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## ORIGINAL ARTICLE

### READINESS OF PRIMARY HEALTH CARE UNITS IN ADDRESSING FACILITY-BASED NEWBORN CARE IN ETHIOPIA

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#### ABSTRACT

**Introduction:** Neonatal mortality declined by 41% in the past 15 years but remains unacceptably high in Ethiopia (29/100 live births). Further reductions in neonatal mortality are a major priority and will require improvements in care for mothers and newborns during pregnancy, postnatally, and especially around the time of delivery. These improvements rely on the readiness of facilities to provide high quality services to those who need them.

**Objective:** To assess the facility readiness for newborn care in Ethiopia.

**Methods:** The study data is drawn from a cross-sectional national health facility assessment of 175 health centers and 120 hospitals conducted between December 2016 and February 2017. The study focused on the availability and functionality of newborn care corner and related services and newborn intensive care units in the nine regions and two city administrations of Ethiopia.

**Results:** The study found that 91% of health centers had newborn corners established within labor rooms although wide variations existed between regions. Radiant warmers were assembled in nearly all HCs (82%), however oxygen was used in only 29% of HCs. Most of the hospitals had received radiant warmers with oxygen cylinders, phototherapy, incubators, and continuous positive airway pressure sets. Radiant warmers with oxygen cylinders and phototherapy arrived ready to use. However, only 77% of hospitals had assembled and used incubators and only 11% of hospitals had assembled and used continuous positive airway pressure sets.

**Conclusion:** While facilities have often been provided with equipment necessary for the management of neonates, gaps in assembly, functioning and use of equipment for service provision undermine potential gains in improved health.

**Key words:** Newborn corner, Newborn Intensive Care Unit, availability, functionality.

#### INTRODUCTION

Availability of quality newborn care services at all levels is critical for reducing newborn deaths from preventable causes. The government has put newborn survival at the center of the health systems transformation plan (HSTP) with the Newborn and Child Survival Strategy (2015-2020). This and other national strategies emphasize reaching every mother and newborn with quality maternal and newborn health (MNH) interventions.

In addition to the Community Based Newborn Care described elsewhere, the Ethiopian government has made large scale investments in facility-based newborn care. This has included massive training of health care providers in essential newborn care (ENC) and neonatal intensive care (NIC), establishment of newborn corners (NBCs) in health centers (HCs) and neonatal intensive care units (NICUs) in hospitals.

The national newborn facility readiness assessment was conducted to assess the capacity of the system to provide comprehensive health services to newborns and to serve as a baseline for future strengthening activities and investments.

#### MATERIALS AND METHOD

**Design:** This study uses data from a cross-sectional national health facility assessment of 175 HCs and 121 hospitals that was conducted between December 2016 and February 2017. Data were collected on the availability and functionality of NBCs and NICUs.

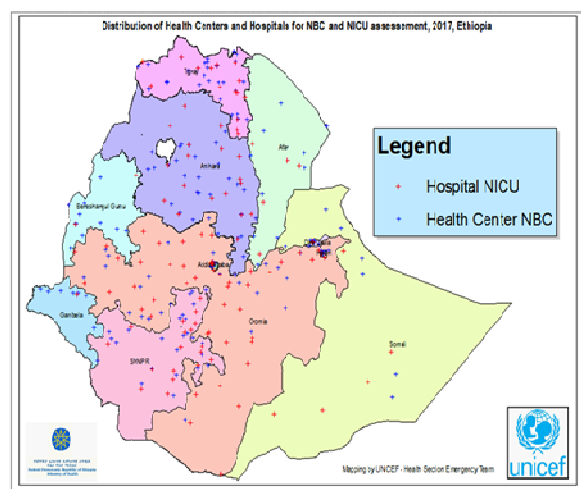
**Setting:** The study area covered 175 HCs that had received the NBC equipment and had trained nurses in their maternity wards, and 121 hospitals that had received NICU equipment and training. Facilities

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**Intervention.** Since 2008, the Federal Ministry of Health (FMOH) has established NBCs in 1523 health centers throughout the country in order to provide essential care to all newborns. An NBC includes the space within a delivery or operating room area that is made available for ENC, a health worker trained in NBC, and basic lifesaving commodities needed for newborns. The services that are provided in the newborn corner include essential care at birth, neonatal resuscitation, provision of warmth, support to early initiation of breastfeeding, and weighing. In addition, health care providers are trained to stabilize and care for near-term infants (35-37 weeks) and to stabilize newborn infants who are less than 35 weeks' gestation or who are ill until they can be transferred to a facility providing specialty neonatal care.

At the end of Ethiopian fiscal year 2008, 2,782 health centers had established newborn corners, and two health workers from each of these health centers had been trained in ENC. ENC equipment and supplies such as radiant warmers, resuscitation bags, suction bulb syringes, and newborn registration books were also provided for delivery rooms in each health facility.

Since 2010, NICUs have been established in 184 hospitals for care of sick and preterm or low birth weight newborns (Figure 1). Nine hundred twenty nurses, 192 physicians, 24 health science college teachers and various health officers have been trained to manage sick and premature newborns appropriately. In addition, these hospitals have received NICU equipment that includes continuous CPAP sets, neonatal beds, phototherapy apparatus, and incubators.



**Figure 1:** Distribution of HCs and hospitals.

**Subjects, Sample Size, and Sampling.** The sample included 175 HCs with NBCs, and all hospitals that have received NICU equipment and training in the past two years. For selection of NBCs, stratified random sampling was used. Regions were divided into two strata defined by socio-economic development, infrastructure availability and strength of their health system. Thirty HCs were randomly selected from each of the four better off regions in the first stratum; Amhara, Oromia, SNNPR and Tigray. Ten HCs were selected from each of the less well-off regions in the second stratum; Afar, Benishangul Gumuz, Somali, and Gambela regions.

**Field Methods, Measurements, and data analysis:**

The newborn corner assessment questionnaire included a checklist, interview questionnaires, and observation forms. Topics covered included health service organization, manpower, equipment and supplies, and other logistics and job aids. A desk review of registers and other documents was also conducted.

Health professionals with recent experience in implementing child health programs and facility-based NBC conducted the assessment. The team also included personnel from the FMOH, the Ethiopian Paediatric Society, Regional Health Bureaus (RHBs), and UNICEF. The data were entered and cleaned using EPI-Info-7 and analysis was done using STATA 13. Coverage of NBC or NICU equipment, human resources, services, and procedures at facilities was calculated with regional variations.

**Ethical Aspects:** The assessment was facility based and did not involve direct investigation or interview with individuals. Facility assessments were done under the auspices of and with the participation of the FMOH and RHBs.

## RESULTS

A total of 175 HCs and 120 hospitals in 11 regions were assessed all of which had received newborn care support in the previous two years. Electricity availability is crucial for delivering NBC and NICU services. Eighty two percent of HCs and all hospitals have access to electrical power, although the reliability, source and costs were not assessed. Emerging or less well-developed regions have fewer higher-level hospitals and less access to electricity.

Out of 175 health centers visited, 130 had at least one midwife or nurse trained in ENC (Table 1). This varied widely between regions from 38% in Afar to 67% in Addis Ababa and 100% in Benshangul Gumuz. However, only 44% of these trained midwives or nurses were assigned to the delivery room where newborn corners were established.

In Benishangul Gumuz, all HCs had at least 2 nurses trained in ENC, but only 56% had one of the trained midwives or nurses present in the delivery room. In Addis Ababa, only 22% of health centers had a midwife or nurse trained in ENC present in the delivery room.

**Table 1:** Availability of trained staff on NBC/NICU

Region	Hospital (n=120)		Health center =175)	
	Nurses trained in NICU	NICU trained Nurses working in Neonatal care	Midwives/ nurses trained in NBC	NBC trained Midwives/ Nurses working in delivery case team
	%	%	%	%
Addis Ababa	100	78	67	22
Afar	60	9	40	22
Amhara	100	52	94	56
B_Gumuz	100	100	100	57
Dire Dawa	100	92	78	54
Gambella	100	27	38	25
Harari	100	89	100	40
Oromia	95	93	56	45
SNNP	95	86	63	39
Somali	80	25	50	14
Tigray	100	80	93	61
Total	95	69	76	44

Nearly all hospitals (95%) had at least one nurse trained in neonatal intensive care services except in Afar where 60% of the hospitals had trained nurses. However, only 69% of these nurses were assigned or present in the NICUs. The lack of trained nurses present in NICUs is more pronounced in the emerging regions with only 9% in Afar, 25% in Somali and 27% in Gambella

The assessment found a total of 94 general practitioners, 33 pediatricians, and 8 neonatologists providing neonatal intensive care services in the hospitals. Half of the neonatologists were concentrated in Addis Ababa hospitals. Afar did not have either pediatricians or neonatologists in facilities.

#### **Health service organization:**

##### **Health centers**

The study found that 91% of health centers had newborn corners within the labor room, although wide variations existed between regions. Overall, resuscitation bags and masks were found in 93% to 95% of health centers. They were available in fewer Somali and Gambella HCs (62% and 75% respectively).

Radiant warmers and oxygen cylinders were available in 84% of health centers. Radiant warmers were assembled in nearly all (82%) health centers. However, oxygen was used in only 29% of health centers due to a lack of oxygen supply, a lack of technical skill to fit the regulator, and/or a failure to assemble the regulator. (See Table 2).

Essential medicines, specifically Vitamin K and tetracycline eye ointment, were available in 80% of the health centers. Chlorhexidine was only available in 20% of facilities despite the recent launch of the community intervention to provide it for cord care of newborns.

**Hospitals:** In most of the hospitals, the NICU rooms are narrow and did not have separate rooms for preterm or babies with infections. In addition, 66% of hospitals did not have kangaroo mother care and 51% did not have step-down rooms. The availability of resuscitation bags and face masks was high in most regions (over 90%) except in Gambella (75%) and Somali (63%).

Nearly all hospitals had received radiant warmers and oxygen cylinders (92%), phototherapy machines (94%), incubators (94%) and CPAP (73%) (Table 3).

While nearly all radiant warmers, oxygen cylinder and phototherapy machines were assembled and in use, only 77% of incubators and 11% of CPAP machines were assembled and in use. The main reasons for not assembling CPAP machines were missing parts and lack of space.

**Table 2:** Availability of ENC Equipment in HCs

Region	Number of HC assted	% of HCs with assembled radiant warmers	% HCs with oxygen cylinder received & being used	% HCs with neonatal resuscitation bag	% of HCs with face masks
Addis Ababa	9	100	44.4	100	100
Afar	10	100	50	90	90
Amhara	32	100	6.3	100	100
Benshangul Gumuz	10	90	10	100	100
Dire Dawa	9	100	100	100	100
Gambella	8	100	62.5	75	75
Harari	8	100	100	100	100
Oromia	27	95	7.4	96.3	96
SNNP	24	95	0	95.8	83
Somali	8	100	12.5	62.5	63
Tigray	30	93	46.7	96.7	93
Total	175	96	29.1	94.9	93

**Table 3:** Availability, assembly and use of key NICU equipment's in Hospital (n=120)

Region	Radiant warmer received and assembled		Oxygen cylinder in use	Phototherapy machine		Incubators		CPAP assembled and were used	
	#	%	%	re-ceived	assembled and were used	re-ceived	assembled and were used	re-ceived	assembled and were used
				%	%	%	%	%	%
Addis Ababa	7	100	100	100	100	100	100	100	57
Afar	5	100	100	100	100	100	40	40	0
Amhara	18	94	94	100	100	100	80	89	5
B_Gumuz	2	100	100	100	100	100	50	50	0
Dire Dawa	2	100	100	100	100	100	100	100	0
Gambella	1	100	100	100	100	100	100	100	0
Harari	2	100	100	100	100	100	50	50	0
Oromia	44	82	82	93	81	91	74	70	16
SNNP	19	95	95	95	95	100	79	84	0
Somali	5	100	100	40	40	60	40	0	0
Tigray	15	100	100	100	100	100	93	73	0
Total	120	92	92	94	93	96	77	73	11

Other services available in hospitals included ultrasound (70%), X-ray (91%), hemoglobin meters or centrifuges (90%), electrocardiogram (11%), echocardiograph (18%), and blood gas analyzers (10%).

The availability of glucometers (64%), umbilical catheters (11%), and exchange transfusion sets (8%) highlighted a big gap in exchange transfusion set availability (Table 4).

**Table 4:** available and functional of key NICU equipment and services in assessed hospitals (n=120)

Regions	n=120	#	Pulse Oximeter %	Physiocal vital Sign monitoring system %	Electrocardiogram for newborn %	Echocardiograph Service %	Blood gas Analyzer %	Ultra Sound Service %	X-ray Service %	Hemoglobin meter, centrifuge %	Exchange transfusion set three way valve %	Glucometer %	Umbilical Catheter %
Addis Ababa	7	7	57	43	29	29	14	57	86	57	29	71	100
Afar	5	5	80	0	20	20	0	100	80	80	0	60	0
Amhara	18	18	56	6	0	11	0	22	94	100	6	61	100
B_Gumuz	2	2	100	100	0	0	0	100	100	100	50	100	0
Dire Dawa	2	2	100	50	0	50	0	0	100	100	0	100	0
Gambella	1	1	100	0	0	0	0	100	100	100	0	0	0
Harari	2	2	100	50	0	50	100	100	100	100	0	100	0
Oromia	44	44	66	9	16	16	14	89	89	86	2	64	100
SNNP	19	19	89	32	5	21	0	42	89	100	0	53	100
Somali	5	5	20	0	20	60	0	100	100	80	0	20	0
Tigray	15	15	80	33	7	7	20	100	100	100	33	87	100
Total	120	120	70	19	11	18	10	71	92	91	8	64	100

Hypothermia correction treatment and oxygen administration were widely available (93% and 95% respectively) but lumbar puncture services were only available in 47% of hospitals. Regional differences were high with less than 50% of hospitals in Afar, Gambella, Oromia, and Tigray offering them. Nasogastric tubes and blood transfusions were available in 93% and 84% of hospitals, respectively. Plasma transfusion was available in 84%, partial exchange was available in 14%, and double exchange was available in 13% of hospitals. None of these services or procedures were available in Afar, Benshangul Gumuz, Gambella, or Somali.

The treatment of neonatal sepsis and infection was available in most of the hospitals in the sample (89%). The availability of hyaline membrane disease treatment with CPAP, intubation, and ventilation was 48% of hospitals, with most regions offering the service in less than 50% of them. The availability of hyperbilirubinemia management with phototherapy and the management of asphyxiated babies were 94% and 90% of hospitals, respectively. The availability of surgical correction for congenital abnormalities was only 32%, and this service was not available in Dire Dawa, Gambella, or Harari.

The availability of both manual and electronic data recording systems was 50%, and only about two thirds of hospitals used the specified recording and reporting formats. The availability and use of registration and reporting was very low in Afar, Oromia, and Somali but was relatively better in Addis Ababa, Dire Dawa, SNNP, and Tigray.

## DISCUSSION

This assessment is the first that has examined the functionality of NBCs and NICUs at a national level after considerable investment by the government. In general, basic infrastructure, equipment and supplies, human resources and the availability of services is better in urbanized areas or city states (Dire Dawa, Harari, Addis Ababa) and somewhat better in the four large agrarian regions (Amhara, Oromia, SNNPR, Tigray). Emerging regions lag behind (Afar, Benishangul Gumuz, Somali, Gambela) and reflects the difficulties of geography, dispersed population, nomadic culture, educational level. The findings of this study were corroborated by the findings of 2016 EMOC assessment (national cross-sectional census of public and private health facilities). The EmONC survey reveals that resuscitation equipment such as neonatal resuscitating tables, mucus extractors or simple suction, neonatal face masks (size 0 or size 1), and neonatal ambu (ventilator) bags were available in more than 70 percent of all facilities. Most supplies and equipment utilized for small and sick newborns were not widely available; fewer than half of the facilities reported their availability (8).

### *Infrastructure and Equipment*

Given the lack of dedicated or appropriate space for newborn care in hospitals, NICU space standards should be developed and enacted. Hospitals may need support to design and retrofit space to best meet clinical needs.

Some expensive equipment such as CPAP machines are extremely underutilized, often because they are not assembled or functional. Only 50% of hospitals had trained bio-medical engineers or technicians for assembly or maintenance. The lack of training, manuals and spare parts contributes to difficulties incorporating it into clinical practice and ultimately may lead to equipment failure.

Neither manual nor electronic data systems were fully functional. In general, the use of registration and reporting forms was relatively better in urban settings and in the agrarian regions with the exception of Oromia. This will need improvement to support making informed decisions about the way forward.

### *Human Resources*

The presence of qualified and experienced staff is essential to provide care for sick newborns in these facilities. Most HCs have few midwives or nurses trained in ENC available for births and postnatal care in the delivery room. This is a serious gap that raises the question of effective utilization of newborn corners, despite their availability in nearly all HCs.

Specialists such as neonatologists and pediatricians are critical providers for hospital-based neonatal services and also to serve as clinical trainers and supervisors for other health workers. To close this gap in the short term, large investments have been made in in-service training for NICU nurses. Ninety five percent of hospitals had trained nurses but only 65% of them were working in the NICU due to scheduling difficulties and staff turnover. In these cases, re-posting of trained nurses from one service to NICU service within the same facility may be an effective strategy that is immediately implementable. New mechanisms to address these challenges need to be developed and implemented urgently.

### *Utilization of key services*

NBCs do not seem to be fully functional as demonstrated by the low utilization of oxygen. Since oxygen is important for services offered in the HC context, existing constraints should be reviewed and more realistic support to incorporating it provided. Finalizing and implementing NICU standardization needs to be a priority to ensure that all hospitals have the necessary equipment, supplies, procedures, manpower, and space. Taking into consideration the regional variations, a mechanism needs to be in place to address assessment gaps and the above shortage of procedures and services in hospitals. Ensuring when purchasing equipment for the neonatal unit the technical requirements to operate the equipment and any pre-purchase installation requirements; any purchasing should include installation, training, and immediate back up and repair.

### *Limitation*

There are some limitations to this assessment: it does neither evaluate the utilization of newborn corners nor assess the skills of health care providers.

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### *Conflict of interest:*

Authors have no conflicts of interest to declare.

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