	Yes	No	Quantity	
Inj. Hydrocortisone	Yes	No	Quantity	
Inj. Potassium Chloride	Yes	No	Quantity	
Inj. Magnesium <u>Sulphate</u> (50%)	Yes	No	Quantity	
Sodium Bicarbonate	Yes	No	Quantity	
Atropine (<u>Injection</u>)	Yes	No	Quantity	
Fruzemide (Injection)	Yes	No	Quantity	

REFERENCES

1. Lawn, J.E., Cousens, S., Zupan, J. and Lancet Neonatal Survival Steering Team, 2005. 4 million neonatal deaths: when? Where? Why?. *The lancet*, 365(9462), pp.891-900.
2. Darmstadt, G.L., Bhutta, Z.A., Cousens, S., Adam, T., Walker, N., De Bernis, L. and Lancet Neonatal Survival Steering Team, 2005. Evidence-based, cost-effective interventions: how many newborn babies can we save?. *The Lancet*, 365(9463), pp.977-988.
3. Facility based newborn care operational guide: Guidelines for planning and implementation, Ministry of Health & Family Welfare, Government of India, 2011.
4. Neogi, S.B., Malhotra, S., Zodpey, S. and Mohan, P., 2011. Assessment of special care newborn units in India. *Journal of health, population, and nutrition*, 29(5), p.500.
5. Singh, M., Paul, V.K. and Deorari, A.K., 1997. The state of India's neonatal units in the mid- nineties. *Indian pediatrics*, 34, pp.696-701.
6. Neogi, S.B., Khanna, R., Chauhan, M., Sharma, J., Gupta, G., Srivastava, R., Prabhakar, P.K., Khera, A., Kumar, R., Zodpey, S. and Paul, V.K., 2016. Inpatient care of small and sick newborns in healthcare facilities. *Journal of Perinatology*, 36(s3), p.S18.
7. Sen, A., Mahalanabis, D., Singh, A.K., Som, T.K. and Bandyopadhyay, S., 2005. Development and effects of a neonatal care unit in rural India. *The Lancet*, 366(9479), pp.27-28.
8. Sen, A., Mahalanabis, D., Singh, A.K., Som, T.K. and Bandyopadhyay, S., 2009. Impact of a district level sick newborn care unit on neonatal mortality rate: 2-year follow-up. *Journal of Perinatology*, 29(2), p.150.
9. Darmstadt, G.L., Bhutta, Z.A., Cousens, S., Adam, T., Walker, N., De Bernis, L. and Lancet Neonatal Survival Steering Team, 2005. Evidence-based, cost-effective interventions: how many newborn babies can we save?. *The Lancet*, 365(9463), pp.977-988.
10. Agarwal, R., Agarwal, K., Acharya, U., Christina, P., Sreenivas, V. and Seetaraman, S., 2007. Impact of simple interventions on neonatal mortality in a low-resource teaching hospital in India. *Journal of perinatology*, 27(1), p.44.
11. Biswas, A.B., Nandy, S., Sinha, R.N., Das, D.K., Roy, R.N. and Datta, S., 2004. Status of maternal and new born care at first referral units in the state of West Bengal. *Indian journal of public health*, 48(1), pp.21-26.
12. Casey, S.E., Mitchell, K.T., Amisi, I.M., Haliza, M.M., Aveledi, B., Kalenga, P. and Austin, J., 2009. Use of facility assessment data to improve reproductive health service delivery in the Democratic Republic of the Congo. *Conflict and Health*, 3(1)
13. Opondo, C., Ntoburi, S., Wagai, J., Wafula, J., Wasunna, A., Were, F., Wamae, A., Migiro, S., Irimu, G. and English, M., 2009. Are hospitals prepared to support newborn survival?—an evaluation of eight first-referral level hospitals in Kenya. *Tropical Medicine & International Health*, 14(10), pp.1165-1172.

14. Neogi, S.B., Malhotra, S., Zodpey, S. and Mohan, P., 2012. Does facility-based newborn care improve neonatal outcomes? A review of evidence. *Indian pediatrics*, 49(8), pp.651-658.
15. Oza, S., Lawn, J.E., Hogan, D.R., Mathers, C. and Cousens, S.N., 2014. Neonatal cause-of-death estimates for the early and late neonatal periods for 194 countries: 2000–2013. *Bulletin of the World Health Organization*, 93, pp.19-28.
16. SNCU tool, “NCRC & DEPT OF NEONATOLOGY IPGMER” Kolkata complete guideline and toolkit for building up a fully functional SNCU.
17. Rakholia, R., Rawat, V., Bano, M. and Singh, G., 2014. Neonatal morbidity and mortality of sick newborns admitted in a teaching hospital of Uttarakhand. *CHRISMED Journal of Health and Research*, 1(4), p.228.
18. Shaziya, S., Ramya, B. and Shruthi, N.S., 2016. Morbidities and survival outcome of admitted low birth weight neonates in non-teaching district hospital SNCU. *International Journal of Contemporary Pediatrics*, 3(3), pp.828-832.
19. Mahore, R.K., Dixit, S., Bansal, S.B., Yesikar, V. and Mehta, N., 2015. A study to assess the association of set-up being provided and beneficiary assessment of Special Care Newborn Units (SCNUs) of indore and Ujjain divisions of MP at different levels. *JOURNAL OF EVOLUTION OF MEDICAL AND DENTAL SCIENCES-JEMDS*, 4(16), pp.2664-2671.
20. Neogi, S.B., Malhotra, S., Zodpey, S. and Mohan, P., 2014. Is the number of beds in special care newborn units in India adequate?. *The National medical journal of India*, 27(2), p.102.
21. Neogi, S.B., Malhotra, S., Zodpey, S. and Mohan, P., 2011. Challenges in scaling up of special care newborn units-lessons from India. *Indian pediatrics*, 48(12), pp.931-935.
22. NFHS fact sheet 2015-16
23. Indian Newborn Action Plan, 2014. Ministry of Health and Family Welfare. Government of India.
24. Home Based Newborn Care Guidelines. Ministry of Health and Family Welfare. Government of India