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FOREWORD

It is my pleasure to have seen that the publication of this Special Issue of the Ethiopian Medical Journal (EMJ) on Community Based Newborn Care (CBNC) is realized. CBNC provides lifesaving services and is part of our commitment to reducing the morbidity and mortality among newborns, thereby also enhancing wellbeing among their families. Indeed, Ethiopia is one of the first countries in the world to provide these services at the community level, which has been now been scaled up and provided nationally. The dissemination of our experience and lessons learned to date through this Special Issue of the EMJ, I hope, will encourage other country programs to adopt similar approaches to improve newborn health.

During the period 2000 - 2016, Ethiopia reduced under-five child mortality by 60%, a reduction from 166 to 67 per 1000 live births. The leadership and political commitment from the government, the advances in evidence-based interventions, and the improvement in health, nutrition and family planning services provided the impetus for this notable achievement. It is widely recognized that Ethiopia has been at the forefront in reaching vulnerable women and children, especially in rural areas, rapidly and progressively scaling-up its Health Extension Programme (HEP) since 2003. More than 38,000 salaried Health Extension Workers (HEWs), the majority of them young women, have been deployed to over 15,000 health posts across the country. Women volunteers organized under the Health Development Army and working with communities have been instrumental in expanding healthy behaviours and practices among the population, including early care seeking for newborn illnesses.

The Federal Ministry of Health (FMOH) introduced and scaled-up Integrated Community Case Management during 2010-2012. The package constitutes high quality basic curative interventions for children under five years of age. When referral is not possible and depending on the diagnosis, HEWs provide treatment with oral antibiotics, oral rehydration solution/zinc, or anti-malarial drugs. However, evidence showed limited care seeking by young infants under-two months of age, a group vulnerable to serious infection. Combined with the observation that newborn mortality declined, much more slowly since 2000, accounting for some 43% of all under-five deaths, the FMOH intensified relevant and required interventions.

The FMOH designed and launched the implementation of CBNC in 2013. This was incorporated into the National Newborn and Child Survival Strategy. Guidelines, training materials, and provider support tools were developed and made available to service providers. Under the leadership of the Ministry, resources were mobilized and partners, including the United Nations Children's Fund (UNICEF), The United States Agency for International Development (USAID), the World Health Organization (WHO), Children's Investment Fund Foundation (CIFF) and technical agencies worked together to roll out and support implementation in all of the four agrarian regions in the country. CBNC has been initiated in selected woredas in the regions requiring special support to learn from and replicate in the remaining woredas. The program is a priority of the government's Health Sector Transformation Plan (HSTP) and is to be expanded nationwide by the end of the first HSTP period.

This Special Issue of EMJ documents the efforts of the government and development partners to introduce and scale up CBNC to improve the coverage and quality of services, to create demand, and to strengthen health system performance. I sincerely believe that the evidence generated will be instrumental in improving policy and decision making on critical issues related to CBNC in Ethiopia and beyond.

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Mary E. Taylor, Abeba Bekele. *Ethiop Med J, 2019, Supp. 3*

OVERVIEW

COMMUNITY BASED NEWBORN CARE IN ETHIOPIA: INTRODUCTION TO THE SPECIAL ISSUE

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In 2012, Ethiopia achieved an under-five mortality rate (U5MR) of 68 per 1000 live births, and therefore successfully reached Millennium Development Goal 4, having reduced the U5MR by two-thirds from its level of 204 in 1990m(1). Improvements in nutrition, immunization, management of childhood diarrhea and pneumonia, water and sanitation, and use of insecticide treated bed nets contributed to Ethiopia's success. However, most of the benefit was realized by reducing mortality among older children, as the neonatal mortality rate (NMR) declined more gradually from 54 to 29 per 1000 live births. By 2013, neonates accounted for fully 43% of all under-five deaths (2).

Earlier, the Ethiopian Ministry of Health (FMOH) had prioritized newborn health in its fourth Health Sector Development Plan (HSDP IV) and the Roadmap for Accelerating the Reduction of Maternal and Newborn Mortality (2011), aiming to reduce NMR to 15 (3,4). Strategies to prevent deaths due to infections, birth asphyxia, and complications of preterm birth were developed and cascaded to hospitals and health centers, building on Integrated Management of Child Illness (IMCI) and facility delivery programs (5). Efforts were also initiated to increase access to services through the Health Extension Program (HEP) by upgrading of Health Extension Worker (HEW) capacities (6). However, utilization of primary care services for sick children, particularly newborns, lagged behind expectations. Reaching Ethiopia's large rural population consistently with care when and where it was needed proved difficult, and barriers to care-seeking by families such as distance, transport, cost, traditional beliefs, and lack of satisfaction with care were widespread (2).

From 2010 to 2012, the FMOH phased-in the integrated community case management (iCCM) program to reach more children effectively at community level with life-saving curative interventions (7). ICCM built on the HEP platform and was successfully scaled nationally through the efforts of the MOH, UNICEF, other donors, and non-governmental organization partners. Evaluation demonstrated strong implementation and adequate quality of care provided by trained HEWs, although utilization continued to be lower than hoped (8,9). Detailed lessons learned from the iCCM experience were extensively documented earlier in a special supplement to the Ethiopian Medical Journal (10).

What happened with newborns? Under iCCM guidelines, treatment for sick children under two months required referral to higher level facilities. There was even more limited care-seeking for children in this age group despite their higher risk of morbidity and mortality, especially in the first week of life. With newborns accounting for the largest share of child mortality in Ethiopia and 27% of newborn deaths estimated to be due to serious neonatal infections, the FMOH focused on developing a program to increase access by building on their primary care system strengths - HEWs, iCCM and the Health Extension Platform (11,12).

The Community-Based Newborn Care program design was based on global evidence of effective newborn care interventions, effectiveness trials of service packages, large scale experience in other countries, and the combined experience of projects in Ethiopia. Studies in India and Bangladesh had demonstrated that community health workers could diagnose and treat neonatal infections when referral was not possible, resulting in reduced mortality (13,14). Nepal had been an early leader in scaling newborn care to communities and provided policy and program guidance (15). In Ethiopia, a research trial to demonstrate the feasibility and impact of identifying and treating possible serious bacterial infection (PSBI) was underway, providing valuable information on how to understand care-seeking and implement services within the existing health system (16). Other HEP-related health projects provided information from evaluations, small studies, and service improvement efforts.

The goal of Ethiopia's Community-Based Newborn Care program is to reduce newborn mortality through the provision of high quality maternal and newborn health services and community demand creation (Table 1).

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Table 1: Components of First CBNC Package (2013)*

• Early Identification of Pregnancy
• Provision of Focused Antenatal Care (ANC)
• Promotion of institutional delivery
• Provision of misoprostol in case of home deliveries or deliveries at health post level
• Provision of immediate newborn care, including application of Chlorohexidine on cord
• Recognition of asphyxia, initial stimulation and resuscitation of newborn baby
• Prevention and management of hypothermia
• Management of pre-term and/or low birth weight neonates
• Management of neonatal sepsis/very severe disease at community level

** Source: FMOH, Community-Based Newborn Care Implementation Plan, Ethiopia Ministry of Health, 2013.*

The purpose of this supplement is to document the implementation of the national CBNC intervention in Ethiopia in order to identify implementation strengths and weaknesses, as well as to generate knowledge for future national and international public health interventions. These papers were written to provide the first comprehensive view of Ethiopia's newborn care efforts and lessons learned to date.

The first four papers in this supplement including the Forward by the Minister of Health (18), Bekele and co-author's editorial describing current newborn health policy and guidelines (19), Taylor and co-author's description of the Four Cs of PSBI (20), and Pearson and co-author's application of the Lives Saved Tool to CBNC (21), lay out the framing of this program in the context of the Ethiopian Ministry of Health's conceptual approach and priorities. The middle section, consisting of six papers, describe components and systems that played important roles in this effort. These papers review facility readiness (22), supportive supervision (23), supply and logistics (24), service delivery performance (25), referral (26), and utilization and care-seeking (27). The penultimate set of four papers go into detail on some of the efforts carried out for specific interventions including newborn corners (28), chlorhexidine for cord care (29), postnatal care and identification of PSBI (30) or for the specific location of Afar (31). The final paper discusses key aspects of sustainability for ongoing and expanded efforts (32)

Together, these papers provide the first holistic account of a vitally important step in Ethiopia's march toward better health for all its children.

We acknowledge the contributions of the many committed partners who have implemented and worked to improve the health of newborns in Ethiopia's communities. They include the Federal Ministry of Health, UNICEF, USAID, the Bill & Melinda Gates Foundation and other donors, implementing partners from non-governmental organizations and universities, Health Extension Workers and their supervisors, and the families who have experienced newborn illness and sought care from the system.

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Mary E. Taylor. *Ethiop Med J, 2019, Supp. 3*

PERSPECTIVE

THE FOUR CS IN ETHIOPIA: FRAMING A COMMUNITY APPROACH TO MANAGEMENT OF POSSIBLE SERIOUS BACTERIAL INFECTION IN NEONATES

Mary E. Taylor, PhD[1*]

ABSTRACT

Ethiopia's progress in reducing neonatal mortality has not kept pace with its reduction in under-five mortality. Improved strategies were needed to address newborn deaths, particularly those due to possible serious bacterial infections in communities.

Based on international experiences applied to the Ethiopian healthcare system and traditional cultural practices among its diverse rural population, a framing model was developed to design and implement more effective community-based newborn care efforts. This model is called the "Four Cs", for Contact, to establish strong connection between the newborn and the health system; Capture/Case Identification, to assure that sick newborns could be rapidly identified; Care, to start treatment promptly even when referral was not possible; and Completion, to be certain that the full treatment course was completed. Each of these simple words encompassed a set of operational and behavioral components and encouraged a holistic approach to newborn care.

The model provided a good technical foundation along the continuum of care from the pre-pregnancy to postnatal period and was practically applicable. Efforts to focus attention on critical constraints to care provision and care seeking, while maintaining a vision of newborns and their families at the center allowed early action to solve constraints.

Key words: *Four C's, Contact, Capture, Care, Completion, PSBI*

INTRODUCTION

In countries with poorly resourced health care systems and high levels of home delivery, newborn deaths due to possible serious bacterial infections (PSBI) remain a critical challenge to reducing child mortality (1). There are effective, low-cost interventions to prevent and treat newborn infections, but while the technical approaches have been proven in clinical settings, there are critical real-world demand and supply side barriers that impede their effective application (2). Many of these same barriers also result in low use of antenatal care (ANC), skilled birth attendance (SBA), and postnatal care (PNC).

In Ethiopia's rural, agrarian regions most people reach services through the Health Extension Program (HEP), with Health Extension Workers (HEWs) as the most frequent point of contact (Figure 1). The 2015 evaluation of one large scale project (Last 10 Kilometers) reported that nearly 50% of women were visited by HEWs in the previous six months and 67% of women had visited health posts in the previous year (3). Another study demonstrated that increased intensity of HEW and Health Development Army (HDA) outreach activities was associated with increased ANC, birth preparedness, and PNC (4). HEWs, along with the volunteer Health Development Army (HDA), are the critical link to reaching women and newborns in their homes.

In this health system context, Ethiopia's health leadership and experts set out to design the Community Based Newborn Care program to make management of PSBI in newborns more accessible by embedding it in the HEP.

Consideration of the key needs and challenges to care for newborns with PSBI

To prevent and treat neonatal infections, a range of contacts throughout the mother and newborn time continuum

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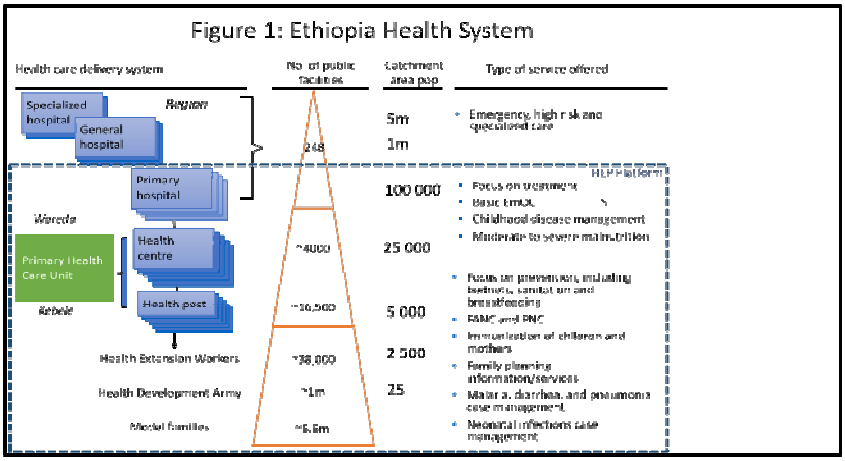

were needed, including during pregnancy, delivery, immediately after birth, in the first week of life, and over the first 28 days. At the time the design group was working in Ethiopia, coverage of these services was low (5). Only a third of women received ANC, 10% of deliveries were attended by a health professional and less than 1% of deliveries were attended by HEWs. Postnatal care within 48 hours of birth was very low even in areas of targeted project support. By policy, care for PSBI should have been available in hospitals, but in practice few newborns were seen by health staff, and system challenges such as drug supplies rendered services unreliable (6).

Several mutually reinforcing cultural beliefs and practices in Ethiopia act as strong barriers to care-seeking by families for newborn illness. Seclusion of the newborn for one to two months after birth is considered to protect the child from exposure to dangerous influences. The understanding of the origin of newborn illness as supernatural or rooted in pregnancy requires traditional cures unrelated to modern medical practice. Furthermore, there is widespread perception that care is not available for newborns in health facilities. Unless and until family attitudes change toward these issues, the ability to respond to newborn illness as well as accessing care is destined to remain low (7).

The Four 'Cs'

Most of the successful community management approaches that have been demonstrated in other countries involved behavior change as well as clinical treatment for neonatal infections by community health workers. They often engaged volunteers residing near households and families for more intensive family contact. Lessons learned from these experiences helped define how programs should be implemented within health systems to achieve high coverage and quality, and thus achieve impact (8-12).

In reviewing key elements of success elsewhere, it became apparent that a unified conceptual model that could readily be applied in the Ethiopian context was needed. While delivery platforms vary in different settings, four essential themes emerged from our analysis that are required for community management of neonatal infections to have impact.

We term these the "Four Cs":

- antenatal and postnatal *contact* with the mother and newborn;
- capture, or case identification, of newborns with signs of possible serious bacterial infection;
- care, or treatment that is appropriate and initiated as early as possible; and
- completion of a full course of appropriate antibiotics.

Program implementers and managers found this helpful in seeing the whole picture of CBNC. If Ethiopia could ensure these 'Four Cs' by building case management of PSBI on the foundation of the integrated community case management (iCCM) platform and the connections between HEWs and childbearing women, they concluded that progress in reducing neonatal mortality and child mortality (MDG 4) could be accelerated.

Contact

One of the fundamental differences between community based newborn care and other community based child health programs is the *active case identification* needed to enable timely provision of care and treatment**.** In Ethiopia, active case identification would require a paradigm shift from HEWs *waiting* for cases to *seeking* cases. Health Extension Workers and HDAs would need to establish more reliable contact and communication with all pregnant women in antenatal, child birth and postnatal periods.

Reliable contact would begin with surveillance to identify all pregnant women in order for mothers to be counseled about birth and newborn care preparedness, including home-based newborn care practices and a plan to immediately notify the community health worker of the birth. Upon birth notification, the community health worker should make a home visit as early as possible to provide counseling on newborn care practices and danger signs, to assess the newborn and facilitate treatment and/or referral for newborns with a danger sign.

Global Evidence
Neonatal Mortality Rate (NMR) has been substantially reduced by community-based packages that included pregnancy and birth identification, and early postnatal home visits by community health workers to provide counseling, newborn assessment, and care. (8,9,10,11,12,13). Evidence from South Asia trials resulted in a global policy recommendation by WHO/UNICEF emphasizing that newborn survival can be increased by community health workers' promotion of 'preventive' care practices, enabling early detection of danger signs, and treatment initiation for neonatal infections (14).

Ethiopia Evidence
Various projects have piloted methods to register pregnancies through home visits by HEWs, volunteers, women's groups, local and religious leaders, and Traditional Birth Attendants (TBAs) (16, 17, 18)

- An external validation survey conducted in SNL sites in November 2011 showed that HEW and volunteer collaboration resulted in 75% of recently delivered women reporting they received a home visit by a volunteer or HEW during pregnancy. The proportion of women reporting that they made at least one ANC visit during their last pregnancy subsequently increased from 38% to 78% in study sites (17).
- In MaNHEP areas, HEWs trained volunteer guides who collaborated with a quality improvement team for the identification of pregnant mothers in their kebeles. In ten months, nearly 10,000 pregnant women were identified (85% of expected pregnancies) (18).
- In L10K project areas, a Community-based Data for Decision-Making (CBDDM) scheme that registered pregnancies and births resulted in greater neonatal tetanus-protected childbirths, institutional deliveries, clean cord care for newborns, thermal care for newborns, and immediate initiation of breastfeeding (16).

Capture or Case Identification
To ensure early and rapid detection of newborn illness, families and community health workers must identify signs of illness and take action for appropriate and timely care. Thus, "capture," or case identification, requires either that families know and recognize danger signs, and seek appropriate care on their own ('passive case detection') or that community health workers identify newborn illness and facilitate referral and/or treatment ('active case detection').

Care-seeking Global Evidence
There are significant barriers to early recognition of and appropriate care seeking for newborn illness that need to be addressed in each health system and cultural context. However, the underlying issues are common across different settings. Barriers to "capture" of cases of neonatal infection include caregivers' lack of knowledge or awareness of danger signs, difficulty recognizing danger signs, socio-cultural beliefs about the causes and significance of newborn danger signs, and lack of appropriate care seeking due to life context. Cultural and religious beliefs strongly influence care seeking and must be explicitly addressed.

Care-seeking Ethiopia Evidence
Local experience had showed that programs could - with targeted attention - provide improve coverage of PNC home visits that are vital to identification of sick newborns through direct assessment, counseling of caretakers on danger signs, and promotion of care seeking.

- Results from the Community Based Interventions for Newborns in Ethiopia (COMBINE) implementation demonstrated that volunteers were able to conduct PNC home visits to about half of mothers and newborns within two days, and near 65% within the first week of life (17).
- The Maternal and Newborn Health in Ethiopia Partnership project survey data showed that PNC visits by HEWs within two days after birth increased from 5% to 51% of expected births in Amhara Region over two years (18).

Community Health Worker (CHW) Algorithms Global Evidence
"Capture," or case detection of neonatal infections, also requires that the health system correctly identifies neonatal illness. There is good evidence that clinical signs of newborn illness can be detected by community health workers with a range of skills, including illiterate or semi-literate community volunteers (19,20). Studies have validated community health workers' assessment of newborn illness, including 'gold standard' comparison of CHWs' assessment to physician assessments. A study in Bangladesh found CHW assessments had high sensitivity (91%) and specificity (95%) compared to physician assessments (21).

CHW Algorithms Ethiopia Evidence
The iCCM program provided a natural platform to add detection of newborn infection because it had defined health worker responsibilities with regard to child illness, and training and clinical mentoring had been carried out.

- Within one year (2010/11), about 15,000 HEWs had been trained and supplied to provide iCCM services in over 7,000 health posts. ICCM supervision was integrated into all routine supervisory mechanisms.
- A cross-sectional survey of iCCM areas revealed that HEWs had provided correct case management for 64% of children. However, only 34% of children with severe illness were correctly managed (22).

Care and Treatment
Timely treatment with appropriate antibiotics is essential for the survival of newborns with severe infections. Thus, curative "care" must be immediately available and acceptable to families whose newborns have been identified with PSBI. Delays in starting appropriate antibiotics risk rapid progression of bacterial infections leading to death. These delays in care initiation result from both 'demand' (or family-related) factors as well as 'supply' limitations (availability and accessibility).

Global Evidence
Standard treatment of newborn bacterial infections is hospitalization for 7-10 days of parenteral antibiotics. Yet, early research from South Asia found that the majority of families of ill newborns (66-76%) did not accept facility referral for this standard care. Simply put, families were usually unwilling or unable to accept referral for treatment of a sick newborn, putting him or her at high risk of death. However, in these same settings, treatment made available closer to home was highly acceptable to families, including injectable antibiotics given by community health workers (20, 23).

Ethiopia Evidence
Ethiopia is a vast country with limited transportation and communications. Families often feel they are too far away from frontline workers and drugs and the costs of care, transport, lodging and food are not affordable. Perceptions of the quality of health services including attitudes of health workers may also diminish care seeking.

The COMBINE study implemented community-based treatment of neonatal sepsis by HEWs from 2011 to 2013, building on the national iCCM platform. In this time period, 57% of newborns were identified with at least one PSBI sign. Ninety percent refused referral and were treated at the health post. Seventy-nine percent completed the antibiotic regimen. However, population treatment coverage at health posts was likely only 50% of estimated cases (24).

Completion
While there are very limited global data, anecdotal evidence suggests that many newborns do not complete a full course of antibiotics in existing health systems, even when families accept hospitalization. Barriers to treatment completion include non-acceptance by families of continued hospitalization due to financial burden, opportunity costs, distance, and perceptions that a newborn is recovered as symptoms diminish, and perceived cultural insensi-

tivities of hospital care.

Global Evidence
Achieving high rates of treatment completion is an unmistakable challenge, especially in settings with weak health systems. However, in a Nepal sub-district, 81% of cases of newborns with PSBI received a complete 7-day course of gentamicin using a model of outreach volunteers linked to health post CHWs for daily injections (10).

Once treatment is started, newborns may begin to improve. This sometimes causes families to believe that the child is cured, negating the need for completion of treatment. Last, health posts and especially health centers have few effective mechanisms for tracking sick newborns, making it difficult to trace defaulters.

Ethiopia Evidence
While CBNC was being designed, there was little evidence available to assess treatment completion, although there were known barriers to maternal and child services involving the timing when health posts were open and absence of HEWs (24). Later, in the COMBINE study area, 79% of newborns with PSBI that were treated by HEWs completed the treatment regimen (25). Similarly, in one CBNC first phase area, 90% of cases of PSBI completed treatment (26).

Conclusion
The challenges of providing care for sick newborns in the context of a resource-limited healthcare system, limited public trust in that system, and deeply embedded traditional cultural practices are daunting. It is easy to fall into the trap of focusing on appropriate clinical care for those who present themselves to facilities. Alternatively, attempting to address the myriad of variables in the care-seeking and care-giving continuum can lead to a diffusion of effort with little focus or impact.

The 'Four Cs' provided a framework for critically analyzing the context and health system realities in Ethiopia and enabled broader thinking about approaches and solutions. 'Contact and counseling' helped assure that strategies were aimed at the simple outcome of newborns establishing permanent connection with the health system. 'Capturing' cases required unpacking how all sick newborns could be rapidly identified when they were largely sequestered in homes. Ensuring 'care' and treatment focused on the most effective ways to start treatment promptly given common constraints in rural health services. And 'completion' required explicit approaches to providing a full course of treatment and knowing that it had happened.

Application of the Four Cs model to the challenges of PSBI in Ethiopia proved to be manageable and helpful during design of program guidelines and as problems were encountered and addressed. The 'Four Cs' was not a simplistic model that resulted in a pre-ordained checklist of activities, rather it served to guide program managers and implementers through an iterative process that was able to respond to the realities of services as well as the needs and perceptions of the populations they served.

The Four Cs approach was central to Ethiopia's efforts for PSBI and CBNC more broadly. It may also offer a useful framing for other efforts aimed at time-critical clinical care dependent on community outreach and care-seeking behavior. These broader efforts warrant exploration.

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BRIEF COMMUNICATION

NEWBORN CARE CORNER: A SIMPLIFIED APPROACH TO PROVIDING OPTIMAL NEWBORN CARE IMMEDIATELY AFTER BIRTH

Assaye Kassie Nigussie, MD[1*], Bogale Worku, MD[2]

ABSTRACT

Introduction: *In 2005, a quarter of all child deaths in Ethiopia happened in the neonatal period, with one quarter of them caused by perinatal asphyxia. The proportion of neonates receiving essential newborn care, including basic life support was alarmingly low. In response to this lack of care, a new and innovative Newborn Care Corner approach was established. The primary objective of establishing a NBC near the labor and delivery room of health centers and primary hospitals was to ensure that all steps of essential newborn care are provided as one clinical bundle to all neonates, including resuscitation of asphyxiated neonates within the first few minutes of life.*
Objective: *To assess the impact and feasibility of the NBC approach,*
Methods: *One hundred resuscitation units were locally manufactured and piloted in 100 health facilities.*
Results: *The pilot demonstrated that health workers could effectively resuscitate neonates and save more than 95% of asphyxiated babies in their respective facilities. As a result, Ethiopia procured approximately 2,000 standard neonatal resuscitation units to move toward full-scale national implementation.*
Conclusion: *The NBC approach is now in use across all regions of Ethiopia and in over 2,000 health facilities across the country with 85% coverage. To obtain the maximum benefit from this approach, future efforts will need to improve the quality of care provided by frontline health workers through regular supportive supervision and clinical mentorship programs*
Key words: *Newborn Care Corner, Neonatal resuscitation, Asphyxia*

INTRODUCTION

In 2005, 25% of deaths to children under five years were due to newborn conditions. Thus, for Ethiopia to achieve Millennium Development Goal 4 (MDG4) by 2015, it was necessary to develop a comprehensive newborn care package across all health service delivery levels from the community to the hospital (1,2). This paper describes the development of Newborn Care Corners (NBCs) in health centers (HCs) and hospitals.

Services for children under five in Ethiopia's health facilities included, Integrated Management of Childhood Illnesses (IMCI). This strategy guided comprehensive, integrated preventive and curative care for sick children aged 7 days to 59 months but did not address common newborn complications within the first week of life. They were excluded because, it was assumed that complications in these age groups would also require maternal care interventions that could not be addressed in the IMCI package. However, newborn complications do occur after delivery and discharge and thus they were not well captured. Major contributing factors to early neonatal mortality are asphyxia (30.1%), severe bacterial infections or neonatal sepsis, pneumonia, meningitis, (20.3%), preterm complications (hypothermia, respiratory distress syndrome, and late onset metabolic problems) (15.5%).

In 2006, Ethiopia's National Child Survival Technical Working Group (NCSTWG) revised the IMCI guidelines to incorporate common newborn complications during the first week of life. Ethiopia was the first country in sub Saharan Africa to include guidelines focused on children from 0-59 months of age. The revised approach or Integrated Management of Newborn and Childhood Illnesses (IMNCI) was launched and included Kangaroo Mother Care (KMC)for preterm or low birth weight babies, neonatal resuscitation, and infection prevention, as well as advanced life support in referral hospitals (2).

Resuscitation of Asphyxiated Babies

In Ethiopia, birth asphyxia accounts for 23% of the neonatal mortality rate (NMR) (3,4). With the need for strengthening Essential Newborn Care (ENC) in facilities as well as resuscitation of asphyxiated newborns, the NBC approach was designed. NBC requires both a space and a clinical bundle of service packages . The space is a

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suitable corner or room attached or close to the delivery room in HCs and hospitals. In 2009, UNICEF, the World Health Organization (WHO) and the Federal Ministry of Health (FMOH) jointly launched the first NBC in Ethiopia.

MATERIALS AND METHODS

Defining the Structural units of NBC and Essential Services

The NBC is a small room of around 10m², located within the labor room environment or close to the delivery room, and equipped with equipment, supplies, and consumables and a trained health personnel to provide the necessary care. To make this approach cost effective and sustainable, low cost, locally available material was initially used to produce the neonatal resuscitation unit and the NBC was intended to provide the following services:

- an acceptable thermal environment for all infants at birth including a radiant warmer;
- clear observation of the newborn including an overhead light source;
- a resuscitation kit to be used for asphyxiated babies;
- other essential care at birth, including cord care, early initiation of breastfeeding, eye care, and weighing.

Developing the prototype and Establishing the First NBC in Ethiopia

In 2009, the cost of one Chinese-made neonatal resuscitation unit (NRU) was more than US $2,500 and at this price, national-scale implementation of ENC in Ethiopia's health facilities was not feasible. Thus, UNICEF worked with a local metal workshop in Addis Ababa to develop a locally made variant specified by newborn health experts (Table 1 and Figure 1).

Table 1: Newborn Corner Unit Specifications

• Low cost (US $120/unit)
• A hard table
• Attached overhead heat and light sources
• Drawer to store essential supplies
• Self-inflating ambu bag, an oxygen reservoir, and face masks in different sizes.
• Easy to disassemble and reassemble for cleaning and disinfection.

In 2009, the NBC initiative was launched with an initial batch of 100 units in Dire Dawa (Figure 1).

Figure 1: The first locally produced NRU (2009) *Source: Ethiopian Pediatric Society*

[1]Distribution of cause of death in new born babies in Ethiopia : University based Surveillance Sites report using a verbal autopsy method, Addis Ababa, Ethiopia, 2009

RESULTS

NBC: Demonstration in 100 facilities

Since 2010, the Ethiopian Pediatric Society (EPS) has taken the lead in supporting the national roll out of NBCs in Ethiopia (Figure 2). The EPS collaboration with the FMOH aimed to increase the proportion of asphyxiated newborns who are effectively resuscitated from 7% to 75% and to increase the proportion who received simplified antibiotic treatment for suspected neonatal sepsis, from 25% to 74% (3).

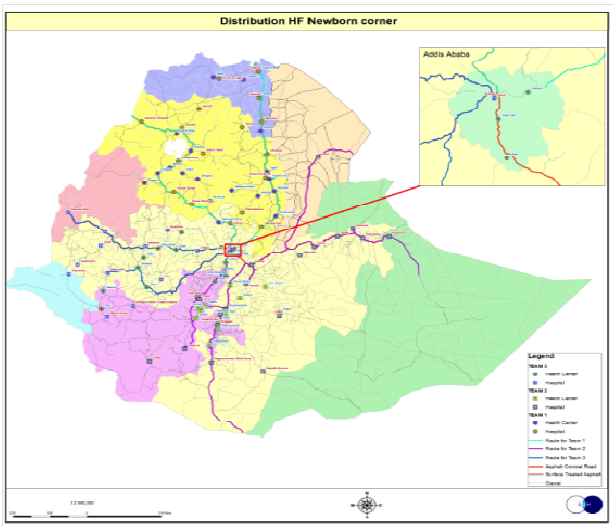

Figure 2: Initial roll out to 100 health facilities

Capacity building of health professionals to improve their knowledge and skill in ENC took place in parallel and was followed with periodic supportive supervision and comprehensive monitoring and evaluation. Initial results were encouraging. Most resuscitated babies survived. (Figure 3).

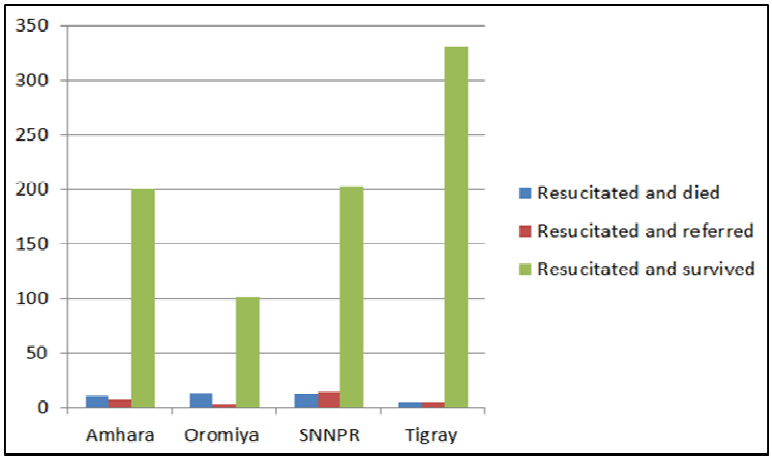

Figure 3: Outcome of babies resuscitated one month prior to the survey
Source: Ethiopian Pediatric Society, 2012

National-Scale Implementation of the NBC

In 2011, the decision was made to scale the program nationally. EPS developed participant training manuals, facilitator guides, and newborn registration logbooks. Training materials included NeoNatalie mannequins, Helping Babies Breathe flipcharts, and a KMC video. A cascade training approach was used to train 224 health professionals and 800 staff in health centers in all regions of Ethiopia in the first round. This was accompanied by supportive supervisory visits (4). In 2015, more than 45,000 babies were born in the facilities with 1,037 deaths or a 2.3% neonatal case fatality rate.

A second wave of training of health workers for 2,000 HCs was initiated in 2012. Rollout has continued through the end of 2012, at which time, the FMOH has shifted to purchasing standard NBC Units from international manufacturers, and a total of 2,000 have been distributed. At this time, 3000 HCs out of a total of 4,000 of HCs have NBCs (85%).

Abeba Bekele, Yunis Mussema, Yenealem Tadesse, Mary E. Taylor

COMMENTARTY

REACHING EVERY NEWBORN: DELIVERING AN INTEGRATED MATERNAL AND NEWBORN HEALTH CARE PACKAGE

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Child mortality in Ethiopia has substantially declined since 2000 due to significant change in mortality in the post-neonatal period. The reduction in neonatal mortality has been much slower and in 2016 neonatal mortality contributed to 43% of under-five deaths (1). Ethiopia endorsed the commitment to end preventable newborn deaths by 2035 whereby every pregnancy is wanted, every birth is celebrated, and women, babies and children survive and thrive to reach their full potential (2).

Reaching every newborn is a global strategy to end preventable newborn deaths. Every newborn is to be reached with good quality, effective interventions without financial hardship for their families. The knowledge and tools to end preventable newborn deaths exist (3). The main challenge is to implement these life-saving interventions at scale and to change newborn health care practices and care seeking behaviours.

Ethiopia has strong policies and plans to guide country-wide implementation of newborn and child health interventions at scale as part of its five-year health sector plan. The Health Sector Transformation Plan 2015-2020 (HSTP) prioritizes maternal, newborn and child health (4). In addition, Ethiopia has made commitments to various global initiatives. To meet the commitment to the Sustainable Development Goals (SDGs), the HSTP has set ambitious targets to reduce under-five, infant and neonatal mortality to 30, 20 and 10 per 1000 live births respectively, by 2030. To support achievement of these targets, Ethiopia approved the National Strategy for Newborn and Child Survival in Ethiopia (2016-2020) in 2015 (5). The strategy defines various integrated, high-impact intervention packages for community and facility level implementation. Significant investment has also been made in infrastructure and human resource development (Figure 1) (6).

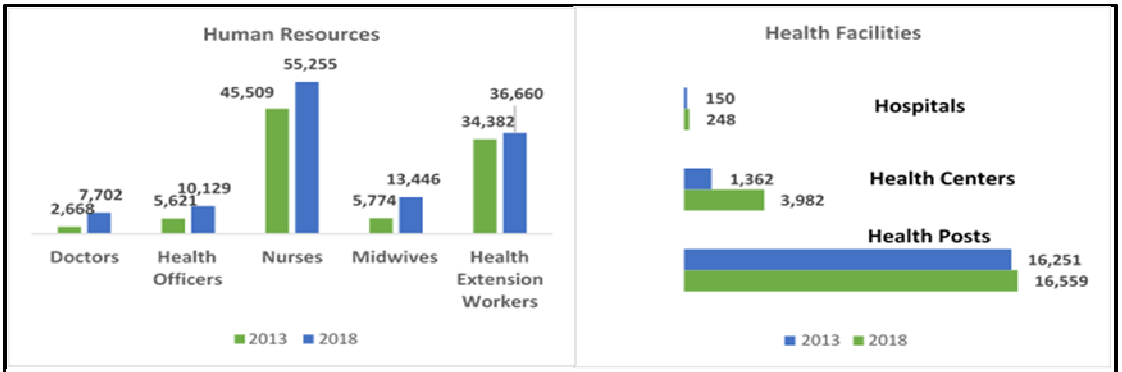

Figure 1: Trend in health facilities and human resources development in Ethiopia, 2013 and 2018.

The Health Extension Program (HEP) is the main platform for newborn and child health at the community level. Initially, Health Extension Workers (HEWs) increased access to basic preventive and promotive health services in rural communities at scale. Curative services that required more skills were added gradually through on the job training and supervisory support. The integrated community case management (iCCM) package was integrated into the HEP in 2010 (7).

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Under iCCM, HEWs were enabled to manage child pneumonia, diarrhea, malaria and severe acute malnutrition. Based on the lessons learned from the iCCM program (8) and evidence from a newborn research trial in Ethiopia (9), community management of sick young infants 0-2 months was added to HEW services when referral is not possible or acceptable (10). The Community Based Newborn Care (CBNC) Program was formally launched in 2013 and provides a package of interventions from pregnancy through the postnatal period (Box 1) (10). By 2016, 94% of health posts in Amhara, Oromia, SNNPR and Tigray regions were providing CBNC and iCCM services (11).

Table 1: Components of newborn care at the community and facility level

Community based newborn care	**Facility based newborn care**
Early identification of pregnancy at the community level	Provision of FANC including laboratory tests
Provision of Focused Antenatal Care (FANC) at Heath Posts	Skilled attendance at birth
Promotion of institutional delivery	Provision of immediate and essential newborn care, including cord care and application of Chlorhexidine
Provision of immediate and essential newborn care, including cord care and application of Chlorhexidine	Recognition of asphyxia, initial stimulation and resuscitation using bag and mask
Recognition of asphyxia, initial stimulation and resuscitation of newborn babies	Management of pre-term and/or low-birth weight neonates, including use of corticosteroids and KMC
Management of pre-term and/or low-birth weight neonates and promotion of Kangaroo Mother Care (KMC)	Management of PSBI, including in-patient care
Management of Possible Serious Bacterial Infection (PSBI) when referral is not possible	Early postnatal care
Early postnatal home visits, counseling and identification and care for sick neonates	Integrated Management of Neonatal and Childhood Illnesses (IMNCI)
	Neonatal intensive care at hospitals

A large number of health workers ware trained to provide critical newborn care services. By 2018, a total of 30,787 HEWs were trained on CBNC; and at least two health workers per health center were trained on IMNCI. Along with the training, health facilities were provided with essential equipment. The Emergency Obstetric and Neonatal Care (EmONC) assessment done in 2016 identified EmONC gaps in majority of the facilities (12) with the most readiness observed for newborn resuscitation at both hospitals (86%) and health centers (69%), indicating the need for ongoing strengthening of facility based newborn care.

As community care for newborns improves, referral services need to be available and delivered well. The guidelines for implementation of patient referral system developed by the FMOH (13) isn't fully operational at the primary health care units. The referral system for neonates that cannot be safely managed at primary health care units using existing protocols remains poorly functioning (14). Alongside establishing a well-functioning referral system, there is a need to strengthen newborn care at health facilities to manage the increasing demand for newborn services. The fact that the FMOH has come up with Emergency Newborn Care (EmNeC) signal functions to be included in the national assessments (12, 15) designed to measure readiness of facilities to manage major neonatal problems for the first time in 2016 indicates government commitment to improving neonatal care in the country. In addition to contributing to the development and implementation of tailored strategies to improve neonatal care, the findings will serve as benchmark to measure progress in addressing key drivers of newborn mortality in Ethiopia in the coming years.

Informed by lessons from implementing iCCM and research evidence on barriers for neonatal care seeking (16-18), the national CBNC implementation plan highlighted the need for strategies to improve care seeking behav-

iours and practices alongside improving service delivery. Among the major barriers reported were various cultural beliefs considered beneficial for neonatal survival (seclusion of neonates to protect from evil eyes and harmful spirits; immediate bathing with cold water to make the baby awake and active; applying substances on the cord to speed up drying; feeding butter and herbal drinks to cleanse the stomach; etc.), lack of knowledge on the availability of health care services for neonates, poor decision making power of mothers, poor support system, lack of money, and lack of transport compounded by difficult terrain.

The national HEW and Health Development Army (HDA) platform, using various approaches (including interpersonal communication, pregnant women conferences, use of media, and the Family Health Guide), served as the major system for improving community awareness on newborn issues and care (10). The CBNC implementing partners used additional community empowerment approaches that went beyond awareness creation and engaged communities for action. The conceptual framework in figure 1 provides an example of a community empowerment strategy implemented in over 240 woredas (19).

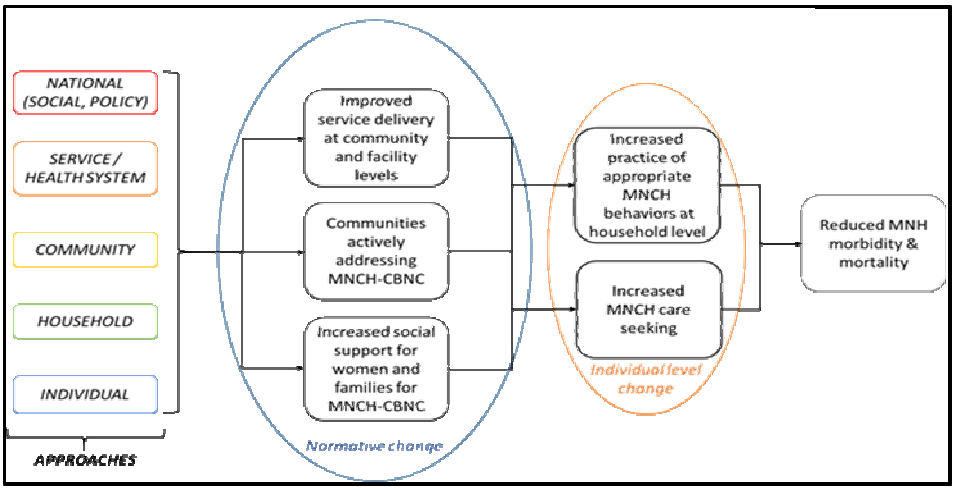

Figure 1: Conceptual framework for MNCH-CBNC demand creation strategy, Save the Children, 2014

The Community Based Data for Decision Making (CBDDM) strategy is another example for mobilizing families and kebeles to improve MNCH (20). CBDDM activities foster partnerships among public administrators, HEWs, local institutions, and HDAs to gather information to identify maternal and neonatal health service utilization gaps and facilitate community solutions to problems. It enables HDAs and their community to analyze the data, identify barriers to access maternal and newborn health services, and implement solutions; and promotes community participation in the planning and monitoring.

The CBNC package was layered upon the iCCM implementation platform and mainly implemented in the agrarian regions of the country. While developing the CBNC Implementation Plan, the MOH made a conscious decision to follow a phased roll out of the package to ensure lessons from initial phases were incorporated into subsequent phases (10). They also adapted implementation models for pastoralist areas (21). However, effective implementation of adapted packages in the pastoralist areas are yet to be done at scale.

Although the initial introduction of the CBNC package into the HEP platform was externally financed, the costed HSTP has already integrated high impact interventions that directly and indirectly contribute to neonatal survival (4), paving the way for sustaining the interventions. Moreover, strategies to address the financial barriers to maternal and newborn health services have been put in place more recently in the form of free service provision or formal and informal waiver systems (4, 13). Eventually, services are expected to be covered through a national community health insurance system that is in early stages.

In conclusion, the integration of CBNC on existing community and facility platforms facilitated at scale implemen-

tation of the interventions, reaching a considerable proportion of Ethiopia's newborns. Its ongoing effectiveness will be dependent on how well the platforms continue to function and how well they expand community demand and utilization. Current health system strengthening efforts are critical to building and sustaining the gains begun with iCCM, CBNC, and newborn referral systems. We believe the HSTP's focus on quality improvement, equity, information revolution and financing, combined with the priority given to newborn health provides huge opportunity to further expanding and sustaining the efforts to reach every newborn in the country with essential health care.

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ORIGINAL ARTICLE

INTEGRATING CHLORHEXIDINE FOR CORD CARE INTO COMMUNITY BASED NEWBORN CARE IN ETHIOPIA

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ABSTRACT

Introduction: *Ensuring adequate cord care at birth and in the first week of life is crucial to prevent sepsis and cord infections, and to reduce preventable neonatal deaths. WHO recommends application of 7.1% chlorhexidine digluconate daily to the umbilical cord stump during the first week of life for newborns born at home in settings with high neonatal mortality.*

Objective: *This article describes the introduction of chlorhexidine for cord care in Ethiopia using the Community-Based Newborn Care (CBNC) platform and early lessons.*

Methods: *Data related to chlorhexidine introduction inputs and processes from minutes, reports, and related documents from 2013 to 2017 were assessed and described using steps from the three phases to ensure sustainable implementation introduced in a recent guideline from the Global Chlorhexidine Working Group.*

Results: *Chlorhexidine was included as one of the components in CBNC after consensus building, and it was manufactured locally. Current implementation status in four zones is described. Early lessons include the fact that chlorhexidine for cord care is feasible and acceptable in Ethiopia. Critical gaps in knowledge, practice, and attitude on the service providers' and mothers' sides were observed. In addition, product availability was limited outside of facilities. Poor documentation and parallel supply-chain management also require further attention.*

Conclusion: *Government leadership and integration within the existing platform were key to the introduction of chlorhexidine for cord care in Ethiopia. Issues that require further attention include synchronization, behavior change communication, monitoring, and evaluation, as well as financing for sustainable product availability.*

Key words: *Community based newborn care, chlorohexidine, cord care, manufacturing, application.*

INTRODUCTION

Infections such as sepsis and meningitis cause about 15% of the 2.7million global neonatal deaths occurring annually (1), with poor hygiene at birth as one of the contributing factors. A meta-analysis of three cluster-randomized community trials conducted in Nepal, Bangladesh, and Pakistan found that application of chlorhexidine to the umbilical cord of the newborn in the intervention groups resulted in a 23% reduction in all-cause neonatal mortality as compared to a control group (2). Therefore, chlorhexidine has a huge potential for impact, is safe, stable with no special storage requirements, cost effective, and highly acceptable, and it has multiple possible distribution channels, as health workers as well as family members can easily administer it (3). In 2014, WHO recommended application of 7.1% chlorhexidine digluconate to the umbilical cord stump soon after birth and continuing daily during the first week of life for newborns who are born at home in settings with high neonatal mortality (30 or more neonatal deaths per 1000 live births) (4).

However, two recent studies conducted in Pemba and Zambia settings with low neonatal mortality (14 per 1000 live births) found no reduction in newborn mortality after chlorhexidine application.

These findings are consistent with current WHO recommendations, in that a meta-regression of all five trials found larger effects of chlorhexidine cord cleansing on neonatal mortality reduction in settings with higher mortality rates and higher proportions of home deliveries (5).

The objective of this paper is to describe the process of introduction of Chlorhexidine for cord care in Ethiopia, using the Community Based Newborn Care program and to share early lessons so that other stakeholders could learn and adapt to their specific contexts.

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MATERIALS AND METHODS

This paper uses the recent Guide to implementing Chlorhexidine for cord care from the Global Chlorhexidine Working Group to assess data related to chlorhexidine introduction inputs and processes from minutes, reports, and related documents from 2013 to 2017 and describe the process using steps from the three phases to ensure sustainable implementation (6).

It also outlines some of the bottlenecks and lessons learned, and provides recommendations for introducing, sustaining, and scaling chlorhexidine into existing platforms in settings that may be of benefit.

RESULTS

Description of key considerations in chlorhexidine introduction

Gaining consensus through a stakeholder consultation process: When Ethiopia introduced the Community-Based Newborn Care (CBNC) package in 2013, the Federal Ministry of Health (FMOH) and partners in the National Child Survival Technical Working Group (NCSTWG) reached a consensus to include the application of chlorhexidine on the umbilical cord as one of its components (7). Evidence summaries provided by global experts and observation of Nepal's program during the joint learning trip by CBNC leaders were important contributors to policy decisions. There was high-level commitment by the FMOH, but only if the product could be manufactured locally. As the development of manufacturing capacity proceeded on one track, a sub-group of the NCSTWG drafted implementation guidelines. While there was wide involvement of child health stakeholders, few maternal health experts participated in consensus-building activities, ultimately resulting in conflicting guidelines.

Generating evidence to support introduction and planning: In 2013, the Maternal and Newborn Health in Ethiopia Partnership (MaNHEP) supported an exploratory qualitative study to provide insight into community perspectives and current practice related to cord care and supplies of chlorhexidine in four kebeles of four regions (Amhara, Tigray, SNNPR, and Oromia). Results showed there was widespread application of various substances to the cord, especially butter and Vaseline to soften or moisturize the cord and to hasten cord separation. Almost all respondents said that they would be willing to use a product that prevented infection of the cord. They preferred a chlorhexidine product that was in gel form packaged in a plastic bottle, distributed through health posts and health centers, with messaging that addresses its benefits over traditional products, duration and timing of application. The potential for local, market-based sale and distribution could be explored once demand was concretized (8,9).

Aligning policies and guidelines: Informed by a synthesis of global evidence and country context, key stakeholders in the NCSTWG under the leadership of FMOH decided that chlorhexidine should be applied to the cord for seven days as per WHO guidelines for both home and facility deliveries. The rationale for facility-based application was the lack of hygienic conditions in health facilities, early discharge from facilities after birth, to households with poor hygienic practices and possible application of harmful substances after discharge. The complexity of trying to implement chlorhexidine differently in co-located sites (facility and community) was also an important consideration. Discussions also included the need for careful branding to promote acceptability and uptake and to avoid confusion with any existing topical drugs.

Accordingly, this high-impact intervention was included in the current National Newborn and Child Survival Strategy (NNCSS) and Integrated Community Case Management (ICCM), CBNC, Integrated Management of Neonatal and Childhood Illnesses (IMNCI), Neonatal Intensive Care Unit (NICU), and Newborn Corner (NBC)training materials. The fifth edition of the national essential medicine list includes Chlorhexidine 4% gel (10). Yet, there are inconsistencies with other training packages that still recommend dry cord care as the standard. This inconsistency has resulted in some confusion between different cadres at facility level, underscoring the need to ensure harmonization among all guidelines and standard operating procedures regarding cord care from the outset.

Disseminating policy and guidelines: Chlorhexidine was integrated into the CBNC package and was disseminated as a whole, even before the product was available.

Demand generation: The initial formative assessment provided information on target users and other influencers that helped shape messaging for cord care. Different implementing partners had different strategies or models for demand generation for the iCCM and CBNC package as a whole, rather than specific chlorhexidine demand-generation plans.

Posters and leaflets were prepared and used to raise awareness about the benefits and proper use of chlorhexidine, targeting health workers, health extension workers (HEWs), and families. However, wider promotion such as inclusion in the Family Health Guide or use of mass media was not done to avoid creating demand for a product that was not yet widely available.

Orientation/training: Training was provided to health workers (usually from under-five clinics) and HEWs as part of the CBNC training, including practical skill building sessions at the beginning of implementation in 2014. Since the product was not available then, the first round of performance review and clinical mentoring meetings (PRCMM)included chlorhexidine-related refresher training for HEWs. Orientation was later provided for midwives in some areas as they had continued to provide dry cord care as per BEmONC standards.

Product manufacturing and distribution: Initial quantification for procurement of chlorhexidine was done using a chlorhexidine market sizing tool (11). Funding and technical assistance was provided to explore supply, manufacturing, regulatory requirements, and the potential roles of different stakeholders, and to suggest a way forward. DKT Ethiopia (DKT/E) assessed the potential for using the Pharmaceutical Funding and Supply Agency's (PFSA) existing distribution system and noted that it would be sufficient to distribute chlorhexidine to the public sector. An independent good manufacturing practices consultant assessed national manufacturers based on several factors including Food, Medicine and Healthcare Administration and Control Authority (FMHACA) licensure, independent laboratory testing of products, frequency of internal and international audits, capacity for internal laboratory quality control, packaging capacity, and interest in manufacturing chlorhexidine. The assessment also examined the regulatory approaches for the adoption of chlorhexidine in Ethiopia, including the timeline and cost for registration of new products with Ethiopia's FMHACA (12). DKT/E recommended two manufacturers based on their capability to produce a high-quality chlorhexidine product at reasonable prices within six months of the time an order is placed. Based on the above, FMOH chose local production of chlorhexidine gel in a tube, to have consistent availability of high-quality, affordable chlorhexidine. The selected local manufacturer received technical support from a manufacturer in Nepal who reviewed the factory, made recommendations, and shared know-how on manufacturing of the product. There were many delays, and the first batch was made available in May 2015, two years after the process was started rather than the expected six months.

Chlorhexidine for cord care was piloted in four zones, one in each of the four regions of Tigray, Amhara, Oromia and SNNPR. DKT/E shipped the chlorhexidine to its hub stores in the regions and then CBNC implementing partners distributed the drugs in their implementation areas. Eighty percent of the drugs went to health centers and 20% to health posts based on facility delivery rates from routine data. This support was provided as a stop gap measure until the product could be included in PFSA's distribution list. Distribution was only through public health care facilities with the possibility of expanding to other retailers or using social marketing. Chlorhexidine 4% gel was included in the essential medicine list in 2015 and in the over-the-counter list in 2016. Furthermore, chlorhexidine has been included in national quantification exercises for child health commodities since 2013.

***Monitoring and evaluation*:** Since chlorhexidine for umbilical cord care was introduced as part of the CBNC program, monitoring and evaluation were incorporated into the iCCM/CBNC platform. Some indicators were captured in the CBNC indicator list, namely the development of policy and drug availability at facility level. Chlorhexidine-related indicators were also included in the CBNC baseline and will be evaluated at the end of the initial program. The supportive supervision checklist includes checking drug availability at health post level. Otherwise, no indicators were included in the health management information system. The lack of consistent information about utilization or adherence has made monitoring the introduction of chlorhexidine challenging. Moreover, monitoring adherence at home even amongst those who have received the product, has not been feasible.

Financing: Startup costs for chlorhexidine production were provided by a donor. The second batch was procured by the government. Though chlorhexidine for cord care has been included in child health commodity quantification exercises since 2013, a source of sustainable funding has yet to be identified for regular procurement. Recurrent costs for procurement still need to be calculated and devolved to the sub-national levels for sustainability.

Status of implementation

A cross-sectional, quantitative, and qualitative study looked at current chlorhexidine program implementation in the four pilot zones 14 months after introduction. The survey was conducted in 16 facilities. Chlorhexidine was available in most health centers (88%).

The majority (66%) had the supplies in ante-natal care units in addition to other areas, including delivery rooms and pharmacies. Many key informants mentioned the lack of recording or reporting templates, which made monitoring the utilization of chlorhexidine very difficult. Only 50% of nurses and midwives interviewed received orientation or training, and many reported a lack of proper training and orientation as a challenge. However, all health workers in the study knew that chlorhexidine prevents infection in the newborn and that it is lifesaving. All HEWs were able to describe the benefits of chlorhexidine, as well as the timing and duration of application.

Six hundred eleven mothers, who gave birth in the six months preceding the survey, were interviewed. Most (86%) delivered at a facility, with only 1% and 13% delivering at a health post or home respectively.

Among mothers who delivered at home, the majority (83%) used razor blades to cut the umbilicus, of which 95% were new and 57% were boiled. Two percent and 15% of mothers used Vaseline and butter on the cord respectively. The prevalence of chlorhexidine use amongst participants was 53% (95% CI: 47%-57%). Primiparous women were less likely to apply chlorhexidine than women who gave birth to more than one baby. However, the most important determinant was place of delivery, as mothers who delivered at a facility had a 10.28times (95% CI: 8%-26%) higher chance of using chlorhexidine. Concerning the timing of application, 37% stated that chlorhexidine was applied within an hour, 63% said for a duration of 2-7 days, and 55% reported that chlorhexidine was applied once per day (Table 1). The fact that 14% applied the drug for more than seven days and that 40% reported applying it twice daily needs serious attention.

Table 1: Timing of Chlorhexidine Application (n=314)

Variable	Sub category	Number
Timing of first Chlorhexidine Application	Less Than an Hour	37% (n=104)
	Hours	28% (n=80)
	Days	7% (n=21)
	Don't Know	28% (n=81)
Duration of Chlorhexidine Application	One Day	2% (n=7)
	2-7Days	83% (n=257)
	Morethan7days	14% (n=42)
	Don't Know	1% (n=4)
Frequency of Chlorhexidine Application	Once	55% (n=169)
	Twice	40% (n=125)
	Three times	4% (n=11)
	Don't know	1% (n=3)

Regarding proper application, 92% of mothers mentioned washing their hands before application, 79% reported application on the tip, 81% reported application around the umbilicus, and 74% reported air-drying. The majority (78%) of respondents who had not used chlorhexidine on the cord for their last birth said that they did not have any information about chlorhexidine, while 19% and 3% stated that they did not receive the product and that it was not available at time of delivery, respectively.

In view of Figure 1, showing low utilization of the available product, this will need close attention, as both service providers and maternal factors seem to affect the utilization of available chlorhexidine, and this needs to be addressed for further scale up.

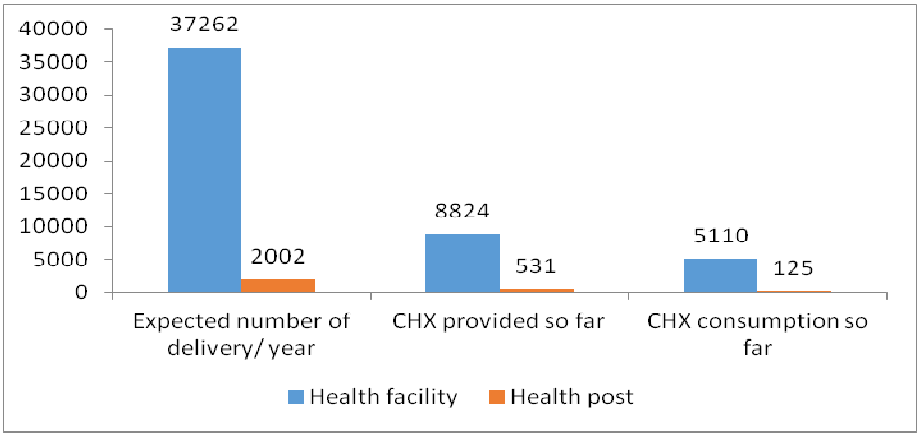

Figure 1: Chlorhexidine distribution and utilization in previous year before data-collection period (Zonal Health Department and Facility data)

DISCUSSION

Government leadership and integration within the existing iCCM and CBNC platform were key to the introduction of chlorhexidine for cord care in Ethiopia. There are still areas that need further effort such as the need for wider and more inclusive consultation with all relevant stakeholders, especially professional societies. This should facilitate harmonization of guidelines and training materials for uniform cord care practice by different cadres.

Other issues, including improving knowledge, attitude, and practice among service providers, notably midwives, and integration of chlorhexidine in the national supply chain management to ensure its continuous availability at health facilities, need to be given due attention as the way forward in Ethiopia. In addition, strengthening the monitoring and evaluation through the recording of utilization in registers and inclusion in future demographic health surveys is crucial.

The low utilization of chlorhexidine, especially amongst home deliveries, requires a special focus on increasing access to and utilization of chlorhexidine for home deliveries through behavioral change communication using updated family health cards, mass media, and other methods. The most important factor for sustainable implementation will be to ensure reliable financing through multiple mechanisms such as inclusion in health insurance schemes, social marketing, and support through corporate responsibility.

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Conflict of interest:
Authors have no conflicts of interest to declare.

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ORIGINAL ARTICLE

POOR POSTNATAL HOME VISITS COMPROMISED THE IDENTIFICATION OF POSSIBLE SERIOUS BACTERIAL INFECTIONS IN YOUNG INFANTS (0-59 DAYS) FROM SOUTHERN TIGRAY, ETHIOPIA

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ABSTRACT

Introductions: *Postnatal period is neglected in Ethiopia and receives relatively little attention compared to the other components of the health extension program. Given that a large number of women and their newborns remain at home during and immediately after birth and strengthening postnatal follow up service is a key strategy.*

Objective: *To assess how postnatal home visits influence the identification of young infants with possible serious bacterial infections in woredas in Southern Zone of Tigray, Ethiopia, an implementation research on community management of possible serious bacterial infections, where referral is not feasible.*

Method: *We used data from implementation research on the management of sick young infants with PSBIs where referral was not feasible. Infants 0-59 days of age during the implementation period of the larger project were included. Data were collected by health extension workers and checked in the field by cluster supervisors, field coordinators, and research team members. Descriptive data analysis was used to describe the study participants and the postnatal care visits. Data analysis was carried out using Statistical Package for Social Sciences version 20 software.*

Results*: The proportion of young infants visited at home compared to the expected postnatal home visits within the first 24 hours., 3 days and 7 days after delivery were 12.1%, 39.4% and 48.9% respectively, suggesting low postnatal care home visits in the study communities. A total of 2,336 out of an expected 4,914 live births (47.5%) were traced or identified in Raya Alamata Woreda and 4,860 out of an expected 8,564 live births (56.7%) were traced or identified in Raya Azebo woreda. Nearly 65% (n = 73) of newborns with clinically severe infections, 73% (n = 19) with critical illness, 8% (n = 13) with pneumonia and 82% (n = 587) with local bacterial infections were identified in the first seven days after birth. About 2.2% (n = 76) and 4.6% (n = 223) of young infants from Raya Alamata and Raya Azebo were identified as having PSBIs, respectively, which was lower than expected.*

Conclusion: *Uptake of early postnatal care service was low. Health extension workers were unable to capture all live births, which resulted in low detection rates of possible serious bacterial infections in young infants. Reinforcing and strengthening the links between the health extension program, the community, and the midwives from the health facilities during the early postnatal days is recommended.*

Key words*: Implementation Research, possible serious bacterial infections, Raya Azebo, Raya Alamata, Postnatal Care, Health Extension Workers, Ethiopia.*

INTRODUCTION

The postnatal period, defined as the first six weeks after birth, is critical to the health and survival of newborns (1). The World Health Organization (WHO) recommends that postnatal checkups should start within the first day and continue on days 3 and 7 and six weeks after delivery so that complications can be identified and treated properly. Postnatal home visits are critical for the prevention and early identification of newborn health problems, including possible serious bacterial infections (PSBI).

The first week of life, particularly the first 24 hours, are crucial because most newborn deaths occur during these periods. Lack of care in the early days may result in death or disability as well as missed opportunities to promote healthy behaviors affecting newborns. During this visit, the health care provider or health extension worker should assess the newborn for any danger signs to identify and refer or treat them as early as possible (2). If routine postnatal care (PNC) services reach up to 90% of newborns, an estimated 10% to 27% of newborn deaths could be averted (3).

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The period soon after birth poses substantial health risks for the newborn, but PNC during the first week of life remains low in the developing world (4). PNC for young infants is likely to be better if given at a health facility, however, this is difficult in practice in low resource settings like Ethiopia. In Ethiopia, the postnatal follow up in the first two days after birth was lower in rural areas (12.6%) than in urban settings (5). Even for deliveries at a health institution, most mothers are discharged very quickly, and most do not return for follow-up visits in the next few days, mainly because of transport, costs, and cultural constraints.

Despite the progress in antenatal care (ANC) services and institutional deliveries, the postnatal period is neglected in Ethiopia and receives relatively little attention compared to the other components of the health extension program (HEP). Strategies for the provision of quality PNC services should include both women giving birth in health facilities and at home. Given that a large number of women and their newborns remain at home during and immediately after birth, building and reinforcing the links between the community and health facilities is essential. Ethiopia has adopted community management of PSBI through the community-based newborn care (CBNC) program. Under this scheme, the Health Extension Workers (HEWs) provide care for young infants by identifying, classifying, and treating young infants with PSBI where referral is not feasible. For the successful implementation of PSBI case management at community level, strengthening postnatal follow up service is a key strategy. Thus, the objective of this study was to examine how postnatal home visits influence the identification of young infants (0-59 days of age) with PSBI from the two districts (woredas) in the Southern Zone of Tigray, Northern Ethiopia that were receiving simplified regimen implementation testing.

PARTICIPNATS AND METHODS

Study setting

This research took place in Raya Azebo and Raya Alamata woredas in Tigray. The total population of the two study districts (woredas) was 260,844. Applying estimates of 3.4% of population for pregnancies and 3.1% for live births, a total of 8,869 pregnancies and 8,087 live births were expected during the study period in the two districts (woredas). Raya Alamata has one primary hospital, five health centers (HCs), and 17 health posts (HPs), and Raya Azebo has one primary hospital, seven HCs, and 22 HPs. Each HP has two female health extension workers (HEWs) with at least one year's training in primary health care delivery.

Study design

The purpose of the implementation research on PSBI was to inform and accelerate the use of simplified management of sick young infants up to two months of age for eventual scale up at country level. If referral from the community is not feasible then patients are managed at HPs by the HEWs with one of two simplified treatment regimens. This analysis is part of the larger implementation research to increase access to quality patient management of sick young infants with PSBI from the two districts (woredas) in Tigray.

Sample size and sampling technique

The sample size was determined to address the objectives of the overarching PSBI project. Seven thousand one hundred ninety-six (7,196) women with young infants were identified by the HEWs during the 20-month period of the project. These women were identified by the HEWs during their routine home and regular postnatal visits. Women were interviewed using Case Recording Forms (CRFs) by the HEWs after they gave informed consent. The HEWs were trained to complete the forms accurately with close follow-up from cluster supervisors and frequent supervisory visits from research team members. Based on estimates provided by the Federal MOH, a total of 8,564 births were expected from Raya Azebo and 4,914 births were expected from Raya Alamata during the reporting period of the project (January 2016 to August 2017).

Study participants

The study participants were all live births and young infants from Raya Alamata and Raya Azebo woredas targeted by the PSBI intervention. All babies born at home and in health facilities were included in the study. The mothers with live births and young infants during the implementation period of the PSBI project were the respondents.

Intervention

In the PSBI project, sick young infants (0-59 days) are identified from communities in the two intervention woredas. If PSBI is confirmed by the HEWs at health posts, they are referred to a hospital. Sick young infants from Raya Alamata were treated with two days' injectable gentamycin and seven days of oral amoxicillin, and sick young infants from Raya Azebo were treated with seven days of gentamycin and seven days of oral amoxicillin. If the mother/ family refused to accept referral of the sick infant to a higher-level health facility or hospital, the sick infant was treated with simplified regimens at the nearest health post or health center.

The experiences and lessons learned from this innovative public health intervention have been documented by technical experts from Mekelle University and Regional Health Bureau. The partnership between academic and service delivery experts allowed the easy adoption and incorporation of treatment innovations into the health system of the study sites.

Performance was assessed against pre-defined criteria consisting:

- All health facilities will provide simplified outpatient management of PSBI;
- 80% of sick young infants will receive treatment; and
- 80% of the sick young infants treated will receive adequate quality treatment.

Data collection methods

The CRFs and focus group discussion guides were used to collect the quantitative and qualitative data, respectively. The case report forms (CRFs) were HEW maintained registers developed by the PSBI study. They were designed to capture information on pregnancy surveillance (CRF 1), postnatal home visits (CRF 2), sick young infant assessment (CRF 3), follow-up and treatment for days 2 – 14 (CRF 4), treatment and outcome record for referred or hospitalized infants by day 14 (CRF 5) and adverse events and deaths (CRF 6). CRF 2 was used to collect data for this study (postnatal care) and was filled-in by the health extension workers from the health posts. FGDs were recorded and then transcribed by trained data collectors within 48 hours of conducting the interview. Each interview was reviewed by coordinators and feedback provided.

Data management

Data were checked in the field by cluster supervisors, field coordinators and research team members. HEWs were re-interviewed and CRFs re-filled if data were missing. Ongoing quality checks were performed by the field supervisors and the authors. In order to assure the quality of the data collected, repeated and high-quality trainings sessions were organized for HEWs, health center directors, maternal and child health experts from woreda health offices, HEP supervisors and implementers. Sustained monitoring activities were provided to ensure that the procedures in the chart booklet were well-implemented. Field research assistants from the nearby hospital (Alamata Hospital) conducted random spot checks, scheduled supportive supervision to the health posts, health centers and hospitals and data were validated with monthly quality audits.

Data analysis

Descriptive data such as means and proportions of selected characteristics were used to describe the study participants and the PNC visits. The data analysis was carried out using SPSS version 20 software. Percentages were calculated both from expected (estimated) live births and actual births identified by the HEWs through house to house visits.

Ethical considerations

Prior to the start of data collection, ethical clearance was obtained from the Institutional Review Board of the College of Health Sciences of Mekelle University and the World Health Organization, Geneva.

RESULTS

Demographic and birth characteristics of the young infants

A total of 7,196 infants were included in the study. Of these young infants, 2336 (32.5%) were from Raya Alamata and 4860 (67.5%) were from Raya Azebo woreda. A relatively small proportion (2.9%) of the newborns had low birth weight, < 2,500 g (Table 1).

Age for PSBI and LBI identification

Seventy-three (65%) newborns with clinical severe infections (CSI), 19 (73%) with critical illness, 13 (8%) with pneumonia and 587 (62%) with local bacterial infections (LBI) illness were identified in the first week after birth. Only one of the newborns with critical illness was identified on the first day of life by the HEWs. A large proportion of the newborns with critical illness were identified within the first three days of life (Table 2).

Prevalence of PSBIs and LBI in young infants

We identified 76 (3.3%) and 223 (4.6%) PSBI cases from Raya Alamata and Raya Azebo woredas, respectively. These included 719 (10.0%) lower bacterial infection and 160 (2.2%) fast breathing pneumonia cases. The first week of life has the highest incidence density of clinical severe infection and critical illness compared to 7-59 days in young infants from the study communities (Table 3).

Table 1: Sex and Birth Weights of the Young Infants Identified by HEWs from the Two PSBI Project Areas of Tigray, Northern Ethiopia (*n* = 7,196).

Characteristic	Category	Raya Alamata N (%)	Raya Azebo N (%)	Total N (%)
Sex	Male	1235 (17.6)	2514 (35.7)	3749 (53.3)
	Female	1063 (15.1)	2224 (31.6)	3287 (46.7)
	Total	2298 (32.7)	4738 (67.3)	7036 (100)
Birth weight	Very low birth weight (< 2,000 g)	2 (0.0)	21 (0.3)	23 (0.3)
	Low birth weight (2,000-2,499 g)	79 (1.1)	107(1.5)	186 (2.6)
	2,500 g and above	2212 (31.2)	4671 (65.9)	6883 (97.1)
	Total	2293 (32.3)	4799 (67.7)	7092 (100)

Table 2: Age of PSBI and Local Bacterial Infections Identification in Young Infants Traced by the HEWs from Raya Alamata and Raya Azebo, Southern Tigray, Northern Ethiopia (*n* = 1023).

Age of identification in days (day of life)	Neonatal infections				
	Clinical severe infection, n (%)	Critical illness, n (%)	Local bacterial infection, n (%)	Pneumonia, n (%)	Total, n (%)
< 1 day	0 (0.0)	1(3.8)	2 (0.3)	0 (0.0)	3 (0.3)
1-3 days	50 (44.2)	16 (61.5)	298 (41.8)	0 (0.0)	365 (35.7)
4-7 days	23 (20.4)	2 (7.7)	287(40.3)	13 (8.1)	332 (32.5)
8-30 days	21 (18.6)	5 (19.2)	92 (12.9)	92 (57.5)	211 (20.6)
> 30 days	19 (16.8)	2 (7.7)	34 (4.8)	55 (34.4)	112 (10.9)
Total	113 (100)	26 (100)	713 (100)	160 (100)	1023 (100)

Table 3: PSBI and Local Bacterial Infection Cases in Young Infants Identified by HEWs from Raya Alamata and Raya Azebo, Tigray, Ethiopia, 2016 (*n* = 7,196).

Cases identified at PHCFs		Raya Alamata (n = 2336) N (%)	Raya Azebo (n = 4860) N (%)	Total (n = 7196) N (%)
Local bacterial infection	0 – 6 days	53	294	99
	7 – 59 days	77	295	372
	Sub-Total	130 (5.6)	589 (12.1)	719 (10.0)
Pneumonia	7 – 59 days	35	125	160
	Sub-Total	35 (1.5)	125 (2.6)	160 (2.2)
Clinical Severe Infection	0 – 6 days	19	46	65
	7 – 59 days	15	33	48
	Sub-Total	34 (1.5)	79 (1.6)	113 (1.6)
Critical Illness	0 – 6 days	6	12	18
	7 – 59 days	1	7	8
	Sub-Total	7 (0.3)	19 (0.4)	26 (0.4)
Total PSBI		76 (3.3)	223 (4.6)	299 (4.2)

Early postpartum period visits

The proportion of newborns visited by the HEWs within the first 24 hours, three days and seven days after delivery compared to expected live births were 13%, 33%, and 43% in Raya Alamata woreda and 12%, 43%, and 52% in Raya Azebo woreda, respectively. Of those newborns identified, 27%, 69%, and 91% from Raya Alamata and 20 %, 76%, and 92% from Raya Azebo were visited at home by HEWs during the first, second and third scheduled postnatal visits, respectively. No remarkable differences were observed in the proportions of the newborns visited at home between the two woredas (Table 4).

Table 4: Proportion of Newborns Visited at Home by HEWs Within the First Week of Birth in Raya Alamata and Raya Azebo Districts, Tigray, Northern Ethiopia, 2016 (n = 7,196).

Home Visit	Raya Alamata (Actual = 2,336, Expected = 4914)		Raya Azebo (Actual = 4860, Expected = 8564)		Total (Actual = 7196, Expected = 13,478)	
	Calculated from expected (%)	Calculated from actual, n (%)	Calculated from expected (%)	Calculated from actual, n (%)	Calculated from expected (%)	Calculated from actual, n (%)
Day 1	12.9	635 (27.2)	11.6	993 (20.4)	12.1	1628 (22.6)
Day 3	33.0	1620 (69.3)	43.0	3686 (75.8)	39.4	5306 (73.7)
Day 7	43.1	2118 (90.7)	52.2	4467 (91.9)	48.9	6585 (91.5)
Day 42	44.7	2195 (94.0)	53.7	4603 (94.7)	50.4	6798 (94.5)
Day 60	46.7	2297 (98.3)	55.0	4713 (97.0)	52.0	7010 (97.4)

DISCUSSION

In this study, only 4% of children in the study area had PSBI and were identified by the HEWs. These prevalence rates for PSBI that ranged from 3.3% in Raya Alamata to 4.6% in Raya Azebo may be underestimates because live births are likely to have been missed by the HEWs. The figures are far below the 10% estimate of expected PSBI cases reported by the AFRINEST study (7) or the 7.6% estimates of the Federal Ministry of Health (8). The majority of the PSBI cases occur in the first week of life, thus early postnatal care is very important to identify and help caretakers take action for sick babies. Unless postnatal care in the first week of life is strong, neonates will be missed and opportunities to educate caretakers will be missed.

Our findings revealed that only 33% and 43% of expected young infants from Raya Alamata were visited during the second and third PNC visits after delivery. While slightly higher, only 43% and 52% of the expected young infants from Raya Azebo were visited. This demonstrates the relatively low PNC uptake in the study communities (Table 4).

The postnatal home visit in the first 24 hours occurred for only 13% and 12% of live births in Raya Alamata and Raya Azebo, respectively. Even though these data do not include those who had PNC at the HCs or hospitals, our findings were similar to the EDHS 2016 finding of 12.6% PNC in the first two days after delivery in rural Ethiopia (5). A study from Lemo Woreda, Hadiya Zone, Southern Ethiopia reported that the prevalence of PNC services utilization was 51.4% (9) and that 66.8% of women from Gonder Zuria woreda, Northwestern Ethiopia received PNC (10). Similarly, 34.8% of mothers from Dembecha woreda, Northwest Ethiopia (11) and 22.7% of mothers from Southern Ethiopia received PNC within the critical first two days after delivery (12).

According to the 2013-14 profile of Tigray, the three main causes of early neonatal death were prematurity, birth asphyxia, and neonatal sepsis (6). Strong postnatal follow up is the cornerstone for the prevention and identification of PSBI in the community. However, as was shown in these woredas, early identification of births and PSBI cases was a challenge for the health system.

Early visits create the opportunity for the HEWs to counsel mothers on preventive care, to detect danger signs, and to encourage appropriate care seeking for the newborn. However, newborns with PSBI were not identified on time for prompt and appropriate healthcare services in our study sites.

Despite the benefits of PNC, most newborns do not receive PNC from skilled health care providers in the first few days after delivery. As a result, the PNC service delivery in the first 24 hours has remained disappointingly low in the study communities. Limited contacts between the HEWs with newborns and mothers means less counseling and health education on danger signs, less identification of PSBI cases, and less opportunity to encourage urgent care seeking. Thus, low levels of PNC remain a challenge for the successful implementation of the community-based management of PSBI in the study communities.

The small proportion of estimated live births identified by the HEWs reflects either the failure to visit or trace all live births and/or inaccurate estimation rates (3.1%). This makes it difficult to enroll newborns in the health system to receive services at optimal ages either for PSBI or other preventive interventions. Fortunately, the percentage of newborns who received care rose from 12% in the first 24 hours to 49% by the seventh day after birth indicating that the HEWs can eventually establish contact. This also indicates that PNC is feasible and can be strengthened. Notification of HEWs for labor and birth within 48 hours was closely linked with improved uptake of PNC services in the Amhara and Oromia regions of Ethiopia (13).

According to the focus group discussions with women from study communities, the postnatal period is governed by long established cultural practices. In the study area, women are expected to stay home in the dark for more than one month after delivery which is a major barrier to HEW household visits or for seeking care for illness. Similarly, 20% of women from Lemo Woreda, Hadiya Zone, Southern Ethiopia reported socio-cultural practices as reasons for poor uptake of PNC services (9). However, there can be considerable variation within Ethiopia. In Gonder Zuria woreda, Northwestern Ethiopia cultural barriers are minimal (10). Thus, it is important for health care providers, especially HEWs, to gain an understanding of cultural beliefs and traditional practices relating to postnatal care in their specific areas.

In conclusion, our study revealed that the early postnatal home visits by HEWs were low in study districts. While recognizing the importance of the use of multiple channels for contact, we argue that the low case detection rate of PSBI in the study communities is partly attributable to poor PNC home visits. Failure to recognize the danger signs in newborns by mothers, the absence of counseling on newborn danger signs during the ANC period, poor newborn health care seeking behavior of the mothers, and challenges to HEWs home visits to every birth within the first 48 hours were some of reasons for the low identification of sick young infants with PSBI. It is widely recognized that the health system in the region is strongly committed to and effective in reaching pregnant women with ANC and delivery services. This may provide a platform to strengthen the PNC program through commitment and support of HEWs as well as increased demand generation for improved care seeking.

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Conflict of interest:
Authors have no conflicts of interest to declare .

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ORIGINAL ARTICLE

DO CARETAKERS OF SICK YOUNG INFANTS WITH POSSIBLE SERIOUS BACTERIAL INFECTION ADHERE TO REFERRALS FROM HEALTH POSTS TO HEALTH CENTERS?

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ABSTRACT

Introduction: *A well-functioning, responsive referral system relies on patient compliance in order to address newborn health problems that cannot be managed by lower level health facilities. Given that early identification and management of young infants with possible serious bacterial infection is fundamental to community-based newborn care.*

Objective: *Thispaper presents the findings of an assessment of adherence to referral.*

Methods: *Using a cross-sectional design with mixed qualitative and quantitative methods in five zones in two regions this study looked at sick young infants (0-2 months) whose caretakers sought care for them from a health post and who were classified with* possible serious bacterial infection *in the 12 months prior to the study. We reviewed clinical records of* possible serious bacterial infection *cases at health posts and health centers and conducted interviews with caretakers of referred* possible serious bacterial infection *cases and health workers.*

Results: *The study involved 33 health centers, 46 health posts, and 20 Woreda Health Offices. A total of 209young infants were identified as having* possible serious bacterial infection *and referred to higher facilities. A total of 145 mothers/caretakers of sick young infants with* possible serious bacterial infection *were interviewed. Registers from the health posts showed that 27% of cases were referred to a higher health facility. Health posts most commonly referred to government health centers (71%) while health centers referred most frequently to public hospitals (38%).According to health post records, only 52% of the* possible serious bacterial infection *cases were given a referral slip. The referral adherence rate from health posts to higher level health facilities was 88%according to caretakers; whereas health center registers reported the adherence rate as 23%. Significant factors associated with referral adherence included providing information on the severity of illness (p=0.037) and spouse's occupation (non-farmers 3 times more likely adhering to referral) (p=0.004).Communication between health posts and health centers was perceived as poor, despite formal meetings. Informal means of communication are more common than the formal ones.*

Conclusion: *This study identified major gaps around necessary health system element for the success of Community-Based Newborn Care, referral linkage between health posts and health centers and beyond. The referral practice including universal offer of referral, use of referral slips, and providing pre-referral treatment according to the national guideline is an area that needs a lot of work.*

Key Words*: Referral, Possible serious bacterial infection, referral adherence, health extension workers, Community-Based Newborn Care*

INTRODUCTION

According to the national Community-Based Newborn Care (CBNC) implementation guideline (1), all cases of possible serious bacterial infection (PSBI) must be referred, but will be managed at health post (HP) level when referral is not accepted and/or possible. The referral pathway for neonates with suspected PSBI considers identification at the household level and care at HP, health center (HC), and hospital levels (Figure 1).

It is estimated that currently about 80-90% of caretakers of newborns with PSBI will refuse to be referred to higher facilities and will be managed by health extension workers (HEWs), while the other 10-20% are assumed to agree with the referral (2).This makes referrals and their adherence critical, life-saving actions. A well-functioning and responsive referral system, therefore, is essential to treat PSBI cases appropriately. However, there is lack of literature about how the existing referral system for PSBI is functioning in Ethiopia and whether families are completing referrals.

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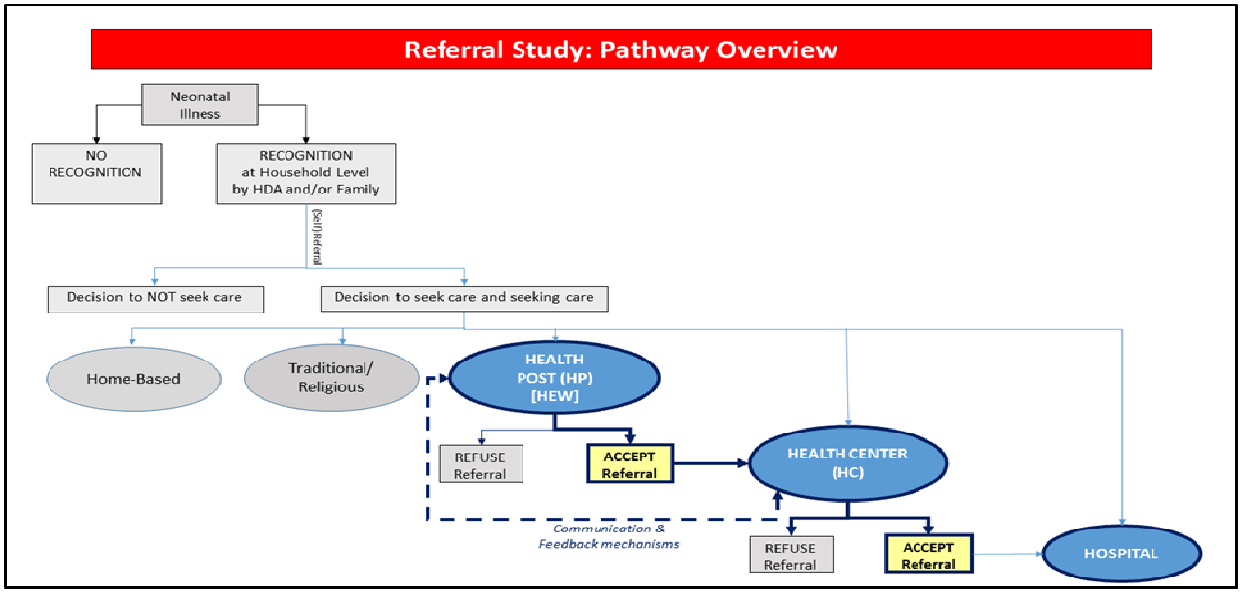

Figure 1: Referral pathway for Community Based Newborn Care

The objective of this study is to assess the referral adherence rate of caretakers of sick young infants and the barriers and facilitators to adherence. Specifically, the study looked at current referral practices from HPs to HCs, acceptance and adherence of referrals, and communication and feedback mechanisms between HPs and HCs.

MATERIALS AND METHODS

We used an observational, cross-sectional study with qualitative and quantitative methods. Data collection took place across five zones in two regions: Sidama and Gurage zones, Southern Nations and Nationalities' People Region (SNNPR) and East Shoa, West Arsi, and South West Shoa zones, Oromia region. We used retrospective register reviews to assess the volume of referrals made and the proportion of referrals completed.

Additional case reviews allowed us to explore the quality of care. Cases identified from the previous 12 months were traced to communities, where surveys of caretakers took place; in-depth interviews were conducted with a subset of caretakers. Qualitative interviews were also carried out with healthcare providers (HEWs) at referring HPs and at referred HCs. Table 1 summarize data-collection methods and sources.

Sample size

A single population proportion formula with the following assumptions was used to determine the required sample size of referred PSBI cases for the survey:

- 50% of cases that accepted referral will reach the designated facility (since the referral adherence rate was unknown, this was the most conservative assumption);
- ± 10% absolute precision;
- Design effect =1.5 (to account for correlation of observations among HPs);
- 95% confidence level

$$n = \frac{1.96^2\, p(1-p)(DEFF)}{d^2}$$

The sample size required for the survey was 145 referred PSBI cases. It was estimated that that at least 215 cases would need to be identified in order to survey 145 mothers/caretakers of infants with PSBI cases.

Sampling procedure – health facilities and PSBI cases: A multistage sampling procedure was used to select caretakers who visited HPs and were referred to HCs. In each HC, HP, and Woreda Health Office (WoHO), one HEW, HW, and WoHO staffer, respectively, was interviewed as a key informant. In-depth interviews with seven purposively selected caretakers were also conducted (four in SNNPR and three in Oromia).A sampling frame of woredas, HPs, and HCs was populated using Save the Children's routine programmatic database. Eighteen woredas (three to five per zone) and two HCs were selected based on level of PSBI case load (supervising HPs with relatively high referral case load, except in three woredas, where we only visited one HC).

[1]Referral adherence: after getting advice to go to a higher facility, having sought care from any qualified, facility-based provider. Whether the referral was completed was based on self-report and/or facility records.

Table 1: Methods overview

Method	Tool	Level	Purpose	Primary Data source	Inclusion Criteria
Quantitative	Module 1: Data extraction sheet	Health post	Document number of PSBI cases and referral practice	iCCM at HP	Child 0 to 2 months old during the onset of illness Child diagnosed with or classified as having PSBI Event occurred in the 12 months prior to HP visit Accepted referral to HC or higher facility
	Module 3: Data extraction sheet	Health center	Describe referral information from caretaker that complied with referral from HPs	IMNCIat HC	
	Module 2: Questionnaire	Community	Describe referral adherence, treatment adherence and the status of the newborn after treatment.	Mother/ caretakers whose newborns were referred for PSBI in the past year at household.	Caretaker identified during data extraction from HP 0-2 months' register, diagnosed with PSBI, event in the past 12 months, accepted referral. Caretaker accompanied sick young infant to HP during the child's illness; should be present at home.
	In-depth interview guides	Community	health-seeking behavior and adherence of referral	Caretakers who had a referral history in the three months before the study	Newborn illness occurred within the three months before the survey. Status of newborn has to be alive to avoid any grievance. Newborn illness occurred within the three months before the survey.
Quali tative		Health post	Explore information on the magnitude of PSBI	HEWs	HEWs who work in an HP where a young infant with PSBI was referred to an HC in the past 12 months.
		Health center	treatment adherenceand the status of the newborn after treatment; enablers and barriers to referral and treatment adherence	HWs	HWs who work in an HC where a young infant with PSBI was treated in the past 12 months.

Among these, HPs with *at least two cases of* PSBI in the previous year were considered and sorted in descending order by case load size. Cases were extracted until the required woreda-level sample size was obtained. Attempts were made to trace all PSBI referral cases from selected HPs to administratively assigned, destination HCs.

Data extraction tools were developed to capture PSBI cases seen and referred in the year prior to the assessment.

Data sources for extraction included ICCM registers (birth to two months) at HPs and the *IMNCI registers* at HCs. Modules for quantitative and quantitative data collection were prepared in English and translated into Amharic and Oromiffa. All were pre-tested and necessary adjustments were made prior to data collection. Data collection was done between July and August 2016 by two teams composed of a research associate with a note taker for the qualitative part and a supervisor and four data collectors for the quantitative part.

The research associates had at least MPH qualification and previous experience in such work, and the data collectors had a health background with least a BSc and previous experience. Extensive training on the tools and the study was done prior to the data collection.

For the quantitative data, SPSS version 21 was used for data entry and analysis. Statistical significance was tested using chi-square and *F*-test statistics. For qualitative data, interviews were transcribed and translated. Transcripts were coded both inductively and deductively and analyzed thematically.

Ethical clearance was granted by the Ethiopian Science and Technology Ministry's Institutional Review Board (IRB). The survey team was trained on ethical issues during orientation. Oral and written consent were obtained from study participants.

RESULTS

Overview of study participants

The study involved 33 HCs, 46 HPs, and 20 WoHOs in the five study zones of the two regions. Using ICCM registers, a total of 209young infants were identified as having PSBI and referred to higher facilities. A total of 145 (69%) mothers/caretakers of sick young infants with PSBI were tracked to their home and all consented to follow-up interviews. The majority of those surveyed (94%) were mothers who took their infants to the HP ;the remaining were fathers and other family members (Table 2).

Referral practice and care for very sick young infants at health posts: Registers from the study's HPs indicated that 778 young infants with PSBI were seen in the year prior to the study, of which 209(27%) were referred to a nearby higher health facility (Figure 2). S.W. Shoa and Gurage zones referred nearly 80% of cases, while the referral in the Sidama is about 50% of those cases seen. Differences among the zones may be explained by the fact that some zones like W. Arsi, which reported a 10% referral rate, has the Zonal health department directing the HPs to treat all newborn sepsis cases, even though the national CBNC protocols have provided clear guidelines on referral.

Of the 209 cases reviewed in HP registers, 71% were sent to HCs and 18% were sent to hospitals; the remaining 7% returned back to the HP. This contrast with caretaker interviews who reported that 82% were referred to HCs, 12 % were referred to hospitals and 6% were referred to non-governmental health facilities.

Table 2: Socio-demographic characteristics of caretakers (n=145)

Characteristics	N (%)
Zone/Region:	
Gurage	46(32%)
Sidama	23 (16%)
SNNP	70 (48%)
W. Arsi	23 (16)
E. Shoa	46 (32)
S.W. Shoa	6(4)
Oromia	75 (52%)
Relationship to infant:	
Mother	136(94)
Father	5(3)
Grandmother	4(3)
Age of the caretaker (mean ±SD)	28.3(±6.4)
Age category:	
Up to 24 years	37(26)
25 -30 years	66(46)
31-35 years	25(17)
Above 35	17(11)
Attended formal education	90(63)
Level of formal education (N=90):	
Primary (1-6) school	63(70)
Secondary (7-12) school	27(30)
Marital status of caretakers:	
Single & never married	6(4)
Married & living together	131(91)
Married but not livening together	1(1)
Divorced/separated	3(2)
Widowed	2(1)
Occupation:	
Housewife	108(75)
Farmer	29(20)
Daily Labourer	1(1)
Trader/merchant	6(3)
Employee (Government/private/ NGO)	1(1)
Spouse/partner occupation:	
Daily Labourer	78(54)
Farmer	49(34)
Trader/merchant	2(1)
Civil servant	7(5)
Other/DK	9 (6)
Average monthly income of the HH (mean ±SD) range	709±672 (20-4400)
Average monthly income of the HH by category	
Below 600 birr/month	68(47)
600 birr/month& above	62(43)
DK	15(10)

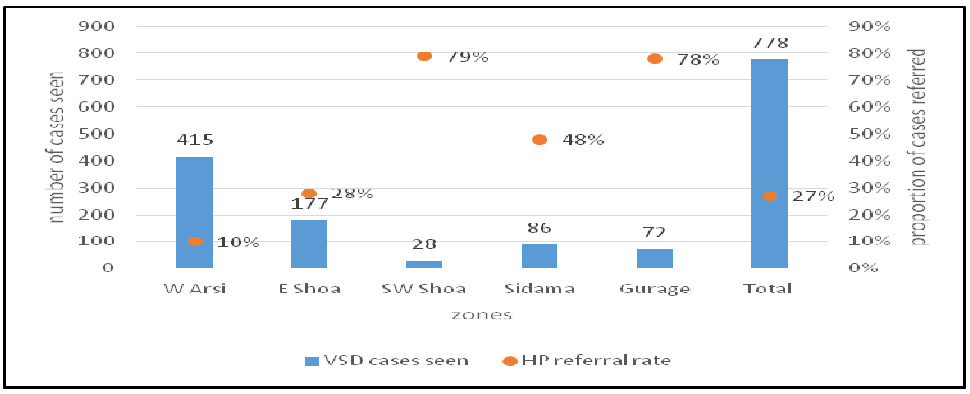

Figure 2: Number of possible serious bacterial infection cases and

Referral practices at HPs

Decision to offer referral

Interviews of health providers revealed that referrals were not universally offered for all PSBI cases. Issues such as the perceived severity of illness, availability of essential drugs at HPs and at destination HCs, awareness and understanding of the protocol, acceptance of the national protocol, and pre-referral treatment outcome were the frequently cited reasons that influence whether referral is made or not.

> *Although the chart booklet states that all neonates with PSBI should be referred to HCs, taking our preparedness and caretakers' suffering (time and cost) into consideration, I always treat them at HP unless we run out of medication, the danger signs worsen, and/or the mother requests to be referred. Furthermore, I do not see the difference in the management of PSBI between HPsb and HCs.*
>
> HEW at S.W. Shoa zone

Pre-referral treatment

Based on ICCM registers, only 64% of sick young infants were provided pre-referral gentamycin at the HP; 13% of records had no information recorded while the rest (23%) did not get the pre-referral gentamycin. This is higher than the 3% not receiving pre-referral gentamycin that was reported by the COMBINE study(3).HEWs cited various reasons for not administering pre-referral gentamycin, primarily a lack of supply, wanting to avoid double injection, and less severe signs of illness.

Fifty-five percent of caretakers surveyed confirmed that an injection was given to their sick infants as a pre-referral medication. Sixty-five percent of the caretakers also reported that their sick infants were given oral medication. Only 47% of PSBI cases reported receiving both the injection and oral medication at

Provision of referral slip

ICCM registers reported provision of referral slip in 52% of referred cases, whereas 72% of caregivers receiving referral reported being given a referral slip. Most HEWs and HWs noted that referral slips to and from HC sare very important because they improve case management and support follow-up to ensure that an infant is completing treatment. Specific referral practices varied. According to some HWs, HEWs call HWs (at HCs) to notify them of PSBI referrals whereas others just send a short note on a small piece of paper. Most caretakers reported that HEWs just told the mother to go to a HC.

> *…I think one PSBI case has been seen in the past three months at the HC. HEWs are not sending referral slips, but at times, they make a phone call, and the register does not have a column to enter referral cases. We also do not have the practice of sending written feedback to HPs.*
>
> Health Worker. Shoa zone

Referral adherence

Of the 145 caretakers who accepted referral, 88% adhered to the referral, of whom 89 (70%) went to the health facility specified by the HEW while 38 (30%) went to other health facilities. By contrast, HC registers show only 23% referral adherence from those who reported that they went to the recommended facility (Figure 3).There were many problems related to the completeness of HC registers, including incomplete registration, a lack of revised CBNC registers, and confusion about the sending facility. The interviews with the health worker revealed that the common perception was that only IMNCI-trained HWs are supposed to

According to the caretakers, nearly 90% of completed referrals arrived at the referral facility within 24hours of referral.

Facility preference and preferential adherence

According to the caretaker interviews (*n*=145), the majority of cases were referred to government HCs as compared to hospital and non-governmental health facilities, with 73% of caretakers reporting they adhered to the referral by going to the recommended facility. Caretakers reported adhering to referral for non-governmental facilities at 100%; 71% for government hospitals; and 57% for government HCs.

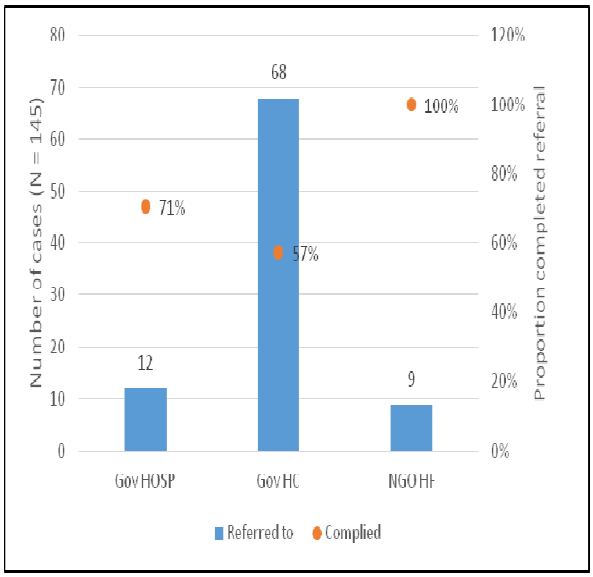

Figure 3: Referral acceptance and completion by destination health facility as reported by caretakers

While most care takers reportedly took their sick young infants to their assigned referral facility, some reported going to other facilities because of cost, distance, confidence, and trust. Most, (57%) of caretakers required to pay for their transport while 80% for medical service they received, an average of 40 birr. Of those who paid for medical care, 82%paid for medication and 21% for consultation/card.

It should also be noted that the current IMNCI guideline directs Health Centers to provide Gentamycin and Ampicillin injections for seven days at OPD level, which requires for the family to come twice daily making it more difficult (4)There were also cases where caretakers and HEWs jointly decided on the destination facility. Some HEWs reported tailoring the referred facilities to the severity level of each PSBI case.

> *If I believe that the illness is severe, I send the baby to nearby hospital and to a nearby HC if I feel the condition is mild or moderate. In fact, direct referral of cases from HPs to hospital is also well accepted and encouraged by HCs, as they believe that there is no difference in the management of VSD between HPs and HCs.*
>
> HEW in Sidama zone

Factors influencing referral

After controlling for possible confounders in a multivariate model, providing information on the severity of illness (p=0.037) and spouse's occupation (where non farmers are 3 times more likely than farmers to adhere to referral) (p=0.004) were associated with referral adherence. These findings should be treated cautiously, as the sample size of this study is relatively small.

Referral non-adherence

In the qualitative inquiry, health workers mentioned time and financial constraints as a major factor for refusing referral, especially to hospitals due to the possibility of being admitted. Other reasons mentioned by HEWs included a less friendly and cold reception at HCs and hospitals. Factors noted by caretakers that hindered referral acceptance included long waiting times for care providers, hassle in drawing patient cards, going to different sections of the facilities for services (e.g., laboratory, injection room) and sometimes referrals to other hospitals.

> *Most families do not like going to the hospital when referred, mainly for fear of admission and the following challenges:(1) maternal exposure to cold/wind and fear of evil eye upon the sick child; (2)expense related to hospital service and to transport food from home; (3) parents with many children [who are] less educated and from poorer households usually resist referral.*
>
> A HEW in Sidama

Caretakers also prefer to go to heath facilities where they are near to their family/relatives for social support rather than to going to the HEW's specified facility.

> *A mother in Adami Tulu Jido Komolcha Woreda with a sick infant with PSBI was advised to take the baby to a nearby HC. In order to avoid confrontation with the HEW, the mother took the referral slip with pre-referral injection, but went to a nearby hospital because the hospital is much closer to her relatives to get support.*

[7]Referral non-adherence: after getting advice to go to a higher facility, not having sought care from any qualified, facility-based provider.

Communication between PHCUs

Written feedback from HCs to HPs was very low (19%); only 12% of cases were referred back to HPs for follow up from referral higher facilities. In interviews with HC and HP health workers, most admitted poor communication between them in general and for PSBI management, in particular; however, the reasons were not explored during the interviews. Informal ways of communication such as telephone calls, use of simple pieces of paper, verbal messages through caretakers and others were reported as more common than the formal referral mechanisms, such as use of referral slips and feedback written notes.

DISCUSSION

We believe our study is the first to examine the referral system for newborns with signs of PSBI under Ethiopia's CBNC program. The study focused on referrals by HEWs to HCs as currently recommended by the Ministry of Health. We specifically examined the quality of pre-referral care by HEWs and referral adherence by caregivers among those who agreed to accept the HEWs' referrals. Using qualitative methods, we further identified enablers and barriers for HEWs to provide pre-referral antibiotics, as well as for caregivers to adhere to referral recommendations.

The study identified factors associated with adherence to referral. These are perceived severity of illness of infants, age of the sick infant, education level of the caretaker, support from caretaker's spouse, prior experience of referral, and access to referral facilities. The importance of social support to make onsite consultative decisions among close family members is indicated by the better adherence rates of those with support from spouses.

On the healthcare providers' side, facilitators included provision of information about the seriousness of illness and the available quality of care at referral facilities to caretakers, psychosocial and physical support for mothers, and provision of a referral slip. Some of these were also mentioned as factors that affect referral as in a couple of other Ethiopian studies where perceived availability of services, commodities, medicines and human resources in the referral facilities limits the completion of referrals (5,6).

CBNC guidelines (3) recommend that HEWs provide pre-referral antibiotics at the health posts for all PSBI cases accepting referral. This is a critical and life-saving because any delays in starting antibiotics put the sick child at risk. During supervision visits and clinical mentoring, pre-referral treatment should be emphasized.

Optimal functioning of the CBNC referral system requires consistent provision of referral slips by HEWs and receipt and appropriate use of referral slips by HCs. Our data on provision and use of referral slips indicates that this component of the referral system is weak. Referral slips serve multiple purposes including helping the family to understand and adhere to the referral, ensuring the health worker at the higher-level facility has information needed to make clinical judgments about illness classification and appropriate decisions about treatment such as timing of administration of Gentamicin.

A key element of primary health care is its referral system in which patients are able to access care at community-based health posts or health centers before accessing higher-levels of care such as secondary and tertiary hospitals. The referral system among health facilities in Ethiopia is used by a minority of patients, suggesting that intended connections between health posts, health centers, and hospitals may need strengthening to increase the efficiency of primary care nationally. (5) The referral of PSBI cases to an admitting higher facility has been the mainstay of management according to global and national guides (3,7). Despite national guidelines requiring universal offer of referral, use of referral slips, and pre-referral treatment, our study identifies major gaps in this service delivery.

In this study, the communication across the various levels of the PHCU with regard to referral and counter referral system was suboptimal. Written feedback from HCs to HP appear to be generally low. This may undermine the necessary follow up home care that need to be provided for at risk vulnerable newborns (particularly for premature or low birth weight babies) once they are back at home (8).

The limitations of this study included that the cases examined had already been classified as PSBI by HEWs, and they were not validated. The study did not classify different levels of illness severity, but instead, analyzed all PSBI cases based on national guidelines. Other limitations include poor documentation in registers of cases and referrals, the lack of a "gold standard" source of information, and a small sample size.

Conclusion and recommendation

This study focuses on major health system element upon which the success of CBNC depends, referral linkage between HPs and HCs. The management of PSBI at the HPs, especially with regards to pre-referral treatment, and irregular communication between HC and HP levels, are major gaps. The institutional capacity of the HPs for managing PSBI cases must be maintained. The study recommends that there needs to be stronger support from the PHCUs in ensuring HPs strictly follow the national PSBI management protocol – pre-referral treatment, counseling of caretakers on the importance of referral adherence, what to expect at a higher facility, and follow up of referred cases. Using mobile phones and other innovative ways can improve two-way communication and feedback loops. There is a need to strengthen the linkages (clinical and social) between HCs and HPs such that they see themselves as one unit; encourage HC staff to facilitate and participate in PRCMMs with WoHO and ensure the focus during these reviews and supportive supervision include issues related to referral.

We also recommend to encourage the use of ambulance for transport of newborns with complications. There is a need to realign the various guidelines that govern management of severe infections in newborns at different levels so that the outpatient treatment is similar. There should also be further study to address the way health facilities handle referrals like process mapping of what happens when families arrive until they are treated.

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Conflict of interest

Authors have no conflicts of interest to declare.

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ORIGINAL ARTICLE

EFFECTIVENESS OF SUPERVISION ON THE CONSISTENCY OF NEONATAL SEPSIS MANAGEMENT SKILLS OF HEALTH EXTENSION WORKERS

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ABSTRACT

Introduction: *Ethiopia has implemented community-based neonatal sepsis management as one strategy to reduce its persistently high neonatal mortality rate since 2012. The key strategies to maintain the quality of community-based management of neonatal sepsis are training, supportive supervision, and woreda-level performance review.*
Objectives*: Examine the effects of supervision visits provided to health posts on the consistency of neonatal sepsis management skills of health extension workers in Ethiopia.*
Methods: *The study domain was limited to 6,416 health posts in 269 woredas of Ethiopia. Longitudinal program monitoring data captured from registers between January 2014 and June 2016 was used for this study. The health post-level repeated measures were accounted for using random effects multiple logistic regression models.*
Results*: All health posts (6,416) received at least one supportive supervision visit, 20% (1,289) received two, and 5% (301) received more than two visits. The consistency of neonatal sepsis management was 71%, 76%, and 84% during the first, second, and third supervision visits, respectively. The effects of supportive supervision that were observed between the first and third rounds of supervisory visits were statistically significant.*
Conclusion: *The findings of this study suggest that supportive supervision visits were an effective intervention in improving the consistency of skills of neonatal sepsis management. At least three rounds of supervision are needed to ensure the optimum skills of management of neonatal sepsis at the community level. In the Ethiopian context, policymakers and program planners should make additional investments to sustain the effort of supportive supervision of the community-based newborn care.*
Keywords*: clinical mentoring, community-based neonatal sepsis management, Ethiopia, health extension program, supportive supervision.*

INTRODUCTION

Community-based management of common childhood illnesses is one of the child survival initiatives that has been implemented at the community level since 2010 in Ethiopia (1). However, the utilization of community -based integrated community case management (iCCM) service for newborns and young infants was low. The introduction of community-based newborn care (CBNC) was found to be imperative to improve the survival of newborns.

The Ministry of Health incorporated the CBNC package within the iCCM platform of the Health Extension Program (HEP) in 2012. This includes incorporating a newborn care package along with the continuum of maternal, newborn, and child healthcare and management of neonatal sepsis (2).

Competency-based training, prompt post-training follow-up, continued coaching through regular supportive supervision, and woreda-level performance review and clinical mentoring meetings (PRCMMs) are key implementation strategies specified in national CBNC plans (2) to improve and maintain the quality of community-based management of neonatal sepsis. However, the frequency of supportive supervision varied across health posts and over time. Moreover, most of the evidence available on the effect of supportive supervision on the performance of health workers pertains to facility-based integrated management of neonatal and childhood illnesses (IMNCI) and iCCM of common childhood illnesses. There is no evidence concerning the effectiveness of supervision on the consistency of neonatal sepsis management skills of Health Extension Workers (HEWs).

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Thus, this study examines the effects of supportive supervision on the consistency of neonatal sepsis management skills of the HEWs.

METHODS

Study areas and sample sizes

The study domain was limited to 6,416 health posts in 269 woredas in Amhara, Oromia, Southern Nations, Nationalities, and People's Region (SNNPR), and Tigray regions covering about 33 million people supported by the Last Ten Kilometers (L10K) Project of the JSI Research and Training Institute and Save the Children International (SCI) Ethiopia. The unit of analysis was the supportive supervision visits carried out in these health posts. A total of 8,006 supportive supervision visits to the health posts were analyzed during the 30-month review period (January 2014–June 2016).

Intervention

A competency-based, four-day CBNC clinical training was provided to all HEWs in the intervention areas to enable them to provide case management of neonatal infections at the community level. Most HEWs had been providing iCCM services. Supportive supervisions visits were provided to their health posts and PRCMMs were held at the woreda level to further enhance their skills and to motivate them.

A national CBNC register was introduced at health posts to serve as a checklist for HEWs to manage sick neonates. The register contains patient demographic data, clinical signs, and columns for classifications and treatments provided to patients. HEWs manage sick neonates using the national CBNC algorithm. They then record the classifications and treatments provided to sick neonates in the register.

To monitor the proper implementation of CBNC strategies, CBNC staff from partner organizations and health center and/or woreda health staff carry out supportive supervisory visits on a quarterly basis to health posts using standard checklists. The primary purpose of the supportive supervision was to reinforce the skills and positive attitude of HEWs and to motivate them to initiate management of neonatal sepsis through mentorship and supervision. During supervision, supervisors reviewed case registers for completeness and consistency between recorded signs/symptoms, classification, and treatment against the CBNC management protocol using paper-based checklists. Also, supervisors looked at the availability of drugs and supplies, reviewed performance related to mobilization of communities and to delivery of key maternal and newborn health services, assessed the knowledge of HEWs, and provided feedback based on any gaps identified.

Community-based newborn care partner staff and woreda officials facilitated the two-day PRCMMs bi-annually at woreda level involving the staff of the woreda health office, health center care providers, and HEWs to reinforce the skills of HEWs and to address service utilization challenges. During PRCMMs, the HEWs from all the kebeles in a woreda met together with their registers. On the first day, facilitators abstracted service statistics from case record registers, reviewed case records for completeness and consistency between recorded signs/symptoms, classification, and treatment against the CBNC management protocol with HEWs, and discussed issues related to consistency of case management and utilization of services. On the second day, clinical practice was carried out for HEWs in a health facility and feedback was provided to HEWs by facilitators.

Study of the intervention and data collection

The data abstracted during the supportive supervision and woreda-level meetings were entered into district health information software (DHIS2), a public-domain, web-based database customized for local use, for further presentation and analysis. A secondary analysis was carried out using these longitudinal data from January 2014 to June 2016 obtained from 269 woredas.

Study variables and their operational definitions

The independent variables of interest were the frequency of supportive supervision and the number of woreda-level performance review and clinical mentoring meetings provided to HEWs. The outcome variables were the consistency of neonatal sepsis management skills of HEWs. The consistency of sepsis management was defined by comparing the recorded classification, treatment including correct dose, duration, and frequency, and follow-up of neonatal sepsis cases according to the national CBNC protocol. A health post was considered to provide consistent case management for sepsis if 100% of the cases assessed were consistently classified, treated, and followed-up within two days of initiating treatment.

Data analysis

Monitoring data captured from case record registers in health posts between January 2014 and June 2016 were used for this study. Data were analyzed for descriptive and inferential statistics using Stata version 14.2 (3). To assess the effect of woreda meetings on the effect of consistency of sepsis management skills of HEWs, the PRCMM database for each of the woredas was combined with the supportive supervision database. In this case, the data from health posts that received PRCMMs before they received supportive supervision visits were excluded as these events could not be combined with the supportive supervision database.

The health post-level repeated measures were accounted for using random effects multiple logistic regression models. The within-woreda variation of the consistency of case management across the observation quarters and across health posts was assumed to be random and uncorrelated with the predictor variables included in the model. We ran random-effects models with observation quarters, regions, and implementing partners as fixed factors to assess the net effect of the supportive supervision and PRCMMs provided to health posts on the consistency of neonatal sepsis management skills of HEWs. In the regression analysis, we excluded the first observation from the quarter of 2014 due to a lack of variability in the number of supervision visits because, at that time, the health posts were receiving the first round of supervision visits (see Table 2). The goodness-of-fit of the regression models was estimated using Wald statistics to see whether all the coefficients in the model differed from zero, with all results at <5% alpha level considered significant. The measures of associations were presented as odds ratios (ORs) with their 95% confidence intervals (95% CIs).

Ethical considerations: Confidentiality of the data were guaranteed for the registers reviewed and the anonymity of the sick neonates and HEWs were preserved. Moreover, all personal identifiers were removed during data entry into DHIS2 and analysis.

RESULTS

Distribution of the supportive supervision visits

Overall, 8,006 supportive supervision visits were carried out in 1,289 health posts. Of these, all health posts received at least one supportive supervision visit, 20% (1,289) received two, and 5% (301) received more than two visits. The number of second and third supervision visits increased over observation periods (Table 1 and Figure 2). About a quarter (26%) of health posts participated in the woreda level review meetings.

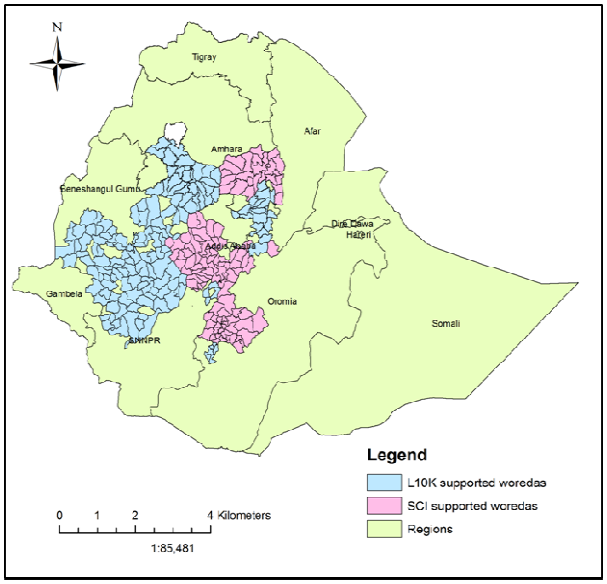

Figure 1: Map showing the study woredas in the four regions of Ethiopia

In 17% (1,336) of visit events at 942 health posts that managed sepsis cases, supervisors reviewed neonatal sepsis cases for consistency of correct classification, treatment, and follow-up to coach HEWs. On the other hand, in 14% (1,086) visit events at 809 health posts, neonatal sepsis referral cases were reviewed for correct classification and correct pre-referral treatment. Accordingly, these referral cases were not included in this analysis as their treatment follow-up was not determined; only those cases managed at health posts were included in this analysis.

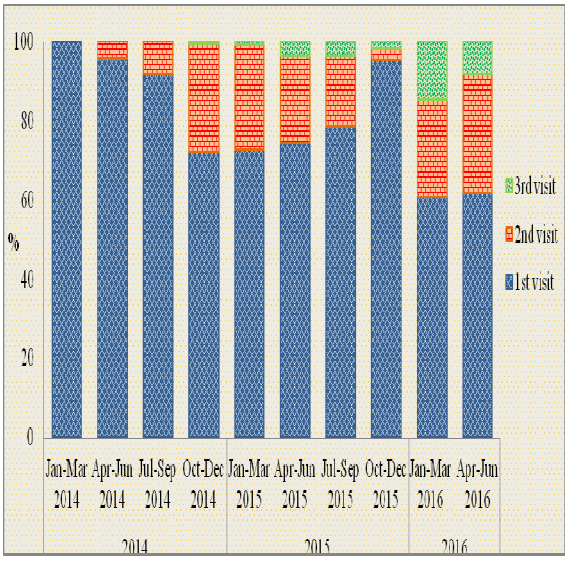

Figure 2: Distribution of supportive supervision visits over observation periods

Consistency of neonatal sepsis management skills of HEWs

The overall consistency of neonatal sepsis management was 71%, 76%, and 84% during the first, second, and third supervision visits, respectively. The consistency of neonatal sepsis management skills of HEWs increased over the observation periods and with the frequency of supportive supervision visits (Table 2).

Table 1: Distribution of health post visits by sepsis cases management according to frequency of visit, observation period, region, and PRCMM

Variables	% of visits did not manage sepsis cases	# of visits did not manage sepsis cases	% of visits managed sepsis cases	# of visits managed sepsis cases	Total % of visits	Total # of visits
Period						
Jan-Mar 2014	94.8	179	5.2	10	100.0	189
Apr-Jun 2014	91.1	781	8.9	76	100.0	857
Jul-Sep 2014	92.1	628	7.9	54	100.0	682
Oct-Dec 2014	88.1	782	11.9	106	100.0	888
Jan-Mar 2015	90.1	247	9.9	27	100.0	274
Apr-Jun 2015	79.4	643	20.6	167	100.0	810
Jul-Sep 2015	77.5	1,031	22.5	300	100.0	1,331
Oct-Dec 2015	79.2	1,127	20.8	296	100.0	1,423
Jan-Mar 2016	78.1	633	21.9	177	100.0	810
Apr-Jun 2016	83.4	619	16.6	123	100.0	742
Region						
Amhara	86.5	1,857	13.5	289	100.0	2,146
Oromia	83.4	2,371	16.6	471	100.0	2,842
SNNP	80.3	2,301	19.7	564	100.0	2,865
Tigray	92.2	141	7.8	12	100.0	153
Frequency of SS visit						
1	85.3	5,473	14.7	943	100.0	6,416
2	76.6	987	23.4	302	100.0	1,289
3	69.8	210	30.2	91	100.0	301
Number of PRCMMs						
0	85.4	5,050	14.6	860	100.0	5,910
1	77.3	1,453	22.7	427	100.0	1,880
2	77.3	167	22.7	49	100.0	216
Total	83.3	6,670	16.7	1,336	100.0	8,006

Table 2: Trend in consistency of neonatal sepsis management skills over observation quarters and frequency of supportive supervision visits

Year	Quarter	1st visit		2nd visit		3rd visit	
		% consistent	# of cases	% consistent	# of cases	% consistent	# of cases
2014	Apr-Jun	78.8	52	87.5	8	0.0	0
	Jul-Sep	88.9	36	100.0	6	0.0	0
	Oct-Dec	92.0	50	91.9	37	0.0	0
2015	Jan-Mar	53.8	13	78.6	14	0.0	0
	Apr-Jun	76.1	109	85.0	40	91.7	12
	Jul-Sep	77.2	206	79.4	63	90.9	22
	Oct-Dec	58.8	323	40.0	5	66.7	3
2016	Jan-Mar	74.5	106	65.4	52	84.8	33
	Apr-Jun	64.1	39	65.3	72	76.5	17
Total		70.8	942	75.8	297	84.1	87

Effects of the supportive supervision on the consistency of neonatal sepsis management skills of the HEWs

The analysis indicated that the odds of consistency of neonatal sepsis management skills of HEWs in Oromia region were 2.7 times higher than Amhara region and 1.7 times higher in SNNP than Amhara region (p-value <0.05). However, the consistency of sepsis management skills of HEWs in Tigray region was not statistically different from Amhara region (p-value > 0.05), which might be due to the small sample size as depicted in Table 1 above.

The odds of consistency of neonatal sepsis management skills of HEWs increased by 25% during the first PRCMM and 95% in the second PRCMM as compared to health posts without PRCMMs. The consistency of sepsis management skills of HEWs was not statistically significantly different between health posts that were visited once and those visited twice; however, the difference was statistically significant when compared between those visited once and those visited more than twice (OR 2.49; p-value <0.05) (Table 3).

Table 3: Random effects logistic regression model estimates of the predictors of consistency of neonatal sepsis management

Variables	OR	95% CI	P-value
Observation period			
Apr-Jun 2014	1.00		
Jul-Sep 2014	2.02	0.55–7.51	0.292
Oct-Dec 2014	2.25	0.78–6.52	0.135
Jan-Mar 2015	0.40	0.12–1.36	0.143
Apr-Jun 2015	0.67	0.27–1.65	0.378
Jul-Sep 2015	0.71	0.30–1.63	0.410
Oct-Dec 2015	0.30	0.12–0.73	0.008
Jan-Mar 2016	0.50	0.19–1.30	0.156
Apr-Jun 2016	0.43	0.17–1.12	0.083
Region			
Amhara	1.00		
Oromia	2.70	1.59–4.60	<0.001
SNNP	1.68	1.01–2.81	0.046
Tigray	2.33	0.43–12.64	0.328
Implementing partner			
SCI	1.00		
L10K	1.01	0.61–1.68	0.975
Number of supervision visit			
1	1.00		
2	1.32	0.86–2.02	0.208
3	2.49	1.16–5.38	0.020
Number of PRCMMs			
0	1.00		
1	1.25	0.80–1.95	0.324
2	1.95	0.71–5.36	0.198
_cons	2.44	1.04–5.73	0.040

DISCUSSION

The analysis showed that there is an increase in the rate of consistency of case management skills of HEWs across supportive supervision visits (71% during the first visit, 76% during the second visit, and 84% during the third visit). It also showed that the third supportive supervision visit had a significant effect on the consistency of neonatal sepsis management skills of HEWs.

The rate of consistency of case management of neonatal sepsis is consistent with a study carried out in India, reporting 89% correct diagnosis and 81% correct treatment rate for neonatal sepsis management by community volunteers (4). However, it is a little higher than the consistency of case management of the three common childhood illnesses—pneumonia, malaria, and diarrhea in Ethiopia (5,6).

It is generally agreed that supportive supervision is effective in improving the performance and motivation of community health care workers (5, 7-9). It has been tested to improve adherence to medical protocols as well as bridge know-do gap (10). Regarding the characteristics of supervision, reviews of intervention studies in low-and-middle-income countries suggest that supervision and audit with feedback are effective (10). Other trials demonstrate positive effects on worker performance when supervision is more frequent and supportive (11), based on trusting relationships between supervisor and supervisee, including team spirit and open two-way communication (12), and when a checklist is introduced (13). On the contrary, irregular and infrequent supervision of health workers does not affect performance and motivation (14-17) and can lead to de-motivation and poor performance of health workers (14). Our study demonstrated a dose–response relationship between the number of supportive supervision visits received by the health posts and improvements in the consistency of the sepsis case-management skills of HEWs.

Participation in the woreda-level PRCMM showed a positive improvement over the consistency of sepsis management skills of HEWs in this study. However, it did not reach a statistically significant level and it should be interpreted cautiously as the number of health posts participated in the woreda-level review was small. There are also contradictory reports that PRCMMs improved (6, 18) or did not improve (5) the consistency in management of iCCM cases by HEWs in Ethiopia.

There is no evidence generated earlier concerning the effectiveness of supervision on the consistency of neonatal sepsis management skills of HEWs in the country. This paper is unique in reporting the effect of supervision visits on the consistency of neonatal sepsis management skills of HEWs in Ethiopia. However, it has limitations. First, the effect estimates observed could be confounded by unmeasured variables and the presence of possible selection bias. The analytic technique we used, the random effects models, did not account for the effect of unmeasured variables that may have confounded the observed associations. Moreover, of the 6,416 health posts visited only 942 health posts that managed sepsis cases were used for the study which is not randomly selected. This affects the representativeness of study samples and generalizability of study results to other settings and other samples. The effect of selection bias would be reduced and the external validity of the study would be improved if there were longer periods of observation and Second, we assumed that all health posts in each woreda attended woreda-level PRCMMs; however, this assumption might not always be true. Third, health posts that received PRCMMs before they received supportive supervision visits were excluded from this analysis as these events could not be combined with the supportive supervision database. This might affect the effect of PRCMMs on the outcome variable of interest negatively. Finally, health posts' participation rate in the woreda-level review meetings were small; as a consequence, this does not have the statistical power to detect the effect of PRCMM on the consistency of case management skills of HEWs.

Additional studies and/ or further analytical methods are needed to determine the effectiveness of PRCMMs on the neonatal case management skills of HEWs. The researchers recommend continuing to track this type of data on the effects of supportive supervision and PRCMMs on the quality of care as part of improving program implementation.

A qualitative study is recommended to explore the nature of supportive supervision that results in high performance and motivation of HEWs. There is no evidence to suggest what type and intensity of supportive supervision are needed overtime to sustain the skills of HEWs to manage neonatal sepsis at the community level. Thus, a longitudinal study would also be helpful. We recommend implementation research be continued on the effects of integrated supervision for primary health care unit on the quality of neonatal sepsis management skills of HEWs.

The findings of this study suggest that supportive supervision with case reviews and/or register reviews and the discussions that emerge from them were an effective intervention in improving the consistency of skills of neonatal sepsis management at the community level. At least three rounds of supervision are needed to maintain consistency in the management of neonatal sepsis. Policymakers and program planners should make additional investments to sustain the effects of supportive supervision.

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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 unacceptability 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.

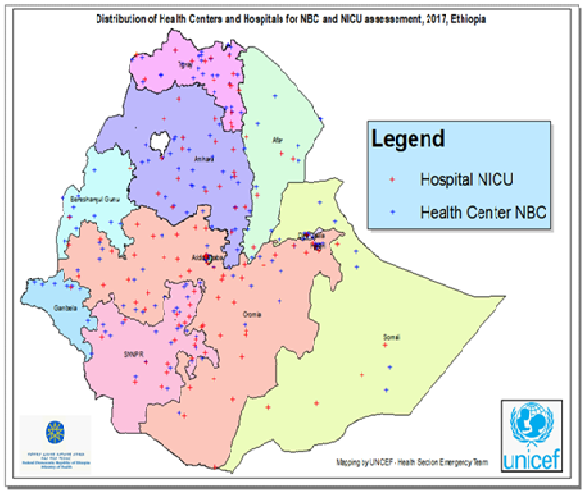

Figure 1: Distribution of HCs and hospitals.

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 assed	% 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	
				received	assembled and were used	received	assembled and were used	received	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 Oxi-meter	Physical vital Sign monitoring system	Electro-cardio-gram for new-born	Echo-cardio-graph Service	Blood gas Ana-lyzer	Ultra Sound Service	X-ray Service	Hemo-globin meter, centri-fuge	Exchange transfusion set three way valve	Glu-cometer	Umbili-cal Cathe-ter
	#	%	%	%	%	%	%	%	%	%	%	%
Addis Ababa	7	57	43	29	29	14	57	86	57	29	71	100
Afar	5	80	0	20	20	0	100	80	80	0	60	0
Amhara	18	56	6	0	11	0	22	94	100	6	61	100
B_Gumuz	2	100	100	0	0	0	100	100	100	50	100	0
Dire Dawa	2	100	50	0	50	0	0	100	100	0	100	0
Gambella	1	100	0	0	0	0	100	100	100	0	0	0
Harari	2	100	50	0	50	100	100	100	100	0	100	0
Oromia	44	66	9	16	16	14	89	89	86	2	64	100
SNNP	19	89	32	5	21	0	42	89	100	0	53	100
Somali	5	20	0	20	60	0	100	100	80	0	20	0
Tigray	15	80	33	7	7	20	100	100	100	33	87	100
Total	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 Dewa, 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 Dewa, 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 technically 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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ORIGINAL ARTICLE

THE EFFECT OF COMMUNITY-BASED NEWBORN CARE INTERVENTION ON SERVICE UTILIZATION FOR SICK NEWBORN AND CHILDREN

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ABSTRACT

Introduction: *Newborn deaths account for 43% of under-five mortality in Ethiopia, and newborn infection contributes to one third of these deaths. The provision of community-based newborn care services through the Health Extension Program platform is a key strategy to increase the utilization of newborn care services by increasing access near the community. In March 2013, the Ethiopian government launched community based newborn care, through which community health workers are trained, supplied with essential commodities, and supervised on the provision of community based newborn care, including the management of severe newborn infections.*

Objective: *To assess the effect of CBNC intervention on improving health care-seeking behavior for community newborn and child health services.*

Methods: *Data regarding sick young infants and sick children who visited health posts have been extracted from integrated community case management integrated community case management/community based newborn care registers pre-and post- community-based newborn care initiation during the first round of community-based newborn care performance review and clinical mentoring meetings. Descriptive and logit regression analyses were used to measure changes in health care-seeking behavior.*

Results: *The number of sick young infants seen at HPs increased 21-fold after the initiation of community-based newborn care. Managed cases of very severe disease and cases of local bacterial infection increased six-fold and four-fold, respectively. Managed cases of pneumonia and diarrhea showed only slight increases.*

Conclusions: *Overall, community-based newborn care has improved the health care-seeking behavior of mothers of sick young infants in Ethiopia. However, care-seeking is still low when compared with the numbers of expected cases.*

Key words: *Sick young infants; sick children; community-based newborn care; care-seeking behavior; pre- and post- community-based newborn care*

INTRODUCTION

Newborn deaths account for 43% of under-five mortality in Ethiopia (1), and newborn infection contributes to one third of these deaths (2). In 2013, the Ethiopian government launched community-based newborn care (CBNC), through which community health workers are trained, supplied with essential commodities, and supported to provide care for newborns who have infections(3,4). Before CBNC, integrated community case management (iCCM) of childhood illness was implemented. One of the main challenges in both programs has been the slow uptake of services by communities and limited care-seeking behavior for sick children and newborns (5,6).

Various interventions to increase the availability, demand, and utilization of health services have been implemented (4,7). At the community level, the Health Development Army (HDA) was launched to mobilize communities to use services and encourage healthy practices. The HDA is an organized network consisting of women (one woman for every five women from neighboring households) who act as a bridge for families to gain access to the services provided by health extension workers (HEW).

Additionally, HEWs play a major role in increasing demand for health services by educating families, conducting active surveillance during house-to-house visits and community mobilization.

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Pregnant mothers' forums, the media, existing social institutions such as 'edir', and women's and religious associations are some of the community platforms used to mobilize the community to boost health service uptake (4).

The objective of this study was to assess whether the CBNC program has improved service utilization by caretakers with sick young infants (SYIs) and sick children (SC) under five years of age.

PATIENTS AND METHODS

Data regarding sick young infants and sick children who visited health posts (HPs) for care have been extracted from iCCM/CBNC registers for pre- and post-CBNC initiation time periods. Data were collected during CBNC performance review and clinical mentoring meetings (PRCMMs) and were analyzed to see if there were changes in the utilization of iCCM and CBNC services.

Design and Setting: The study is a pre- and post-intervention analysis of iCCM/CBNC data collected during PRCMMs at two different times. While national CBNC implementation guidelines call for the first PRCMM to be conducted within three to six months of training, most HPs held them six to nine months after the initiation of the program (7). PRCMMs are important opportunities to mentor and coach HEWs, and to collect important data on the progress and quality of program implementation (4).

The study covered 4,403 HPs from 204 woredas (districts) in the four agrarian regions (Amhara, Oromia, SNNPR and Tigray), where Save the Children support the Federal Ministry of Health (FMOH). Pre-CBNC data were missing in other partner-supported areas, and thus could not be included in this study.

Data relating to the number of cases detected and treatment of SYIs and SC were collected for pre- and post-CBNC time periods. Pre-CBNC is the interval between the last PRCMM held for the iCCM program and the date the HP received CBNC training and supplies. Post-CBNC is the interval between the date the HP had at least one CBNC-trained HEW and supplies, and the date of the first iCCM/CBNC PRCMM. The same technical expert collected information for both periods during the review meetings.

Intervention: CBNC was built on the iCCM platform, and the implementation began in the agrarian regions in January 2014.

For iCCM, HEWs manage sick children with pneumonia, diarrhea, malaria and malnutrition. CBNC added services to manage newborns with very severe disease (VSD) when referral is not possible (8).

Field Methods, Measurements, and Data Analysis

All SYIs under two months of age and SC aged two to 59 months for whom caregivers sought care for illness were used to determine the caseload in the two time periods. These data were compared with published estimates of annual disease incidence rates: 7.6% of neonates for of very severe disease (VSD) (9), 27% for pneumonia, and three episodes of diarrhea annually for children under five years (10). Woreda-level demographic information was used for denominators. Data for the treatment of VSD were analyzed for the post-CBNC time period only because HEWs were not authorized to treat these cases beforehand. Malaria and malnutrition, part of community case management, were excluded from analysis in this study due to seasonal characteristics and the absence of complete data.

The data-entry platform and data-extraction format were developed as part of the PRCMM facilitator's guide. Data were entered into DHIS2 and analyzed with Stata version 13.

The study used descriptive statistics to allow comparison between the two time periods, and regression models to measure changes in utilization. The relative differences between the two time periods, coverage (percentage) and mean were calculated to determine service utilization. To calculate the mean number of SYIs, SC and specific disease cases per annum (see Table 4), the data used were annualized. First, we calculated monthly averages, then the annual number of cases were estimated by multiplying by 12. The actual data extracted for each HP covered an average of 7.4 months pre-CBNC and 8.1 months post-CBNC.

Ethical Aspects: The FMOH Child Survival Technical Working Group and the subgroup responsible for the CBNC monitoring and evaluation framework provided oversight to the study. The data analyzed did not have individual patient-level data and names.

[1]Local indigenous self-help association in most part of Ethiopia

RESULTS

A total of 4,403 HPs that conducted PRCMMs between December 2014 and March 2015 were included in the study. Data extracted for each HP covered an average of 7.4 months pre-CBNC and 8.1 months post-CBNC. This distribution varied regionally, from 5.4 months in Southern Nations, Nationalities, and peoples (SNNPR) to 7.9 months in Amhara for pre-CBNC, and from 6.6 months in Amhara to 9.4 months in Oromia for post-CBNC. Despite these variations, all HP records included two to three quarters of implementation (Table 1).

The timings of woreda review meetings were distributed randomly during 2014 and the first quarter of 2015. To standardize the data for comparison, the number of cases per month were computed for all children seen. We found a significant 19-fold increase in the utilization of CBNC treatment services in the post-CBNC time period (Table 2). Six times as many newborn VSD cases and four times as many local bacterial infection (LBI) cases were seen (see Table 3). However, there was only a small (.01) increase in the utilization of services for sick children (aged two to 59 months). This also reflects the fractional increases in the treatment of pneumonia (.01) and diarrhea (.08) (see Table 3).

Table 1: Distribution of the health posts observed by region and period

Region	# of HPs	# of observations			Average months of recorded data in the study	
		Pre-CBNC	Post-CBNC	%	Pre-CBNC	Post-CBNC
Amhara	1,120	1,120	1,120	25.4	7.9	6.6
Oromia	1,656	1,656	1,656	37.6	8.9	9.4
SNNPR	1,376	1,376	1,376	31.3	5.4	8.1
Tigray	251	251	251	5.7	6.1	7.2
Total	4,403	4,403	4,403	100	7.4	8.1

Table 2 : Total Number of Sick Young Infant and Sick Children Seen Monthly at Health Post Pre- and Post-CBNC n= 4403

Age catagory	Pre -CBNC	Post -CBNC	Fold change
Months/weeks	#	#	times(fold)
Sick Young Infant			
0-2 months	579	11,333	18.6
Neonate	442	9,600	20.7
5-8 weeks	137	1,733	11.6
Sick Children			
2-59 months	308,521	331901	0.1

*Fold changeis calculated ((Post-CBNC-Pre-CBNC)/Pre-CBNC)

We observed a significant increase in CBNC service users (SYIs), both in terms of absolute size (9,600 vs 1,733) and frequency of fold change (20.7 vs 11.6) among neonates, compared to those aged five to eight weeks (see Table 2). Increased care-seeking behavior at early periods of birth is very important, as the first day, week and month of birth are periods where the risk of VSD and other neonatal complications is high. Examining the change by type of disease for SYIs, the increase in service uptake of VSD cases (6.3) at HPs was higher than for LBI cases (4.2) (Table 3).

Comparing the total number of SYIs with specific cases, there was a substantial increase in the total number of neonates and SYIs, much higher than for specific diseases such as VSD and LBI (see Tables 1 and 3). While a total of 11,333 caregivers of SYIs sought care at HPs post-CBNC, 528 VSD and 580 LBI cases were diagnosed. Nonetheless, data in Figure 2 show that care-seeking remains very low compared to estimates.

We also calculated the mean number of SYI and SC cases per HP per annum. The data in Table 4 reveal a significant positive change for the post-CBNC period, particularly for newborns, although the numbers of VSD and LBI cases were small.

A binary logistic regression analysis, not presented here, reveals that the *p*-values for these effects are zero – the introduction of CBNC has significantly increased the utilization of HPs for neonatal health conditions.

Table 3: Total number of monthly cases seen at health posts pre- and post-CBNC (n = 4,403)

Category	Disease	Pre-CBNC	Post-CBNC	Fold increase*
		Number	Number	
Sick young infants	VSD	72	528	6.3
	LBI	112	580	4.2
Sick children	Pneumonia	61,684	66,710	0.1
	Non-severe diarrhea	125,965	130,746	0.0

Table 4: Mean number of cases of sick young infants and sick children seen per annum (annualized) per health post during pre- and post-CBNC interventions (n = 4,403)

Age category	Cases	Period	Mean	St. err.	95% conf. inter
0-2 months	Total SYIs (< 2 months)	Pre-CBNC	1.6	0.43	(0.77, 2.40)
		Post-CBNC	31.3	0.49	(30.37, 32.30)
	Total neonate (< 28 days)	Pre-CBNC	1.2	0.31	(0.63, 1.84)
		Post-CBNC	26.4	0.48	(25.43, 27.32)
	VSD	Pre-CBNC	0.2	0.09	(0.03, 0.37)
		Post-CBNC	1.5	0.04	(1.37, 1.54)
	LBI	Pre-CBNC	0.3	0.25	(–0.18, 0.80)
		Post-CBNC	1.6	0.06	(1.49, 1.71)
2-59 months	Total SC (2-59 months)	Pre-CBNC	70.5	2.05	(66.52, 74.54)
		Post-CBNC	75.9	1.18	(73.61, 78.25)
	Pneumonia	Pre-CBNC	14.1	0.8	(12.55, 15.67)
		Post-CBNC	15.3	0.37	(14.56, 15.99)
	Non-severe diarrhea	Pre-CBNC	29.1	1.03	(27.09, 31.11)
		Post-CBNC	30.2	0.6	(28.97, 31.34)

Additional analysis was run on the changes between the two time periods by comparing the number of cases seen with estimates of the expected number of cases. Figure 1 shows that, despite increases in the post-CBNC period, a considerable number of cases are still not being seen at HPs.

HEWs are expected to treat VSD and LBI cases when referral is not possible. Figure 2 shows that more than two-thirds of VSD cases identified started treatment at HPs and more than three quarters completed the seven-day treatment. We also found that 66% of LBI cases were treated at HPs.

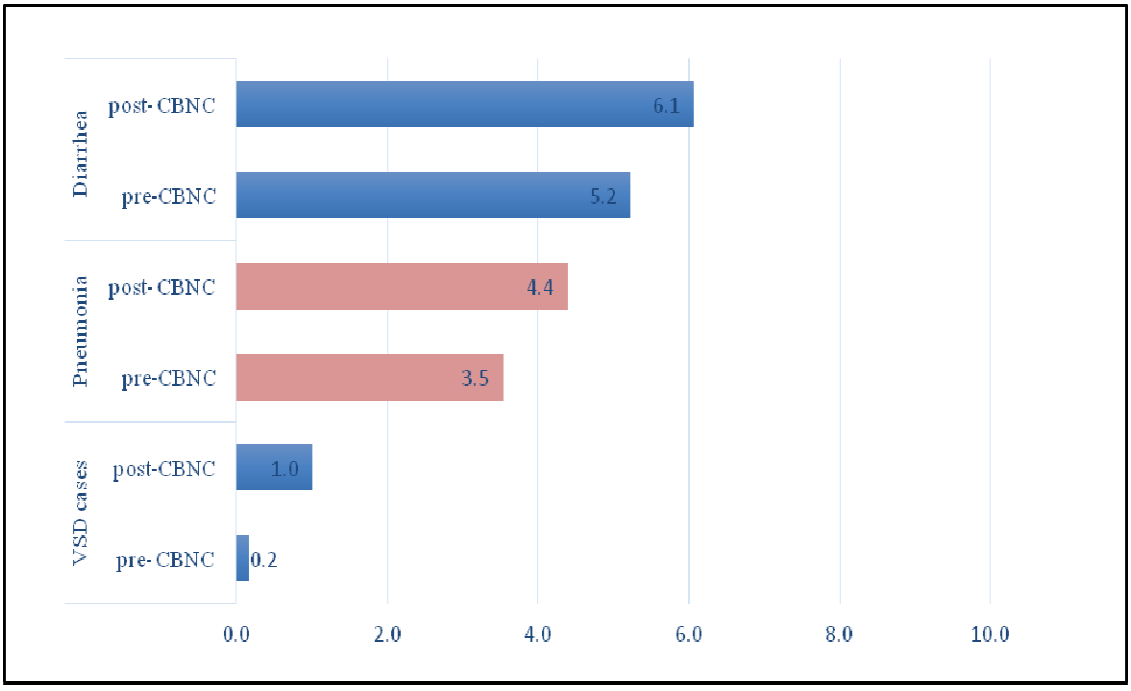

Figure 1: Percent coverage of selected diseases from an estimated summary incidence in both periods

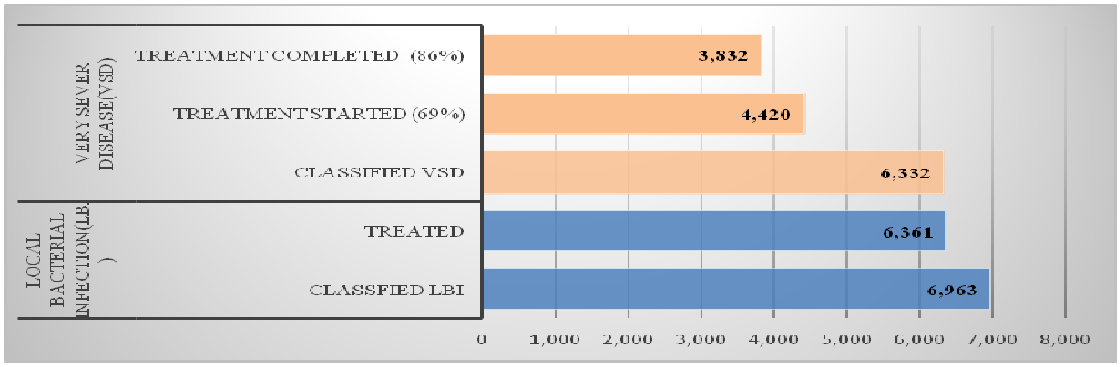

Figure 2: Treatment of LBI and VSD post-CBNV period

One of the limitations of the study is that it did not consider the number of cases identified or treated at HCs and hospitals. In other studies, caregivers sought treatment directly at HCs (10,11). Thus, the utilization of health services overall may be undercounted, and proportions of expected cases may have been exaggerated.

DISCUSSION

This analysis of the effect of the CBNC program on the utilization of newborn and child health services shows that it has significantly increased for newborn illnesses.

Possible contributory factors include the existence of a strong HEP platform, the recent implementation and application of lessons learned from a working iCCM platform (13), strong implementation that included standardization of the program, effective partnerships between the FMoH/RHBs and other stakeholders, high-quality training, routine supportive supervision, and review meetings (13).

The study findings show that there is a wide discrepancy between the total number of SYI and actual number of CBNC cases, particularly for VSD and LBI.

The implication is that although contacting mothers with newborns is an important entry point for capturing cases, promptly identifying severe disease cases and linking them to the HEW can effectively save more newborn lives.

The findings presented above on treatment part indicates that HEWs were able to treat 86% of VSD cases and 91% of LBI cases. There is also previous evidence from iCCM that HEWs were treating cases effectively and the general quality of care was high (5).

Even though there was a measurable increase in newborns seen by HEWs, the proportion of estimated expected cases remains very low. This is consistent with iCCM findings that health service utilization for children under five is lower than expected and only rises slowly during early program roll out (6,14-16). The iCCM program also found that SYIs under two months were brought in much less frequently than older children (6). Low utilization of health care for newborns has been associated with cultural and geographic barriers, and with financial access constraints (14). What these figures do not reflect is the possible utilization of HC and hospital services for neonates. Accurate program data on direct care-seeking, diagnoses, and referrals to higher levels of care are not available.

More than two thirds of the cases classified as VSD started treatment at HPs and three quarters of those completed the seven-day course. This demonstrates the potential for good-quality care at the community level. In the post-CBNC time period, there was little change in the utilization of pneumonia, diarrhea, and malaria services under iCCM.

Thus, even though iCCM and CBNC systems are integrated, there did not seem to be any knock-on effect from CBNC initiation. Despite encouraging improvement in the utilization of newborn care services, the progress is far below what was expected. HEWs were able to treat the significant majority of cases to the extent that caregivers were able to seek care at the HP. This study also could not reveal the significant positive impact of CBNC in relation to increasing the service uptake of other childhood sickness. To work in an integrated way, this would require a more coordinated response by FMoH, partners, research institutions at upstream level, and local administration, health authorities and service providers, HDA and communities at grass-root level.

Though the study provides important insights into the effect of CBNC on care-seeking behavior of child and new community case services, it is by no means complete. Further studies should be encouraged to investigate care-seeking across the continuum of care and referral linkages.

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Conflict of interest

The authors have no conflicts of interest of declare.

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ORIGINAL ARTICLE

SUPPLY CHAIN MANAGEMENT FOR COMMUNITY-BASED NEWBORN CARE IN RURAL ETHIOPIA: CHALLENGES, STRATEGIES IMPLEMENTED AND RECOMMENDATIONS

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ABSTRACT

Introduction: *Successful implementation of Community Based Newborn Care, relies on uninterrupted availability gentamycin and amoxicillin at health posts requiring strong national supply chain System. Ethiopia is implementing a pull system through an integrated pharmaceutical and logistics system but mainly focusing on HIV, tuberculosis, and malaria commodities. Hence a semi-parallel push system was used by the ministry of health with United Nations Children's Fund support to avail newborn lifesaving commodities at health posts. Moreover, the ministry coordinated the incorporation of the lifesaving commodities in the national essential medicine list, their registration, procurement and distribution.*

Objective: *This article presents challenges, strategies in availing lifesaving commodities at health posts and recommendations.*

Methods: *We reviewed different documents and data related to newborn supply chain from March 2013 to December 2016: data from a cross-sectional survey between Quarter-4, 2015 and Quarter-1, 2016, and program monitoring from October 2015 to September 2016 were used. We describe the findings using key components of the supply chain system.*

Results: *Ethiopia took several measures to overcome supply-chain challenges; cross-sectional survey showed availability of gentamycin and amoxicillin, 72% and 82% of health posts on the day of visit respectively. during routine monitoring visits to 2,500 health posts, gentamycin and amoxicillin dispersible tablets were available in 99.8%and 77.5% on the day of visit respectively.,*

Conclusion*: the current supply chain is not strong to sustainably avail lifesaving commodities at health-posts; a semi-parallel procurement and distribution was implemented as a short-term strategy. Building a strong national supply chain system should be given due focus.*

Key words: *Ethiopia, supply chain, community based newborn care, procurement, distribution.*

INTRODUCTION

Ethiopia's ambitious Newborn and Child Health Services Strategy (NCHSS) aims to achieve reductions in neonatal mortality through an integrated program that includes Community Based Newborn Care (CBNC). CBNC relies on the uninterrupted availability of essential supplies at community health posts (HPs). As with other health system supplies, these should be provided through routine systems of the Pharmaceutical Funds and Supply Agency (PFSA).

PFSA is a separate agency under the FMOH that is mandated to forecast, procure, store and distribute all pharmaceuticals and other health related logistics. The FMOH coordinates partners' technical and financial inputs for commodities and manages day to day activities through its Pharmaceutical and Logistics Management Unit (PLMU).

Currently PFSA is developing a pull approach at all levels through integrated pharmaceutical and logistics systems (IPLS). These have been in use since 2009 but have focused on HIV, tuberculosis, and malaria commodities. PFSA uses IPLS to directly deliver all pharmaceuticals in an integrated manner to all public health facilities every two months, based on demand. Product related stock and use information flows up from health facilities to the center.

However**,** problems in record-keeping, forecast data quality, and timely requisition and consumption reporting within IPLS remain challenges. Strengthening PFSA systems is a priority in Ethiopia's Health Sector Transformation Plan, but in the interim the CBNC program has worked around it to ensure reliable supplies.

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The supply system for child health commodities including CBNC has been a push system through United Nations Children's Fund (UNICEF) and its implementing partners due to the limited capacity of PFSA and facilities (6).

MATERIALS AND METHODS

The authors reviewed different national documents related to CBNC supply chain for the period between October 2013 and December 2016. In addition, two sets of data source were used to study the stock status of the essential commodities for CBNC-gentamycin 10mg/ml and amoxicillin 125 and 250 mg dispersible tablets at health posts in Amhara, Oromia, Southern Nations Nationalities and Peoples Region (SNNPR) and Tigray regions where CBNC has been scaled up to all communities. This included 1) a cross-sectional survey which was conducted, between 4th quarter of 2015 and 1st quarter of 2016 in 367 health posts in 117 districts of Amhara, Oromia, SNNPR and Tigray regions selected through multi-stage, stratified cluster sampling technique; and (2) data from program monitoring visits in JSI Research and Training Institute Inc. The Last Ten Kilometers and UNICEF project areas.

CBNC essential commodities which included amoxicillin DT and gentamycin 10mg/ml. Data was available from 2,579 and 2,548 health posts for amoxicillin DT and gentamycin 10mg/ml respectively.

The health posts were covered in three round visits and were distributed in 112 districts in Amhara, Oromia, SNNPR and Tigray regions. Filed data was sent by supervisors to the national data base where it was organized, analyzed using an excel sheet by a dedicated monitoring and evaluation expert. We describe the results using the key components of the supply chain system.

RESULTS

Key steps followed in scale up and integration of CBNC commodities

Through the Federal Ministry of Health (FMOH) and its partners, several interventions have been carried out to strengthen national CBNC supply system. This included standardization of the required supplies and equipment (Table 1), revision of the national essential medicine list (EML) (7), registration, national forecast and quantification, pro-

Table 1: Training Kit Contents and Quantity Needed for a Health Post for One Year or an Estimated Population of 5,000

No	Item	Quantity per Health Post
1	Chart booklet for each HEW	2
2	Exercise booklet for each HEW	2
3	Sick young infant register for each HP	1
4	Amoxicillin dispersible tablets 125mg, pack of 100 tablets	2
5	Gentamycin 10mg/ml,2ml ampoule, pack of 50 ampoules	1
6	Syringe with needle (2cc), sterile box of 100	1
7	Clinical thermometer, digital (32-43°C)	2
8	Weighing scale, infant, spring type, 5kg x 25g with sling	1
9	TTC eye ointment5g tube of 50	1
10	Chlorohexidine g (4% w/w) gel	168
11	Timer, respiration for acute respiratory infection	2
12	Gloves, exam, latex, powder free, medium, box of 100	1
Additional Supplies and Equipment for Training Site		
13	Facilitator's guide	1 per facilitator
14	CBNC video in local languages	3 per training site
15	Neonatal complete simulator (mannequin, bag and mask, and suction)	4 per training site

National policy, strategy, and scale up of CBNC service: CBNC was launched in March 2013. To translate the policy into action, guidelines and standards that included an overall implementation guide, training guides, and job aids in local languages (Amharic, Oromifa, Tigrigna) were developed by the national technical working group (TWG). Production, and distribution of these guides was managed by UNICEF, and reached all implementation sites. By December 2016, the FMOH and implementing partners had scaled up CBNC service to 95% of HPs in Amhara, SNNPR, and Tigray regions.

Regulatory support and timeline: The Food, Medicine & Health Care Administration & Control Authority (FMHACA) lead the regulatory process for CBNC. This included support for standardizing and registering the commodities as well as updating the EML, to include amoxicillin dispersible tablets of 125mg and 250mg, gentamycin injections 10mg/ml, and chlorhexidine 4% gel for cord care in 2015 (7). Chlorhexidine gel was added to the list of over-the-counter (OTC) commodities in April 2016, along with zinc dispersible tablets and oral rehydration salts (10) (Table 2). The national TWG played a critical role by advocating program needs with FMHACA. Following the launch of CBNC and the revision of the EML, FMHACA supported off-shore procurement and importation of some commodities (gentamycin 10mg/ml, amoxicillin DT) by granting pre-import permits to UNICEF. They also made them fast-track commodities and conducted quality assurance activities.

Table 2: Timeline of Supply Chain Events for CBNC from 2013-2016

2013	2014	2015	2016
• Gentamycin 10mg/ml, amoxicillin DT, CHX gel 4% were introduced per protocol • National guidelines for medicines, supplies, equipment, job aids for HPs developed • Projections of annual quantity needed per health post developed	• Local manufacturing of chlorhexidine gel 4% 20g (Misrach) initiated • First batch of 150,000 tubes distributed to 4early CBNC zones in Tigray, Amhara, Oromia, and SNNP	• Amoxicillin DT 125mg, 250mg; gentamycin 10mg/ml; chlorhexidine gel 4%; zinc sulfate DT added to national EML	• Chlorhexidine gel 4%; zinc sulfate DT included in OTC drug list; • Amoxicillin DT registered locally

Coordination and management:
Overall coordination of CBNC supply forecasting, quantification, procurement, and distribution was provided by FMOH through the PLMU and PFSA. The national TWG, which included FMOH/PLMU, UNICEF, WHO, CHAI, Results for Development (R4D), Save the Children, JSI Research and Training Institute/L10K, Emory University, and the Integrated Family Health Program (IFHP), gave technical guidance through regular and ad hoc meetings.

Forecasting, quantification, and procurement:
To guide the standardization and procurement of life-saving commodities, the FMOH/PLMU and PFSA led national quantification and forecasting exercises for two-time periods. The first, forecast 2014 to 2015 and the second forecast 2016 to 2018 (8,9). Based on a decision by FMOH and its partners, procurement of CBNC commodities took place through UNICEF from2013 to 2016. UNICEF also supported the procurement with distribution through implementing partners or directly using its own mechanisms.

Distribution:
CBNC supply distribution used three mechanisms built on lessons from Integrated Community Case Management (iCCM) supply systems.

1. Training kits containing enough supplies for 12 months to woredas were distributed to implementing partners before each training session occurred. Then, the kits were provided by the partners to HEWs at the end of the trainings. This short-term approach helped HEWs start service delivery immediately after finishing training and returning to their HPs.
2. Later, replenishment supplies to cover 12 months were distributed to HPs either directly through implementing partners or by UNICEF to woreda health offices (WrHO). and health centers (HCs) made the final distribution to HPs. In this case, supplies were distributed based on monitoring reports of stock-outs.

These two approaches used a semi-parallel and push system that ensured continuous availability of the supplies during the period 2014 to 2016.

3. Distribution through the IPLS based on demand was initiated in December 2016 after planning, preparation of training guides, amended or new forms and job aids, and after HC pharmacy personnel and HEWs were trained.

Stock Monitoring and information: In the absence of well-established and strong LMIS and IPLS, the FMOH/PLMU and UNICEF integrated supply stock monitoring into implementing partners' quarterly supportive supervision checklists. Using the national quantification exercises and microplanning by the TWG, enough supplies were made available at national level to respond to replenishment requests (Tables 3 and 4). Overstock and understock problems in HPs were corrected through redistribution among HPs by district staff.

Table 3: Supplies Procured and Distributed, 2014-2016

Supply	Quantity
Gentamicin injection 10mg/ml, 2ml ampoule/BOX-50	70,245
Amoxicillin 125mg dispersible tablet/PAC-100	68,417
Amoxicillin 250mg dispersible tablet/PAC-(10x10)	345,822
Syringe, disposable,2ml, w/needle,21g/BOX-100	21,000
Tetracycline eye ointment 1%/TBE-5g	65,000
Scale, infant, springtype,5kg x 25g with sling	23,800
Thermometer, clinical,digital,32-43ºC	34,563
Timer for ARI	26,800
Gloves, exam, latex, powder free, medium/BOX-100	16,500
Training guides and job aids	220,685
Neonatal resuscitator (bag and mask and suction device)	7,800
Neonatal complete simulator (mannequin, bag and mask, and suction)	3,900

Table 4: Cost of Items in Training Kits

No	Item	Quantity per Health Post	Unit cost per item (USD)	Cost per Health Post (USD)	Total cost for 13,870 Health Posts (USD)
1	Chart booklet for each HEW	2	3.00	6.00	83,220.00
2	Exercise booklet for each HEW	2	1.01	2.01	27,901.09
3	Sick young infant register for each HP	1	5.68	5.68	78,718.65
4	Amoxicillin dispersible tablets 125mg, pack of 100 tablets	2	1.14	2.27	31,484.90
5	Gentamycin 10mg/ml, 2ml ampoule, pack of 50 ampoules	1	12.80	12.80	177,558.31
6	Syringe with needle (2cc), sterile box of 100	1	4.25	4.25	58,947.50
7	Clinical thermometer, digital (32-43°C)	2	3.96	7.92	109,916.98
8	Weighing scale, infant, spring type, 5kg x 25g with sling	1	5.50	5.50	76,285.00
9	TTC eye ointment 5g tube of 50	1	14.72	14.72	204,097.05
10	Chlorohexidine g (4% w/w) gel	168		-	-
11	Timer, respiration for acute respiratory infection	2	3.47	6.93	96,152.39
12	Gloves, exam, latex, powder free, medium, box of 100	1	4.25	4.25	58,947.50
Sub total			59.76	72.33	1,003,229.36
	15% freight for offshore air transport				122,008
	Total cost				1,125,237.81

Stock availability at health posts:
Gentamycin 10mg/ml was available in 99.8% of the 2548 health posts, while amoxicillin DT was available in 77.5% of the 2579 HPs visited by CBNC supervisors over a period of one year, from October 2015 to September 2016 (Table 5). In the cross-sectional survey conducted by the FMOH, CHAI, and PFSA, gentamycin was available in 72% while amoxicillin DT was available in 82% of the 376 HPs on the day of visit.

In this same survey, the stock-out rate of 125mg amoxicillin DT in the health posts in the previous 30 days was 2% (6). The survey and the supervision haven't captured the stock status of amoxicillin DT and gentamycin injection together as both should be available to treat the sick newborn which is the limitation of the data presented.

Table 5: Availability of Supplies, Equipment, and Job Aids in HPs on the Day of Visit as Observed During the 1st,2nd, and 3rd Quarterly Supervision Visits in the Period from October 2015 to September 2016

	Round1			**Round2**			**Round3**			**All Rounds**		
Medicines, Equipment, and Job Aids	HP Visited	Supply Available	%	HP Visited	Supply Available	%	HP Visited	Supply Available	%	HP Visited	Supply Available	%
Chart booklet	1,907	1,891	99	523	523	100	220	219	100	2,650	2,633	99
Sick young infant register	1,906	1,746	92	521	462	89	220	220	100	2,647	2,428	92
Family health guide	1,907	1,881	99	523	517	99	220	220	100	2,650	2,618	99
ARI timer	1,907	1,796	94	522	558	107	220	182	83	2,649	2,536	96
Newborn weighing scale with sling	1,884	1,732	92	520	455	88	220	219	100	2,624	2,406	92
Thermometer digital	1,903	1,780	94	521	519	100	220	212	96	2,644	2,511	95
Amoxicillin DT	1,906	1,418	74	523	436	83	150	144	96	2,579	1,998	77
Gentamycin injection	1,907	1,864	98	521	459	88	120	100	83	2,548	2,543	95
2cc syringe	1,903	1,190	63	523	378	72	201	114	57	2,627	1,682	64

Resource mobilization and financing: The FMOH and UNICEF mobilized external resources for procurement and distribution of commodities from different sources. These included the UN Commission for Lifesaving Commodities/RMNCH Trust Fund, the European Union, the ELMA Foundation, the Canadian Development Agency, the UK Department for International Development (DFID), USAID, the Bill and Melinda Gates Foundation, Margaret A. Cargill Philanthropy, and the Korean International Cooperation Agency (KOICA).

DISCUSSION

Ethiopia successfully introduced essential commodities to support the national scale up of CBNC. Key program elements for the success included a functional national TWG that addressed challenges, FMOH leadership that managed regulatory approvals, incorporation of essential commodities into the national Essential Medicines List (EML), mobilization of adequate resources and strong partnerships that supported procurement and distribution of essential CBNC commodities.

Given the larger functional evolution of the PFSA and the IPLS, a short-term strategy through UNICEF and its partners was used in order to enable the FMOH to launch and scale up CBNC more rapidly. Despite the limitation of pushing the same quantity of commodities to all HPs without consideration of variations in need, it kick-started the program and allowed the delivery of life saving interventions for several years. It also serves as a bridge to the time when the national IPLS becomes fully functional.

The development of logistics for a new initiative required time and active technical support. The logistics subgroup of the national TWG was instrumental in preparing standard treatment guidelines and ensuring translation into local languages. The initial procurement, packaging of CBNC commodities into kits, and distribution took 12 months but completing these preparations before implementation enabled the coordinated use of training venues as distribution points for HEWs.

Despite the success of making CBNC commodities available in country for the short term, critical challenges still need to be addressed. Data from the cross-sectional survey indicated that gentamicin 10mg/ml was available in only 72% of HPs on the day the visit. Similarly, the proportion of health posts with amoxicillin DT was 82%. This implies that about 28% of newborns with possible serious bacterial infection could not be treated or receive adequate pre-referral treatment before being referred to the next level facility.

The national forecasting and quantification exercises were challenged by a lack of consumption data for proper quantification and planning due to the lack of an IPLS and an LMIS that integrate child health commodities. The lack of consumption data could result in over or under quantification which means wastage of resources or stock outs of lifesaving commodities.

The funding for most of these commodities came from external development partners channeled through UNICEF and distribution took place through non-PFSA channels. This made stock tracking and refill decisions difficult. Moreover, funding from development partners may decline, requiring more from scarce domestic resources.

Conclusion and recommendations:

Transitioning the short-term supply approach to PFSA and IPLS:

The FMOH and PFSA directed that all MNCH commodities including those for CBNC be integrated into the IPLS system in 2017. A national plan was developed and a MNCH supply security working group was established to oversee integration. Procurement financing plans, revisions of supply chain formats, IPLS Standard Operating Procedures, and training of facility supply chain personnel have been initiated.

As of the end of 2017, amoxicillin DT and gentamycin started to be processed through the national system. Careful monitoring and learning from this process should provide the foundation for successful incorporation of all CBNC supplies. The effective transition to the national system is essential to sustained supplies at all levels.

Leadership and policy support:

Strong leadership and commitment by the FMOH and PFSA to ensuring sustained supplies has been critical to the successful launch of a new, national initiative. It will be especially important to CBNC national scale up and sustainability for leaders to prioritize the reliability of child health supplies more broadly. This may benefit from robust monitoring and reporting by the MNCH commodity security working group to assure accountability.

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ORIGINAL ARTICLE

MODELING THE POTENTIAL REDUCTION OF NEWBORN MORTALITY WITH NATIONAL SCALING UP OF COMMUNITY BASED NEWBORN CARE IN ETHIOPIA

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ABSTRACT

Background. *Ethiopia is scaling up community based newborn care (CBNC) on the platform of the Health Extension Programme after national introduction of integrated community case management of pneumonia, diarrhea, malaria and severe acute malnutrition in the four agrarian regions. Since 2013, 26,600 female health extension workers have been trained and supported to provide CBNC, including management of newborn sepsis, at an estimated 14,000 health posts or at home.*

Objective. *To conduct a modeling exercise to project the potential reduction of the newborn mortality rate due to the CBNC program in the four agrarian regions of Ethiopia.*

Methods. *We created three projections: (1) baseline projection without CBNC using 2013 data; (2) a "realistic" projection using the 2014-16 data from available survey and routine information systems and (3) a "best case" scenario which scaled up the full package of MNCH interventions according to the targets of the Health Sector Transformation Plan (HSTP) of Ethiopia.*

Results. *If the 2016 coverage achievements of the implementation sites (realistic projection) were applied to the four agrarian regions, we project that the CBNC program has contributed 46,180 additional neonatal lives saved between 2013 and 2016. If the HSTP targets of MNCH programmes are reached, nearly 187,514 additional neonatal lives will be saved between 2017 to 2020, with 233,696 additional neonatal lives saved between 2013 to 2020.*

Conclusions. *Community based newborn care delivered at scale and high quality is a significant contributor to the reduction of neonatal mortality in rural Ethiopia. Continued investment in CBNC is critical to sustain and improve the recent decline in child mortality.*

INTRODUCTION

Ethiopia has made remarkable progress in child health in the past two and half decades. MDG 4 targets were achieved in 2013, two years ahead of the 2015 deadline(1). The phased scale-up of Community Based Newborn Care (CBNC) started in 2013 in the four agrarian regions, which represent 86% of the total population of the country (2). The primary objective of the CBNC initiative was to further accelerate reduction of child mortality by scaling up essential newborn care including newborn sepsis management in health facilities and at community level. The key components of CBNC include: early identification of pregnancy; provision of focused antenatal care (ANC); promotion of institutional delivery; safe and clean delivery including provision of misoprostol in case of home deliveries or deliveries at health post level; provision of immediate newborn care, including application of chlorohexidine for cord care; recognition of asphyxia, initial stimulation and resuscitation of newborn baby for inevitable home birth; prevention and management of hypothermia; management of pre-term and/or low birth weight neonates; and identification, referral and management of neonatal sepsis/very severe disease at community level.

By the end of 2016, the Government of Ethiopia with support of development partners had trained and supported 26,600 female health extension workers (HEWs) at roughly 14,000 health posts across the country. They provide the 9 packages of community based newborn care including the treatment of neonatal sepsis using gentamycin injections and amoxicillin dispersible tablets when referral is not possible (3).

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The Lives Saved Tool (LiST) uses demographic projections and intervention efficacy measurements from the literature to model mortality changes based on baseline data and program targets (4, 5). LiST has been found to yield accurate projections of expected mortality for scaled up maternal and child health interventions through several validation studies (6).

LiST projections have helped implementers identify high-impact interventions for stronger programs in Burkina Faso, Ghana, and Malawi and Ethiopia (7). From Pearson et. Al., modelling potential reduction of child mortality after national scaling up of community -based treatment of childhood illnesses (iCCM) in Ethiopia, suggested that high quality iCCM, delivered and used at scale is an important contributor to the reduction of U5MR in rural Ethiopia (8).

This paper describes a LiST (ver 5.71) modelling exercise to project NMR decline for the two scenarios of CBNC scale-up against the baseline. The projections included changes of coverage of interventions directly attributable to the CBNC: antenatal visits, essential newborn care such as thermal care, clean cord care and early breast feeding, and neonatal sepsis management, among children 0-28 days in the 4 agrarian regions of Ethiopia.

METHODS AND MATERIALS

Adjust population and child mortality rate for the four agrarian regions

The analysis is restricted to the agrarian regions where CBNC has been implemented since 2013. The population projection is based on the United Nations (UN) Population Division 2017 revision of the World Population Prospect and Ethiopia Census 2007 (9). We adjusted the population projection to reflect the four agrarian regions of Ethiopia for a total population of around 80 million. The rural estimates of neonatal mortality of Ethiopia are applied to the analysis.

According to single point HIV related estimates and projections for Ethiopia 2014, the national HIV prevalence is 1.14%, so we did not consider it necessary to include the HIV module of LiST, which adjusts the mortality impact from program scale-up by projected HIV-related deaths (10).

Data source and projections

Baseline projection: The 2017 version of Inter-Agency Group for Child Mortality Estimation (IGME) estimates were used to set the 2013 baseline NMR. The year 2013 WHO estimates of causes of mortality for children under 5 were used. The programme coverage for 2013/2014 prior to the CBNC scaling up was obtained from the L10K household survey (11).

Realistic projection: The three rounds of cross-sectional surveys conducted by the JSI/L10K project provided the bulk of data for the baseline projection and the projection of 2016 (11). Achievement coverage data related to malaria were obtained from the Management Information System (MIS) 2015 (13). The coverage of newborn sepsis treatment is derived from routine data. The estimated incidence rate of newborn sepsis is 7.6%. Based on service provision data collected from 1,675 health posts (out of an estimated 13,800 health posts) through the JSI/L10K CBNC project MIS, the utilization for the identification, treatment and referral of possible serious bacterial infection/ very severe disease (PSBI/VSD) from the expected cases of the catchment populations reached 11.4% in 2016, as compared to 3.8% in 2014 and 7.6% in 2015 from 1,419 health posts.

Best Case Projection: In the "best case" CBNC scale-up scenario, we projected neonatal mortality reduction based on the assumption that MNCH programme coverage including CBNC, is scaled up to meet the HSTP targets in 2020 in the four agrarian regions of Ethiopia.

RESULTS

"Baseline Case Scenario projection" using the 2013 baseline data. Without any improvement of maternal and newborn care in the four agrarian regions of Ethiopia, we expect the NMR to be 35.8/1000 live births or the same as the 2013 rate, by 2020.

The realistic scenario projection: In 2016, the expected NMR would be 28.1/1000 live births or a 21.5% reduction in the agrarian regions due to the introduction of CBNC compared to no CBNC implementation. Due to improvement in maternal and newborn care including scaling up of community based newborn sepsis management, the CBNC program has contributed to roughly 46,180 additional newborn lives in between 2013 to 2016 compared to the baseline impact year before the national CBNC package implementation.

Table 1: Coverage of selected MNCH indicators used in the baseline, 2016 and best scenario projections

Indicator	Year 2013/14	Source	Year 2015/16	Source	HSTP target 2020
ANC 4 or more visits	39	CBNC Base line survey	51	L10K survey	95
TT (Protected at Birth)a	58	L10K survey	63	L10K survey	95
Iron folate supplementation of pregnant women	60	CBNC Base line survey	75.2	L10K survey	100
Skilled attendant at delivery	26	CBNC Base line survey	59.1	L10K survey	90
Facility Delivery	23	CBNC Base line survey	53.1	L10K survey	90
Thermal Care	23	Using facility delivery as a proxy for Thermal care	53.1	Using facility delivery as a proxy for Thermal care	90
Early initiation of breast feeding (within one hour)	60	CBNC Base line survey	73.8	L10K survey	90
Exclusive BF (Infants less than 1 month of age)	90	CBNC Base line survey	93	L10K survey	98
Postnatal visit in 48 hours	5	CBNC Base line survey	10.3	L10K survey	50
ITNs/IRS	55	MIS 2011	64	MIS 2015	90
Treatment of newborn infection	0/3.8	Intervention was not in place	11.4	ICCM/CBNC Utilization UNICEF	80%

The Best Case Scenario projection: By the end of 2020, if the CBNC coverage reaches the HSTP targets we expect a NMR drop to 18.1 per 1,000 live births, around 49.4% reduction compared with the baseline NMR of 35.8 per 1,000 live birth. An estimated total of 237,545 newborn deaths could be averted between 2013 and 2020.

Table 2: Comparison of newborn mortality rate reduction between 2013 and 2020

Neonatal mortality rate (deaths per 1,000 live births)	2013	2014	2015	2016	2017	2018	2019	2020	% reduction in mortality rates
Ethiopia 2013-2020 rural baseline	35.8	35.8	35.8	35.8	35.8	35.8	35.8	35.8	0.0
Ethiopia 2013-2020 rural realistic	35.8	33.3	31.3	28.1	28.1	28.1	28.1	28.1	-21.6
Ethiopia 2013-2020 rural best case	35.8	33.3	31.3	28.1	25.3	22.7	20.3	18.1	-49.4

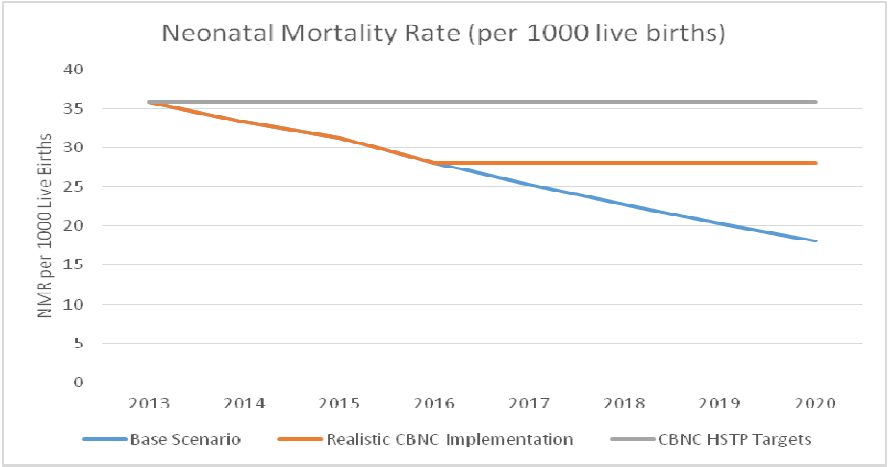

Figure 1: Projected trend of NMR with base scenario (no CBNC), realistic CBNC implementation and with CBNC HSTP targets

Table 2: Estimated additional lives saved by the realistic and best case scenario respectively, in children 0-28 days between 2013 and 2020 in the 4 Agrarian regions of Ethiopia (Amhara, Oromia, SNNP and Tigray)

Additional neonatal lives saved	2013	2014	2015	2016	2017	2018	2019	2020	Total (2013 - 2016)	Total (2017-2020)	Total (2013-2020)
Baseline	0	0	0	0	0	0	0	0	0	0	0
Realistic	0	7,619	14,084	24,477	24,892	25,275	25,610	25,896	46,180	101,673	147,853
Best case	0	7,619	14,084	24,477	33,913	42,861	51,357	59,383	46,180	187,514	233,694

Since CBNC is a package of interventions, we looked at additional neonatal lives saved by interventions. In the rural realistic model, among the 147,583 total newborn lives saved between 2013 and 2020, labor and delivery management could save 58,284 newborn lives (39%), followed by neonatal resuscitation (22,858, 15%), clean birth practices (15,998, 11%) and case management of newborn infections (12,734, 9%).

In the best case model, among the 233,694 newborn lives saved between 2013 and 2020, labor and delivery management could save 74,861 newborn lives (32%), followed by newborn sepsis management (39,159, 17%), neonatal resuscitation (32,831, 14%), and clean birth practices (20,011, 9%). Table 3.

DISCUSSION

Since 2013 under the leadership of Federal Ministry of Health Ethiopia, the CBNC programme has been scaled up in the 4 agrarian regions, representing 86% of the total population. The platform of the Health Extension Programme is essential for the rapid scaling up.

Although the CBNC programme has contributed to the reduction of the newborn mortality rate in Ethiopia, newborn deaths averted projected by this analysis are not attributable to the CBNC programme alone.

During the last decade, Ethiopia has witnessed rapid economic development, improvement in female literacy, reduction of total fertility rate, and significant improvement in women giving birth in health facilities.

Based on the review of health post records, Agazi and colleagues(x) have found significant increases in newborn sepsis cases managed by the HEWs. However, the overall utilization rate is still low compared to the estimated number of cases of newborn infections (16). The next phase of the program should continue to improve effective coverage of postnatal home visits, regular presence of HEWs at the health posts, supplies of drugs and commodities and supportive supervision.

he study of Community-Based Interventions for Newborns in Ethiopia (COMBINE) has documented that community based newborn care including sepsis management by the HEWs is both effective and cost effective. It can reduce post-day 1 newborn mortality rate by 17%, translating to a cost per DALY averted of $223 or 47% of the GDP per capita, a highly cost-effective intervention by WHO thresholds (17).

Table 4: Additional neonatal lives saved by intervention by year

Additional neonatal lives saved by intervention	2013	2014	2015	2016	2017	2018	2019	2020	Total (2013-2020)	Percent of total live saved
Ethiopia 2013-2020 rural realistic									147,856	
Pregnancy										
TT - Tetanus toxoid vaccination	0	189	385	588	598	607	615	622	3,604	2%
Syphilis detection and treatment	0	157	321	490	498	505	512	518	3,001	2%
Childbirth										
Clean birth practices	0	870	1,742	2,597	2,641	2,682	2,718	2,748	15,998	11%
Immediate assessment and stimulation	0	613	1,223	1,810	1,841	1,869	1,894	1,915	11,165	8%
Labor and delivery management	0	2,635	4,395	9,945	10,113	10,269	10,405	10,522	58,284	39%
Neonatal resuscitation	0	1,266	2,517	3,701	3,764	3,822	3,872	3,916	22,858	15%
Antibiotics for pPRoM	0	344	468	914	929	944	956	967	5,522	4%
Breastfeeding										
Age-appropriate breastfeeding practices	0	134	266	390	397	403	408	413	2,411	2%
Preventive										
Clean postnatal practices	0	174	336	480	488	496	502	508	2,984	2%
ITN/IRS - Households protected from malaria	0	66	136	207	211	214	217	219	1,270	1%
Curative after birth										
Case management of premature babies	0	450	886	1,298	1,320	1,340	1,358	1,373	8,025	5%
Case management of neonatal sepsis/ pneumonia	0	719	1,410	2,058	2,092	2,125	2,153	2,177	12,734	9%
Ethiopia 2013-2020 rural best case									233,694	
Pregnancy										
TT - Tetanus toxoid vaccination	0	189	385	588	1,554	2,549	3,567	4,601	13,433	6%
Syphilis detection and treatment	0	157	321	490	498	507	514	521	3,008	1%
Childbirth										
Clean birth practices	0	870	1,742	2,597	3,101	3,546	3,924	4,231	20,011	9%
Immediate assessment and stimulation	0	613	1,223	1,810	2,221	2,624	3,014	3,389	14,894	6%
Labor and delivery management	0	2,635	4,395	9,945	11,831	13,650	15,384	17,019	74,859	32%
Neonatal resuscitation	0	1,266	2,517	3,701	4,790	5,849	6,868	7,840	32,831	14%
Antibiotics for pPRoM	0	344	468	914	1,092	1,270	1,449	1,625	7,162	3%
Breastfeeding										
Age-appropriate breastfeeding practices	0	134	266	390	517	608	823	1,304	4,042	2%
Preventive										
Clean postnatal practices	0	174	336	480	1,299	2,018	2,628	3,112	10,047	4%
ITN/IRS - Households protected from malaria	0	66	136	207	362	522	685	851	2,829	1%
Curative after birth										
Case management of premature babies	0	450	886	1,298	1,673	2,034	2,378	2,703	11,422	5%
Case management of neonatal sepsis/ pneumonia	0	719	1,410	2,058	4,975	7,684	10,125	12,185	39,156	17%

The CBNC strategy of Ethiopia has adopted a comprehensive programme approach to scale up a package of maternal and newborn care related interventions. The projected 21.6% reduction of NMR in 2016 is not attributable to scaling up management of newborn sepsis alone.

Publications in this supplement and a survey on CBNC implementation strength show that CBNC program inputs such as training, start-up supplies, post training follow-up, and supervision are adequate, although utilization continues to be a challenge (Agazi et al). Improving demand, utilization, and quality of CBNC service is critical for reducing newborn mortality. A recent study in Ethiopia identified care-seeking barriers to CBNC services and suggested potential solutions for demand generation (18).

The best case scenario in which CBNC coverage is high in all rural regions of Ethiopia, is likely if resources are mobilized to scale up the full package of MNCH interventions, if the performance of HEWs continues to improve, if community mobilization through the Health Development Army (HDA) increases, and if innovative ways to increase utilization at the health posts are effective.

As Ethiopia is committed to ending preventable maternal, newborn and child deaths by 2030, governments and partners commitment to sustain and scale up the investment in HEP, iCCM and CBNC programs can significantly contribute to the overall goal.

Limitations: The main limitation of this study relates to the assumptions and data used in the modeling. The quality of the output is greatly affected by the input data. The coverage of sepsis management is made based on information collected from 1675 health posts supported by the JSI/L10 K projects. Since these health posts are not randomly selected, they may not represent the average performance of the estimated 14,000 health posts in the four agrarian regions in 2016. The estimates produced by LiST assume that interventions will be delivered and used at levels of quality sufficient to produce effects on mortality equivalent to those assumed in the model (4).

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ORIGINAL ARTICLE

COMMUNITY-BASED NEWBORN CARE IN AFAR: LESSONS LEARNED

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ABSTRACT

Introduction: *Neonatal mortality in the pastoralist areas of Ethiopia is higher than the national average. There is much disparity in availability and use of key services in these areas and services at health centers and health posts are variable and low.*

Objectives: *This paper describes the development and adaptation of a community based newborn care model for the pastoralist areas of Ethiopia.*

Methods: *Data were assembled from studies and surveys conducted in Afar region including a health facility assessment, baseline surveys and formative research with health workers and communities. Guidelines and lessons learned were drawn from review of manuals, strategy documents and plans including the National Newborn and Child Survival Strategy (NNCSS), the Health Extension Program, social mobilization documentation, and national Community-Based Newborn Care and pastoralist integrated community case management implementation plans. Other learning was distilled from a desk review of project documents for the Maternal Newborn Health and Nutrition model for pastoralist regions including training, coaching, supervision, and review meeting documents.*

Results: *There has been low access, quality, and utilization of Community-Based Newborn Care services in the pastoralist communities of the Afar region. In pastoralist communities there are multiple and unique barriers to demand for care that include scattered settlements, mobile lifestyles, and traditional practices. As a result, the Federal Ministry of Health service delivery strategies such as the Health Extension Program do not work as was designed for more densely settled agrarian regions, all of which require adaptation or redesign of programs such as Community-Based Newborn Care. Previously, the Afar Regional Health Bureau and Emory University adapted the maternal newborn health and nutrition model for the regional context that was associated with significant improvements to care. This model and Community-Based Newborn Care national guidelines have been further adapted to the context and are being tested for effectiveness in improving newborn health in pastoralist regions. Drawing from the Community-Based Newborn Care the model aims to reach 'every woman and baby, in-time, every time' and consists of the four interrelated interventions of capacity building, demand creation, quality improvement, and monitoring, evaluation and research.*

Conclusion: *In order for Community-Based Newborn Care to succeed at national level, adapted models are needed for different populations such as pastoralists in emerging regions. The adaptation process included local data gathering to inform the adaptation process and community participation combined with application of program guidelines. This process is considered feasible by the Federal Ministry of Health, Afar Regional Health Bureau and partners, thus the adapted Community-Based Newborn Care C model can be implemented for further evaluation and refinement to be scaled up to other pastoralist areas.*

Key words: *Community based newborn care, Maternal and newborn health and nutrition model, Pastoralist community, Afar*

INTRODUCTION

Afar is one of the nine regions of Ethiopia with 1.8 million people living widely dispersed as pastoralists (1). It is classified as having hardship environmental conditions (very high temperatures, very low rainfall) and is prone to recurrent emergencies such as drought, floods, and disease outbreaks (2-5).

Low literacy, low social status of women, inadequate health services, and weak leadership are barriers to the provision of newborn and other health services (4). Improvements in the health of the population are running at least a decade behind the national average (6-8). Neonatal mortality in Afar is 38, which is 31% higher than 29 for Ethiopia (8).

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Large disparities in availability and use of key services are evident. Only 25% of health centers (HCs) provide integrated management of neonatal and childhood illnesses (IMNCI) and only 15% of health posts (HPs) provide integrated community case management (iCCM) services (9).

The Health Extension Program (HEP) that was designed to bridge these gaps is neither well adapted nor fully operational. HEWs have marked skill gaps due to low educational levels and are weakly managed (10). There is high absenteeism, compounded by inadequate supplies. Since the HEWs are stationary, they cannot follow the mobile communities seasonally. The Afar HEP is hampered by an almost non-existent health development army (HDA). The FMOH recognizes that health services as currently provided do not meet the needs of pastoralists and is committed to ensuring equitable health services, and have stressed the need for innovative solutions (11). In this context, the Federal Ministry of Health (FMOH), Afar Regional Health Board (RHB), United Nations Children's Fund (UNICEF), and Emory University initiated a pilot study of CBNC in 8 woredas of Afar in 2015.

The objectives of this paper are to understand newborn health needs and current service delivery in Afar, to describe the adaptation process for Community Based Newborn Care (CBNC), and to describe the adapted CBNC model that has been initiated.

METHODS

CBNC was initiated in eight woredas of Zone 1, Afar region (Chifra, Mile, Asayita, Afambo, Ada'ar, Kori, Dupti, Elida'ar) by the RHB in collaboration with the EU and UNICEF. These woredas include 117 kebeles, 587,376 people, and 16,858 live births per year. Multiple methods were used to develop this CBNC model, including rapid assessment, baseline survey, formative research, document review, and continuous quality improvement.

A rapid health facility assessment was conducted in February 2016 to determine the status of human resources, equipment and supplies, iCCM/CBNC service availability, and recording and reporting systems. The sample included all eight woreda health offices (WorHOs), 40% of health centers (HCs) (8) and 30% of HPs (28) open during the assessment period. The assessment included interviews, document review, and on-site observation using a structured data-collection instrument. Data entry and descriptive data analysis were done using MS-Excel and SPSS.

Two baseline surveys, one for each of iCCM and CBNC were conducted. The purpose was to establish a baseline on MNCH service utilization and care seeking behavior for common childhood illnesses (pneumonia, fever, and diarrhea) among under-five children. The sample size was determined using single population proportion sampling (80% power, 95% CI, 5% margin of error, design effect of 2), 10% compensation for non-response and assuming 33.8% of caregivers seek treatment (7) and 6.4% of mothers had post natal care (PNC) within 48 hours (12). For iCCM, 600 women who had at least one child under-five during the survey period were interviewed and for CBNC, 518 mothers who gave birth in the preceding year were included. The study followed a two-stage cluster sampling approach.

Formative research was conducted to assess MNCH knowledge, attitudes, and practices of health care providers and community members, including HEWs. The aim was to identify demand and supply challenges to service utilization. The samples were drawn using purposive sampling and eight focus group discussions (FGDs) took place. Four of these were with women with children under the age of five and four were with men from the community. A total of 17 key informant interviews took place with the RHB, district health office representatives, health professionals from HCs, HEWs, community volunteers/traditional birth attendants (TBAs), kebele leaders, and religious leaders. Baseline surveys and formative research took place after ethical clearance was obtained from Mekelle University, Tigray region.

Document review

The project team reviewed documents that included health care provision assessments, the NNCSS, the HEP package, social mobilization documents, the national CBNC implementation plan, the pastoralist iCCM implementation plan, the MNHN model for pastoralist regions, MaNHEP, Amhara, and Oromia project papers and materials. Moreover, project implementation documents for pastoralist regions including training, coaching, supervision, and review meeting documents were reviewed.

Sequencing of activities in relation to implementation and model development

Figure 1 shows how these activities were integrated. The implementation started with a facility service availability and readiness assessment. This was followed by provision of iCCM training at all levels to strengthen the iCCM platform.

A CBNC baseline and formative assessment was conducted and quality improvement (QI) monthly data monitoring started. CBNC cascade training was given at the community level. Following the training, the initial CBNC model was designed, post-training follow-up was conducted, and monthly coaching visits to health facilities began.

Then periodic follow-up activities including primary health care unit (PHCU) review, community coaching, data quality assessment, and women's conferences continued.

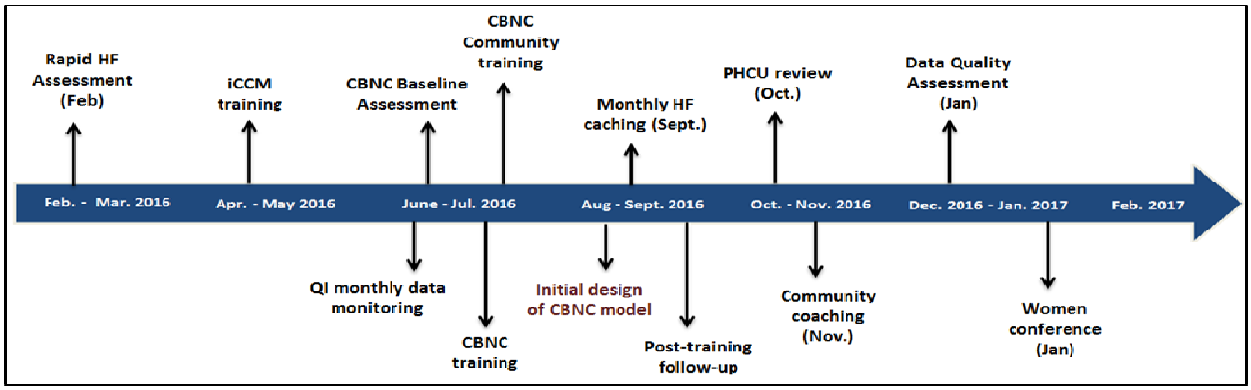

Figure 1: Sequence of activities in CBNC implementation, Afar region.

RESULTS

Understanding the needs and the service delivery modality

By 2012, HEP challenges were clear. Poor perceptions of health workers by the community, unmet demands for manpower, inadequate participation of community members, limited capacity in HCs to provide services or to support HPs, and a weak referral system, prevailed.

The baseline survey confirmed low health service utilization of MNH services including CBNC (Table 1).

Slightly more than a quarter (28%) of mothers had at least one ANC visit and fewer than 10% had ≥ 4 ANC visits, most (89%) mothers gave birth at home, and postnatal visits were insignificant – 2% of mothers and 2.5% of newborns.

Only one in four (24%) newborns were given breast milk immediately. Nearly three quarters (72%) of the mothers discarded colostrum. A tenth (10%) of them reported that their newborn was sick in the first two months of life; and less than half of them sought advice or treatment from health care providers.

Table 1: CBNC Service in Zone 1, Afar Region, Ethiopia, June 2016

Variables	%
ANC – I	28%
ANC – 4+	10%
Health facility delivery	9.5%
PNC – 48 hours	2%
Newborns received PNC check	2.5%
Immediate breast feeding	24%
Discarded colostrum	72%
Newborn illness (0-59 days)	10%
% of newborns sought advice from HP or HC	46%

iCCM is a pre-requisite platform for CBNC. The facility assessment revealed that only 44% of HPs in project woredas had trained health workers and standard registers. About 45% of children had at least one of the three illnesses (pneumonia, fever, and diarrhea) in the two weeks prior to the survey. Nearly half of the mothers sought treatment from health facility or health care provider; of these, most (≥ 80%) sought advice or treatment after two days.

There are multiple barriers to demand for care that include: isolation and long distances to services, lack of community awareness about danger signs and lack of a sense of urgency for acting on them, lack of transportation, more trust in TBAs than in health workers in the system, the persistence of harmful traditional practices, and inadequate participation of community volunteers.

HEWs' limited involvement in newborn and child care ('Diagnosing and treating sick newborn infants is not my responsibility'), cost of medication for sick children, and shuttered HPs were evidence of low access, utilization, and quality of CBNC services. Thus ,the program chose to strengthen iCCM in parallel with the CBNC program.

Adaptation Process

The Afar RHB and Emory University adapted the MNHN model, which had both community and facility components and was associated with improvements in competence, confidence, and leadership in providing care and using a collaborative quality improvement model. The model creates the platform for people to listen to, learn from, and share ideas with each other, it combines both research and service delivery, it creates ownership to ensure sustainability and it was implemented within the existing government platform, PHCU and HEP structures.

Develop/redesign appropriate model and pilot

Drawing from the national CBNC package, the CBNC pastoralist model is organized into four interrelated interventions: capacity building, demand creation, quality improvement, and monitoring, evaluation (M&E) and research. It shows how the CBNC care package can be provided to "every woman and baby, in time, every time" in the pastoralist community.

Capacity building: To address health worker skill gaps, hands-on CBNC training and supervision were provided for health care providers at all levels. The training used a cascade approach.

Demand creation: Based on lessons from CBNC implementation in the agrarian regions, a new community intervention was included in the model to enhance participation. It started with selection of 5 to 7 community members representing community mobilization teams and HDA. Training was given to enable them to identify pregnant women and sick babies, to identify danger signs and facilitate early referral, and to orient family members. Women's conferences involved pregnant mothers and mothers with children under five, and CBNC was included as one agenda item. To address the hard-to-reach kebeles, regular outreach services were organized, in which community volunteers mobilized the community. These interventions were not part of the agrarian CBNC implementation plan.

Quality improvement activities: QI was introduced to improve CBNC service accessibility, utilization, and quality through strengthening health facility and community coaching, supportive supervision, home visits, and performance reviews. In addition to joint supervision, performance review, clinical mentoring meetings (PRCMMs) and home PNCs were conducted. This model included adapting and introducing the existing MNHN change package and monthly community review meeting to support teams to develop, test, and implement change ideas, monthly coaching for all health facilities, and home visits by community volunteers.

Monitoring and Evaluation: The following core activities were included in the pastoralist model: baseline and end line surveys, monthly quality monitoring, data quality assessment and operational research to strengthen program monitoring and ensure data quality.

Although changes in service coverage have not yet been documented, several capacity building, coaching and supply distribution activities have been carried out since the baseline study. Training was completed for all levels of the health system and monthly coaching visits to all HPs and HCs have been initiated. The program has held monthly community review meetings at kebele level and joint supportive supervision visits. All health posts in the zone have started providing CBNC service.

[1]Solutions or ideas that have been tested and found to be most successful in MNHN improvement in the previous MaNHEP Afar project. It includes solutions with detailed descriptions of how to implement them.

Table 2: Components of the MNHN, CBNC Agrarian, and CBNC Pastoralist Models

	Components of the model		
Category	**MNHN model**	**CBNC agrarian model**	**CBNC pastoralist model**
Capacity Building	Training of trainers Health workers' training HEW/FLW training	Training of trainers Health workers' training HEW/FLW training	Training of trainers Health workers' training HEW/FLW training
Demand creation/ BCC	Community volunteers' training Family meetings Support women's conferences Support outreach services	Linking with HEP (different demand creation models by different implementing partners; use of FHG, which is not specific to CBNC) Support pregnant women conference	Community volunteers' training Family orientation and counseling Support outreach services Support and adopt women's conference
QI activities	QI Training of trainers QI health facility staff training QI community training Monthly coaching for all HPs and HCs Woreda learning session Regional learning session Strengthen home PNC Birth audit	Post training follow up Quarterly supportive supervision and mentoring Biannual joint supportive supervision PRCMM Strengthen home PNC	Introduce existing change package (at community level) Monthly coaching for all HPs and HCs Monthly community review meeting Quarterly supportive supervision Bi-annual joint supportive supervision PRCMM Strengthening PHCU Strengthening home PNC Home visits by community volunteers
Monitoring &Evaluation	Baseline/end line Survey Monthly QI monitoring Data quality assessment	Baseline, mid-term and end line survey Operational research Quarterly review meeting Annual review meeting	Baseline/end line survey Monthly QI monitoring Data quality assessment Annual review meeting Operational research

Conclusion

The coverage of CBNC implementation has reached more than 90% in agrarian regions, however pastoralist communities and emerging regions lag behind due to important natural, cultural, and health system differences. The adapted model being demonstrated by the FMOH and RHB with the support of partners has made CBNC services available for the first time. The adaptation process was carried out at local level with the active participation of providers and end users. This has ensured responsiveness to local perspectives and flexibility to improve. There were challenges during the adaptation process including low education and experience of health workers, engaging a highly mobile community, and limited time. The CBNC program in this zone has not run long enough to measure its effects or to assess its costs. This has been done in December 2017 and recommendations made to scale what works in other relevant geographic areas.

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Conflict of interest:

The authors had no conflict of interest to declare.

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ORIGINAL ARTICLE

COMMUNITY-BASED NEWBORN CARE IN ETHIOPIA: IMPLEMENTATION STRENGTH AND LESSONS LEARNED

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ABSTRACT

Introduction: *Building on lessons learned from integrated community case management of common childhood illnesses, Ethiopia launched community-based newborn care in March 2013 with the goal of reducing newborn and child mortality. The strategies of community-based newborn care included, among others, identification and managing sick newborns at the community level when referral is not possible.*

Objective: *To assess the strength of the community-based newborn care program implementation in terms of inputs, process, and outputs, and document key lessons learned through the implementation of the first phase of the program in the four agrarian regions of Ethiopia.*

Method. *Mixed methods were employed; a secondary analysis of quantitative data from routine program databases collected March 2013 through December 2016 and desk review and after-action reviews with stakeholders, in the first phase community-based newborn care program zones.*

Results: *Trained service providers were available in all health posts(HPs) and 91%(95 CI: 90-92) of health posts had the essential drugs, amoxicillin and gentamycin for community case management of sick newborns on the day of visit. A third (32%) of the expected very severe disease cases sought care at HPs. Nearly three quarters (74%) of these cases were treated at health posts, and 90% of the cases completed their treatment.*

Conclusions: *community-based newborn care can be implemented effectively in similar contexts if it is well planned, there is good-coordination with partners and stakeholders, uninterrupted supply is ensured, and continuous support and supervision is in place.*

Key words*: community-based newborn care, sick young infant, implementation strength, Ethiopia, health extension workers.*

INTRODUCTION

Building on lessons learned from integrated community case management (iCCM) of common childhood illnesses (1), Ethiopia launched community-based newborn care in March2013 (2). The goal of CBNC was to reduce newborn and child mortality. CBNC seeks to achieve its goal through further strengthening Primary Health Care Units (PHCUs) and the Health Extension Program (HEP). These include improving linkages between PHCUs and health posts (HPs) and the performance of health extension workers (HEWs) and the Health Development Army (HDA) to scale up community-based maternal and newborn health (MNH) services (3). Strategies of CBNC included early identification of pregnant women, provision of focused antenatal care (ANC), promotion of skilled birth attendance, postnatal care (PNC), identification and managing of sick newborns at the community level, and information, education, and communication (IEC)/behavior change communication (BCC) and community mobilization. This paper focuses only on assessing the implementation of one of the key strategies: managing sick young infants at the community level.

Understanding whether a program was implemented correctly per the implementation guideline allows evaluators to interpret the relationship between the program and observed outcomes more accurately (4). Such assessment also provides an accurate description of the program components and their associated degree of program integrity, thus fostering more accurate replication of the intervention (5). Theresa Diaz et al. proposed a model to conduct process and outcome evaluations and implementation research of child health programs in Africa using integrated community case management as an example (6).

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We used this model to assess the implementation of CBNC, with due focus on process and output level indicators, and to document the early lessons learned in Ethiopia.

This paper focuses on: examining the extent to which the program has been implemented per the plan, the process, and quantifying the outputs of program. These outputs include trained staff availability, supply availability, supportive supervision and follow up, and service utilization by intended beneficiaries, as well as exploring HEWs' capacities for assessing, classifying, and providing correct treatment. It also documents key lessons learned in the first phase in the CBNC zones of Ethiopia.

The assessment enables the Federal Ministry of Health (FMOH), donors, and implementing partners to examine the scale and the intensity of CBNC program, and the extent to which its key components were implemented as intended. The lessons learned will help to inform the course adjustments needed to garner the intended outcomes from the program in the next steps of the program.

MATERIALS AND METHODS

This assessment employed mixed methods: a secondary analysis of quantitative data and desk review and after-action reviews (AARs). For this assessment, domains of the implementation strength and relevant data sources for each domain from the implementation guide were identified. Then, a data extraction tool was developed to obtain the data from each source. Program data from routine program databases collected from March 2013 to December 2016 were used to measure the intensity and coverage of the program. For qualitative data document review, AARs with key stakeholders and program implementers were conducted.

Data sources

The FMOH CBNC task force, in collaboration with stakeholders, developed and approved data-collection forms integrating information on CBNC and iCCM:

- iCCM/CBNC Supportive Supervision/ Follow-up Checklist (Form C): This form is completed during post-training follow-up and regular supervision visits to HPs.
- Performance Review and Clinical Mentoring Meeting (PRCMM) data extraction form: This form was completed biannually by implementing partners at the meeting. PRCMM is a review meeting conducted at woreda level with HEWs, health center staff, and woreda representatives, which brings all HEWs together after training and provides an opportunity to mentor and coach them. It is also used to collect some important data to inform progress and quality of the program(3).
- Training database: an Excel spreadsheet that documents the ways HPs and HEWs participate in the training as trainings happen.

Supervision and the PRCMM data were obtained from implementing partners (Table 1) and training data were obtained from FMOH's training data compiled in the excel sheet.

Setting

The first phase of CBNC was implemented in seven selected zones of four agrarian regional states (Table 1): East Gojam and North Shoa (Amhara), Eastern (Tigray), East Shoa (Oromia) and Gurage, Sidama, and Wolayta (SNNPR).Out of the seven first-phase zones, five(East Gojam, North Shoa, East Shoa, Gurage, and Sidama)were included in this study. Data were not available for the remaining two zones (Eastern Tigray and Wolayta) as it was in a different format and data elements did not match. We used data from all HPs in the five CBNC learning zones. For qualitative data, the study team conducted document review and AARs with key stakeholders and program implementers.

Study design

For this study, strength of implementation is defined as quantifying the output of program processes, service utilization, and service providers' (HEWs') capacity to deliver appropriate care. Thus, it combines three important types of output data:

1. Data on training, supply, and supervision
2. Data on utilization – such as number of cases initiating treatment
3. Data on HEWs' capacity – such as proportion of cases correctly classified and cases correctly treated

Then findings from the data were compared against selected key activities in the implementation guide to assess implementation fidelity. We sought expert opinions and reviewed literature for variables that did not have targets for implementation strength to set the appropriate benchmarks. We used findings from AARs to complement findings from the routine data.

[9]CBNC task force: Group of child health experts from different organization, organized by FMOH to advise on national CBNC implementation

Table 1: Phase 1 CBNC Implementing Partners and Zonal Profile (All Figures in the Tables Represent 2013 Data)

Implementing Partner	Zone	Population	Women in Reproductive Age (WRA)	Expected Newborns	# Urban Woredas	# Rural Woredas	# Rural Kebeles	# of HPs	# of HEWs	# of HCs	# of Hospitals
Save the Children	East Shewa	1,583,855	350,032	54,960	3	10	301	299	660	55	3
	Gurage	1,572,303	366,347	54,402	2	13	409	409	844	65	2
	Sidama	3,471,310	808,815	120,107	2	20	545	545	1,133	118	3
L10K	North Shewa	1,388,617	306,884	48,185	2	13	267	267	498	51	2
	East Gojam	2,397,876	565,899	80,808	2	16	392	402	665	100	2
IFHP	Eastern Wolayta	868,326	204,057	29,870	2	7	143	124	284	41	2
	Total	11,282,287	2,602,033	388,333	13	79	2,057	2,046	4,084	430	14

Data collection and analysis

We extracted data from relevant sources using extraction tools developed for this purpose. We used an AAR guide to obtain qualitative information on how the program was implemented as compared to the implementation guide. The team conducted AARs in August 2016. Members of the National Child Survival Technical Working Group (NCSTWG), regional managers, and zonal program coordinators of Save the Children participated in the AAR.

Quantitative analyses were carried out in Stata 11.2 (7). Descriptive statistics were calculated for selected indicators. Indicators of correct classification or treatment were calculated by comparing the HEW's classification and treatment with the agreement of supervisors on the supervision form. PRCMM data extracted from HPs were annualized to standardize calculation of expected very severe disease (VSD) cases for a year.

Ethical consideration:

CBNC is a national program owned and led by FMOH and implemented by partners. For this study, consensus was reached with FMOH, NCSTWG, and implementing partners to conduct analysis on their routine supervision data and AARs and a support letter was obtained from FMOH, MNCH directorate.

RESULTS

A total of 1,891 HPs from the five Phase 1 zones were included. CBNC implementation in these zones was launched in March 2014. Data were routinely collected from March 2014 to December 2016. HEWs' training was conducted from March 2014 to December 2015 in two rounds. Post training follow up (PTFU) was conducted from February 2014 to July 2016 and Performance Review and Clinical Mentoring Meetings (PRCMMs) were conducted from December 2014 to April 2015. PRCMM data were extracted from HPs over eight months after CBNC initiation on average. The distribution varies regionally, from 6.6 months in Amhara to 10 in Oromia.

Implementation of CBNC

The program had a comprehensive implementation guide, which clearly laid out the guiding principles, goals, and objectives of the program, strategies to achieve the objectives, and main activities to be carried out (3).The AAR participants mentioned that implementation was in line with the guiding principles and the proposed strategies of the implementation guide.

[10] Annualized: Yearly expected number for VSD cases was divided to 12 months and 8 months' data was taken as denominator for this analysis

However, there were some inconsistencies between what was planned and what actually happened on the ground.

Training: To have a skilled service provider at service delivery points, one of CBNC's key activities was training of health workers (HWs) and HEWs. The CBNC task force revised the existing iCCM training materials to include a package of CBNC interventions like the management of VSD in young infants by HEWs in the community, when referral is not possible (3).

The training was cascaded from the national-level master training of trainers to HEWs training. Nearly all HEWs in the target zones were trained on CBNC, and 98% of HPs initiated CBNC in these zones (Table 2).

Table 2: Plan Versus Achievement on CBNC Training, PTFU, Routine Supportive Supervision (RSS), and PRCMM by zone

Basic profile					**Plan**			**Achievements**			
Region	**Zone**	**# Woreda**	**# HCs**	**# HPs**	**Training of Trainers for HWs**	**Basic CBNC/ IMNCI Training for HWs from HCs**	**HEWs on CBNC Training**	**# HWs on CBNC Training of Trainers**	**# HWs from HC on Basic CBNC Training**	**# HEWs Trained on CBNC**	**# CBNC Initiated HPs**
Amhara	North Shoa	17	89	286	76	178	586	79 (104%)	127 (71%)	586 (100%)	267 (93%)
	East Gojam	16	100	402	64	200	900	57 (89%)	199 (100%)	900 (100%)	402 (100%)
Oromia	East Shewa	10	55	291	50	110	578	38 (76%)	133 (121%) *	578 (100%)	288 (99%)
SNNP	Sidama	20	135	545	40	270	1,203	39 (98%)	305 (113%) *	1,203 (100%)	545 (100%)
	Gurage	13	72	412	26	144	708	26 (100%)	307 (213%) *	708 (100%)	389 (94%)
Total		76	451	1,936	256	902	3,975	239 (93%)	1,071 (119%)	3,975 (100%)	1,891 (98%)

*There were gap filling trainings as there were high staff turnover

Supervision and PRCMM:
The implementation guide stated that all HPs would receive PTFU within four to six weeks after training. A team of trained professionals from Woreda health offices, HCs, and implementing partners would conduct the PTFU using a standard checklist. The PTFU data showed that almost all HPs have received PTFU (Table 3). However, according to the AAR participants, less than half of the HPs received it within the specified period, it was delayed on average for three months.

The first training for HEWs was conducted in March 2014, and only 24% of the HPs received PTFU before May 31, 2014.The implementation guide suggests that at least one direct case observation should be made in all HPs during PTFU, but the proportion of HPs that had direct case observation was only 2.4% (95% CI: 1.7-3.1).

Eighty-five percent of HPs have received at least one routine supportive supervision (RSS) after CBNC initiation. Thirty-eight percent had a second round of RSS and 8% had three rounds or more. Implementing partnersand PHCU staff conducted all the visits jointly. None of the PHCUs took the initiative to conduct CBNC-focused RSS without partner prompting them.

[11]Implementing partners: nongovernmental organizations that conducted training of HEWS and HWs, PTFU, RSS and PRCMM in the implementation zones

Table 3: Distribution of HPs that received PTFU and RSS and Conducted PRCMM by Region and Zone

Region	Zone	HEWs Trained on CBNC	HPs Initiated in CBNC	HPs Received PTFU	HPs Participated in PRCMM1	HEWs Participated in PRCMM1	HPs Participated in PRCMM2	HEWs Participated in PRCMM2	HPs Received at Least One RSS Jointly By Implementing Partners and PHCU	HPs Received at Least One CBNC-Focused Supported Supervision by PHCU
Oromia	East Shewa	578	288	277 (96%)	283 (98%)	494 (85%)	281 (97%)	464 (80%)	281 (98%)	0
SNNP	Sidama	1,203	545	538 (99%)	533 (98%)	846 (70%)	545 (100%)	855 (71%)	545 (100%)	0
SNNP	Gurage	708	389	383 (98%)	343 (88%)	514 (72%)	364 (94%)	528 (75%)	364 (94%)	0
Amhara	North Shoa	586	267	267 (100%)	266 (99%)	375 (63%)	30 (11%)	55 (9%)	130 (49%)	0
Amhara	East Gojam	900	402	402 (100%)	402 (100%)	793 (88%)	382 (95%)	765 (75%)	281 (70%)	0
Total		3,975	1,891	1,867 (99%)	1,827 (96%)	3,022 (76%)	1,602 (84%)	2,667 (67%)	432 (23%)	0

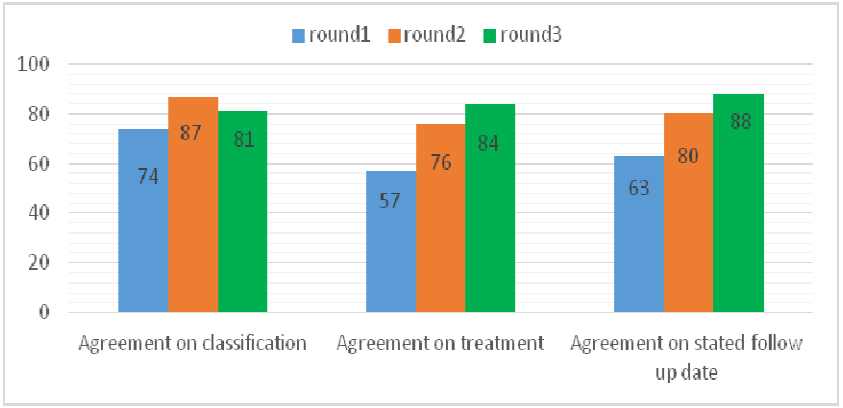

Figure1: Agreement level of classification and treatment between HEWs and supervising HWs by round of visit

According to the implementation guide, PRCMM should happen three to six months after training, and it should happen twice a year. Eighty-five percent of HPs and 76% of HEWs participated in the first round of PRCMM, which was conducted nine months after the CBNC training.

The team conducted further descriptive analysis to look into HEWs' skills, the availability of supplies, and service utilization using expected number of VSD cases for the year. We don't have incidence data for VSD in young infants hence the expected number is based on the national estimation that FMOH's plan and policy directorate provided for woreda based planning(8). According to this estimation, 7.6% of young infants are expected to develop VSD.

During the study period, 1,101 cases were classified as VSD by HEWs. Sick young infant (0-2 months) registration books were reviewed across three rounds of visits by supervising HWs, to observe HEWs' skill and capacity in assessing, classifying, and treating sick young infants. HEWs' skill and capacity to classify, treat and follow up on VSD cases correctly increased by 7%, 27%, and 25% respectively, revealing an improvement since the first round of visits (Figure 1).

Supply availability

Table 4 presents the proportion of HPs with key CBNC commodities, supplies, and job aids on the day of supervision as well as HPs with stock available in the month before the visits.

About 18%(95% CI = 16-20) of HPs reported stock outs of dispersible amoxicillin in the previous month, but only 8% (95% CI = 7-9) had stock outs one month before RSS. Over 80% of HPs had gentamicin during PTFU and RSS.

Table 4: Availability of Essential CBNC Commodities and Supplies During Supportive Supervision and One Month Before the Visit.

Item	Variable	Available on Day of Visit				Available in the Last Month Before the Visit			
		No. of HPs With the Item (n)	No. of HPs Providing Data (N)	%	95% CI	n	N	%	95% CI
Dispersible amoxicillin	1st round	1,600	2,034	79	77-80	1,509	1,842	82	80-84
	2nd+ round	1,558	1,716	91	90-92	1,481	1,611	92	91-93
Gentamycin	1st round	1,613	2,028	80	78-81	1,527	1,841	83	81-85
	2nd+ round	1,565	1,715	91	90-92	1,494	1,619	92	90-93
2cc syringe and needle	1st round	1,893	2,031	93	92-94	1,720	1,818	95	94-96
	2nd+ round	1,634	1,764	93	91-94	1,549	1,661	93	92-94
Thermometer	1st round	1,962	2,049	96	95-97				
	2nd+ round	1,787	1,806	99	98.6-99.5				
Weighing scale	1st round	1,953	2,059	95	94-96				
	2nd+ round	1,754	1,819	97	96-98				
CBNC register	1st round	1,992	2,048	97	96.5-98				
	2nd+ round	1,803	1,810	99	99.3-99.8				
Timer	1st round	1,708	2,038	84	82-85				
	2nd+ round	1668	1,804	92	91-94				

Service utilization for VSD

We analyzed PRCMM data to estimate the proportion of sick young infants who sought care for VSD in the study HPs (Table 5) from the expected VSD cases. Nearly a third (32%) of expected VSD cases sought care at the HP level. When further analyzed for the number of VSD cases per HP in the eight-month period, over half of the HPs (52%; 95%CI: 51-54) did not see any VSD cases, 17% (95%CI: 15-18) saw one case, 11% (95%CI: 10-12) saw two cases, 6.6% (95% CI: 5.8-7.4) saw three cases, and only 1% (95%CI:0.7 -1.5) saw eight cases, or one case per month.

Service initiation and completion

Of the cases that sought care in study HPs, nearly three quarters (74%) of the cases were treated at the HP and the remainder were referred to a higher level facility (9). The number of cases treated at HPs vary among zones (table 5); however, 90% of the cases that started treatment at HPs completed their treatment of seven days (once daily) injectable gentamicin and twice a day oral amoxicillin.Overall CBNC program implementation strength was rated comparing the result with targets on implementation guidelines and benchmarks set based on expert opinion (Table 6).

Table 5: Proportion of Cases in Which Caregivers Sought Care, Started Treatment, and Completed Treatment for VSD After

Zone	Number of HPs	Mean Number of Months Data Covers	Expected Number of VSD Cases*	VSD Cases Caregivers Sought Care for at HP	Cases Started Treatment at HP	Cases Completed Treatment at HP (7 Days)	cases referred to other facilities[12]
East Shewa	288	8.4 (8.2-8.6)	3,611	970 (38%)	577 (59%)	500 (87%)	393 (41%)
Sidama	545	10 (9.8-10.2)	7,915	2,339 (35%)	1,967 (84%)	1,809 (92%)	372 (16%)
Gurage	389	10.4 (10.3-10.6)	3,585	1,268 (41%)	1,006 (79%)	849 (84%)	262 (21%)
North Shoa	267	9.6 (8.8-10.2)	3,166	198 (8%)	132 (67%)	120 (91%)	66 (33%)
East Gojam	402	6.6 (6.4-6.8)	5,467	751 (25%)	425 (57%)	409 (96%)	326 (43%)
Total	1,891	8.8 (8.7-8.9)	23,744	5,526 (32%)	4,107 (74%)	3,687 (90%)	1419 (26%)

* The number of expected cases is annualized and adjusted to reflect actual months the data covers (eight months on average).

Table 6: Program Implementation Strength: Comparison of Implementation Guide's Targets with Actual Implementation

Program Implementation Variable	Target	Achievement	Strength (Strong, Average, Weak)
HEW training A	100%	100%	Strong
HPs initiating CBNC A	100%	98%	Strong
HPs having PTFU any time after training A	100%	99%	Strong
HPs having two+ PRCMM A	100%	85%	Strong
Proportion of HEWs participating in PRCMM A	100%	71%	Strong
HPs having at least one joint RSS from implementing partners and PHCU A	20%	85%	Strong
CBNC drugs availability A		91%	Strong
Treatment completionB		90%	Strong
HEWs' ability to classify correctly B		81%	Average
HEWs' ability to treat correctly B		84%	Average
Service utilization for VSD at HP (expected cases) C		32%	Average
HPs having timely PTFU (4-6 weeks after training) A	100%	50% (AAR finding)	Weak
HPs having RSS from PHCU A	80%	0	Weak

[12] referral quality and compliance with referral is discussed in the referral paper

[13] Treatment completion: According to the CBNC chart booklet, treatment for VSD cases is gentamycin injection, once daily for 7 days and oral dispersible amoxicillin

[A] 90-100 (S), 80-89 (Av), < 80 (W)
[B] 85-100 (S), 75-84 (Av), < 75 (W)
[C] > 70 (S), 30-69 (Av), < 30 (W)

DISCUSSION

Previous experience with iCCM (10, 11) has helped to develop a well-defined implementation guide, which has framed each activity so that it happens in an orderly fashion with well-defined roles and responsibilities for all stakeholders. CBNC has largely been implemented as planned in the study areas. All HEWs have been trained in CBNC.A high proportion of HPs have had PTFU and PRCMMs. This result is similar to the implementation strength study conducted in iCCM (12). However, there were areas that did not strictly follow the implementation guide, such as the roll-out modality of HEW training. The implementation guide suggested that PHCU staff should train HEW sat the HCs to allow timely and frequent follow up, ownership and sustainability of the program. A HC has, on average, five HPs and 10 HEWs under it. However, only nearly one HW per HC had TOT on CBNC. This resulted in shortage of facilitators at the district level. As a result, partners had to take leadership in training HEWs using their trainer pool and TOT-trained HWs from different HCs. This in turn resulted in extended training duration, delaying PTFU and ultimately PRCMM.

PTFU and RSS are believed to improve HEWs' consistency in providing care to sick children (12). Because of a smaller pool of trainers than expected and the volume of HEWs to be trained, follow up was not timely – it was on average **three** months late. Potentially this might have contributed to less confidence and skill and thus suboptimal performance. The assessment has shown that most regular supervision was led and conducted by partners, and less was done to strengthen local government systems. The same was true during iCCM, where partners hired consultants to conduct PTFU following the initial training (12).According to the national health structure, five HPs are linked to one HC, and the HC staff provide weekly supervision and on-the-job mentoring (13).However, none of the PHCUs could conduct RSS on their own using the standard checklist (iCCM/ CBNC supervision checklist).HWs' training on CBNC was conducted following HEWs' training and PTFU.As a result, HWs who support HPs lacked confidence in supporting HEWs on CBNC, though the sequence in subsequent phases was adjusted. Further strengthening Government ownership and functions of the PHCU are critical for successful national scaling up of CBNC.

As service utilization data indicates, more than half of HPs did not see any VSD cases, and only 1% of HPs saw at least one case per month. With very few cases, developing and maintaining the skill and competency of HEWs to assess, classify, and treat would be very difficult. In addition to skills-based training of HEWs, PTFU, RSS and PRCMMs are intended to improve quality of care and strengthen links between HPs and HCs. This approach built on lessons learned from iCCM. A similar approach within the PHCU system needs to be developed to maintain skills obtained through trainings.

HPs did not have much shortage of essential commodities, as implementing partners were providing the supplies directly to zones and districts in parallel to the existing system. A similar procedure to iCCM was followed to equip HPs with essential supplies for CBNC(10). Unlike iCCM, the availability of drugs was good on the days of visits. However, this is a parallel system, and partners have invested significantly to ensure supply availability at the service delivery point. An iCCM study (14) assessed supply availability in intervention and control sites and found that control sites had shortages of supplies to treat malaria and diarrhea, which was part of the HEP even before iCCM. A study conducted to assess the effect of iCCM on malaria case management found that control HPs where there was no iCCM intervention, had shortages of drugs compared to intervention HPs which received their supply through implementing partners. As a result, control area HEWs were less likely to deliver case management, use the algorithm, or record in the register—all of which reinforce skills (15).Both findings indicate the importance of strengthening the supply system to ensure sustainability (16).

Service utilization remained low compared to the expected number of sick children, and this was also true for iCCM services (17). Identifying and treating or referring over 70% of total PSBI cases was needed to result in significant mortality reduction in Sylhet district, Bangladesh (18). These data, however, need to be interpreted cautiously, as the expected number is for the entire zone, but the data analyzed here only come from HPs. Some cases might have gone directly to the HC or hospital (19, 20).Learning from the iCCM lessons, a stronger focus was given to community sensitization and mobilization through the HDA, an existing community structure, to improve service utilization. Several factors might have contributed to low service utilization (3).More needs to be done to address barriers to care seeking and service utilization. The national expectation for VSD incidence could also be unrealistic. Further study on setting accurate denominators should be considered.

As CBNC is built on the experience of iCCM, HEWs have demonstrated better skill in assessing, classifying, and treating cases. However, with very few cases, developing the skill and competency of HEWs to assess, classify, and treat is very difficult. The study on effectiveness of supportive supervision of iCCM (21) has shown that frequent visits improve HEWs' consistency on classification and treatment of pneumonia in children under age of five. There should be regular supportive supervision and mentoring visits from the supervising health facility to refresh HEWs' knowledge and skills so that they retain skills, stay motivated and are competent.

Low rates of early PNC visits (22) might also contribute to low case identification and service utilization. Studies have shown early postpartum visits by community health workers have helped identify and improve care seeking for PSBI, feeding problems and other newborn illnesses (19,23). The treatment completion rate for VSD was better than it was for pneumonia during iCCM implementation (16). The same was true with the Community-Based Newborn Intervention work in Ethiopia (COMBINE) (24)

One limitation is that this study analyzed routine data, which were collected for program monitoring purposes to improve program quality, and therefore for a different objective than this study. Furthermore, all the data came from HPs, and so there are no data from HCs to give a complete picture of service utilization and treatment completion. The data also do not allow us to conduct dose response analysis to assess the effect of implementation strength on the outcome of the program.

Conclusion

Community health workers, in this case HEWs, can manage very sick young infants when referral is not possible with high-quality training, prompt coaching, RSS, and PRCMMs. However, the program needs to be well planned, integrated with the existing health system, and capable of supervising HEWs and higher level health facility staff better. For HEWs to provide optimal quality service PTFU, RSS, and PRCMMs are essential. For the program to be effective, partners' support should be well coordinated and should be used to build the capacity of health staff in the MOH structure (RHBs and district health offices) and the system in general. Partners have invested a large amount of their time and energy in rolling out training and conducting PTFU, RSS, PRCMM, and delivering supplies to the districts.

But more should be done to strengthen the system to integrate CBNC and routinize its implementation such as implementing the program with the integration principle and practice in mind by donors and implementing partners alike. Government should also envision having dedicated human resource within the RHB and district health offices for child health.

Recommendations:

Partners of FMOH should build the capacity of MOH staff and strengthen the system, especially in logistics management and information systems, supervision and quality improvement systems such as PTFU, RSS and PRCMMs, and the health information system to ensure strong CBNC implementation will achieve its goal.

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BRIEF COMMUNICATION

MAKING COMMUNITY BASED NEWBORN CARE SUSTAINABLE IN ETHIOPIA

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ABSTRACT

Introduction: *To urgently reduce child mortality in Ethiopia, the Federal Ministry of Health has implemented a community-based newborn care program, building on the foundations of Integrated Community Case Management of Child Illness and the Health Extension Program. From the outset of the program, the Federal Ministry of Health goal has been to ensure that the program is rapidly scaled nationwide and its benefits sustained into the future.*

Objective: *To assess the sustainability of the Community Based Newborn Care program to date and recommend a way forward.*

Methods: *Applying a program sustainability framework suggested, we conducted a desk review of available documents. These included program guidelines, plans, tools, studies and evaluations, meeting reports, annual reports and program data. Collaborating partners were engaged throughout and provided additional insights through group meetings.*

Findings: *The community based newborn care program has had robust leadership from the Federal Ministry of Health throughout the program design and implementation process. The program builds on the foundation of the Health extension program, which provides services through government supported Health Extension Worker. Community based newborn care was designed to fit into the existing primary care health system as an integrated component of maternal, newborn and child health care rather than as a vertical initiative. The program has a communication strategy that includes the Health Development Army. Community based newborn care has resulted in improving access to services that were not available at the community level and has also enhanced preventive interventions during antenatal, delivery, and the postpartum period. However, supplies of drugs and other medical equipment required for the execution of the program have not been assured sustained funding. In addition, demand creation activities have been fragmented and need strengthening in order to improve low service utilization.*

Conclusion: *In order to sustain gains in community based newborn care service availability and improve use, the Federal ministry of health, Pharmaceuticals Fund and Supplies Agency and partners urgently need clear supplies financing strategy and resources. Demand creation work needs to strengthen and motivate health development army leaders', so that uptake of newborn services is increased. This will involve focusing on the ability of Health development armies and families to recognize danger signs for young child illness and to take action rapidly. Program related support systems have shown promise but need to be institutionalized and incentivized. The most important systems are related to supportive supervision, performance review and clinical mentoring, and quality improvement. One approach would be to add appropriate indicators to health workers and managers' official performance reviews.*

Key words: *Sustainability, partnership, community based newborn care*

INTRODUCTION

From the outset of the Community Based Newborn Care (CBNC) program, the Federal Ministry of Health (FMOH) goal has been to ensure that the program is rapidly scaled nation-wide and its benefits sustained into the future (1,2). After three years, blanket coverage has been achieved in agrarian regions while additional efforts are needed to reach newborns in pastoralist areas. Program sustainability is defined as 'the ability to maintain programming and its benefits over time' (3). This study was conducted to assess the sustainability of CBNC program in Ethiopia and recommend the way forward.

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METHODOLOGY

To assess the sustainability of the program, we have applied Schell et al's framework (4). This framework identifies factors that promote long-term program sustainability derived from a concept mapping process (Table 1).

Table 1: Program Sustainability Framework

Domain	Definition
Political Support	Internal and external political environment which influences program funding, initiatives, and acceptance
Funding Stability	Making long-term plans based on a stable funding environment
Partnerships	The connection between program and community stakeholders
Organizational Capacity	The resources needed to effectively manage the program and its activities
Program Evaluation	Monitoring and evaluation of process and outcome data associated with program activities
Program Adaptation	The ability to adapt and improve in order to ensure effectiveness
Communications	The strategic dissemination of program outcomes and activities with stakeholders, decision-makers, and the public
Public Health Impacts	The program's effect on the health attitudes, perceptions, and behaviors in the area it serves
Strategic Planning	The process that defines program direction, goals, and strategies

CBNC documents such as program guidelines, plans, tools, studies and evaluations, meeting reports, annual reports and monitoring data assembled from the FMOH, partners and professional associations were reviewed. Content was classified and summarized based on the framework.

Ethical consideration

This paper used secondary data from existing national and project documents, including guidelines, plans, monitoring tools, periodic reports and program review documents. Consent and authorization to use these documents was obtained from the Maternal and child health directorate of the Ministry of Health.

RESULTS

Political Support: The Program has robust leadership support from the Federal Ministry of Health that led the program design and roll out process. The program implementation manual explicitly states that the government will lead and own the program at all levels including the Minister of Health. There are clear roles and responsibilities specified for the community, including local decision makers such as the kebele command post, kebele staff and the Health Development Army (HDA) (1,5).

Roles for Primary Health Care Unit staff (PHCU), woreda and zonal managers, and Regional Health Bureau (RHB) directors and managers are similarly defined.

Expansion of the Community Based Newborn Care program is highlighted in the Health Sector Transformation Plan (HSTP) that includes targets to improve coverage of sepsis management (5). Strong champions at different levels in the FMOH, professional societies and development partners with proven ability to garner resources for the program contributes to sustained support. FMOH leaders have mobilized resources for national scale up.

Funding Stability: The program builds on the existing Health Extension Program (HEP) platform, with stable government funding for hiring and retaining health extension workers (HEWs). Domestic resources are also used to pay facility health workers and management staff. However, initial roll out costs such as for training, supplies, supervision, and evaluation were largely externally financed through sources such as UNICEF, the United States Agency for International Development (USAID), the Children's Investment Fund Foundation (CIFF), and others (6).

Drugs and other medical equipment required for the execution of the program have been externally supported and more sustainable funding sources are being sought. Looking forward, the program may face competition for domestic resources as health priorities are broadened in scope and reach.

Partnerships: At the national level, the program was integrated into the successful partnership approach of the Integrated Community Case Management (iCCM) of childhood illnesses program. CBNC used the coordination and partnership forum of the National Child Survival Technical Working Group (CSTWG), which brings together key implementing partners, multilateral partners, and others under the leadership of FMOH (1). This established coordination group met regularly to design, mobilizes resources, harmonize, implement, and resolve problems. This has led to strong roll out in agrarian regions with partners working together on training, supply distribution, supportive supervision, and performance review meetings.

At the community level, the program engaged existing community resources such as HEWs, kebele command posts and the HDA to plan and implement CBNC, creating widespread linkages at the lowest levels.

Organizational Capacity: CBNC was integrated into the health system in maternal, newborn and child health programs at the primary health care level, largely within the HEP. The existing organizational capacity of the HEP is fairly robust (6). About 98% of the 28,923 HEWs in agrarian areas were trained, supervised, and supplied for CBNC services. Moreover, there are 2,956 supporting health centers providing technical and administrative supports to HPs under the PHCUs.

The decentralized governance system and the availability of other child health programs such as Integrated Management of Neonatal and Child Illness and neonatal intensive care units at facility level have provided supervisory support and referral care. However, some activities such as post training follow up and performance review and clinical mentoring meetings have not yet been institutionalized. More capacity building is needed in supply chain management and use of data for decision making. In addition, service delivery problems such as HPs closed during working hours and low postnatal home visit coverage must be addressed to ensure sustainable and effective coverage for CBNC (7).

Program Evaluation: Standard baseline and midline evaluations of the CBNC program have been done, and the results shared with funders and other key stakeholders (7). Midline evaluation results have been used to help craft quality improvement and implementation plans to address gaps. However, the current health management information system of the country does not fully capture monitoring data or intermediate outcomes of the program and most studies have been externally funded.

Program Adaptation: There is a system in place to identify problems, make necessary changes, and incorporate improvements into CBNC. The program proactively addressed service provision by health workers in the absence of HEWs at HP level and has incorporated simplified treatment regimens for PSBI. Safe and clean delivery by HEWs, which was part of maternal health services and linked to the initial CBNC package, was abandoned due to ineffectiveness and new guidelines were adopted, further demonstrating flexibility.

Communications: CBNC has a communication strategy that raises awareness and seeks to change behaviors through the HDA program, program leaders, HEWs, and health workers. Similarly, the demand-creation strategy aims to increase community understanding of newborn health issues and recommended behaviors. However, lower than expected utilization of services indicates the need to more actively engage communities and families.

Public Health Impacts: The program resulted in improving access to services that were not available at community level previously and also offered an opportunity to enhance preventive interventions during antenatal, delivery and postnatal periods. This brought critical services and information to caretakers who would not accept referral to higher level health facilities. However, although utilization of services has increased, they have not reached expected levels and some newborns are going without needed care.

Strategic planning: The CBNC program is highlighted in the HSTP and is one of the priority packages in the National Newborn and Child Survival strategy. It is also included in woreda based health sector plans ensuring regular review of performance and sustained services. However, the program has not yet developed a long-term financial or sustainability plan (5).

DISCUSSION

The CBNC program is government led, owned by the FMOH and implemented through the existing public health system. As such, it is financed through the government with external financial support mainly limited to initial roll out, supplies, and supervision. Even though there was little clarity on long-term financing or sustainability at the beginning of the program, there are some prerequisite for sustainably funding being addressed. First, essential CBNC drugs and supplies are being integrated into the government's Pharmaceuticals Fund and Supplies Agency (PFSA) system. Second, program priorities and performance expectations have been integrated into the National Newborn and Child Survival Strategy (2016-2020) and into the HSTP (5,6,8).

The program has had strong political support from the outset because it addresses a critical portion of Ethiopia's child mortality. In addition to potentially reducing NMR, the program has strengthened related services in the antenatal, delivery and postnatal periods. It has also continued to deepen the linkages between communities, health posts and health centers. Since CBNC was layered onto the iCCM platform with integrated monitoring, supervision and review mechanisms, the program has contributed to iCCM institutionalization. Moreover, program design and implementation with the same set of donors and implementing partners contributed to the grown of partnership based on mutual trust and transparency. However, while the program has enjoyed strong partnership among those working in newborn and child health, it has not been as successful in establishing linkages with maternal health partners.

Although CBNC will continue to be funded through public health financing, stable and long-term financing for the specific commodities and supplies needed doesn't appear to be assured. Developing clear financing commitments for the medium term is critical in order to benefit from past investment.

Up until now, the CBNC program has been buffered from less tractable weaknesses in the overall health system by collaborative work with partners at regional and woreda levels. These include weak supportive supervision, poor use of data to improve service delivery, unreliable supply logistics, poor motivation of health workers and variable quality of services. As partners have phased out support, the program has felt the effects in implementation. This is compounded by weak leadership and ownership at sub-national levels.

To the extent possible, transition plans should outline practical strategies to address such systemic issues in order to sustain the gains and further institutionalize the program within the health system.

In addition to ensuring availability of services for sick young infants closer to communities, the CBNC program aimed for a strong demand generation intervention designed to address key barriers to care seeking. While the importance of demand generation is well understood by health managers and service providers, it is not active or well incorporated in the local health system.

Given that socio-cultural and traditional barriers affect many maternal and newborn care seeking behaviors and practices, continued investment in demand generation activities that empower communities for positive action is critical.

Recommendations

- Ensure continued political support for CBNC at all levels in the context of the HSTP and Ethiopia's Sustainable Development Goals.
- Develop a clear commodities and supplies financing strategy for the medium term.
- Strengthen HDA leaders' capacity for demand creation to increase uptake of newborn services, focusing on their ability to recognize danger signs for young child illness and effective use of the family health card.
- Strengthen pre-service training for HEWs for CBNC.
- Improve the supply chain system for CBNC related drugs, ensuring that the drugs are fully incorporated into PFSA and the Integrated Pharmaceutical Logistics System.
- Institutionalize supportive supervision and PRCMM meetings as key responsibilities of health center staff by including them as indicators for their performance review.
- Strengthen implementation of the quality improvement and transition plan with respect to iCCM/CBNC.
- Incorporating child health indicators in the revised version of the routine health information management system.

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The authors have no conflicts of interest to declare.

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CONCLUSIONS

INTRODUCTION OF COMMUNITY-BASED NEWBORN CARE IN ETHIOPIA

Mary E. Taylor, PhD[1]

This supplement presents findings from evidence and experience drawn from the design and early implementation of the Community-Based Newborn Care program (CBNC) in Ethiopia (2013-2016). The story of this program has its roots in the extraordinary leadership and commitment of the Ministry of Health (FMOH) to reduce neonatal mortality nation-wide by extending care into communities through its Health Extension Program (HEP).

CBNC was designed to leverage the learning and practice of Integrated Community Case Management (iCCM), that had rapidly scaled care of sick children to rural areas, and to empower Health Extension Workers (HEWs) to provide curative services for newborns when referral was not possible. CBNC was also implemented in such a way that related health services such as antenatal care, skilled delivery, case management of child illness, and nutrition could be strengthened. With strong harmonization of guidelines, partners and resources, Ethiopia was able to phase-in rapidly a complex care package in the agrarian regions of Amhara, Oromia, SNNPR and Tigray.

How well is CBNC working?

The papers in this supplement document that a functioning system has been established, although challenges to effective use of that system remain.

***Readiness*:** The resources necessary to deliver CBNC components were often in place. In one study area, trained HEWs were available at all health posts and around 90% had the essential medicines to treat Possible Serious Bacterial Infection (PSBI). Throughout the program area, 80% of health posts were found to have supplies when visited. However, these supplies were provided through a parallel logistics arrangement rather than the routine logistics system of the MOH. When stock-outs loomed, partner workarounds were engaged. As CBNC was phased-in, health facilities were provided with medical equipment for higher level care of newborns (e.g. oxygen). While audits showed this equipment to be available, a considerable proportion was not ready for use nor used routinely.

***Supervision*:** Supportive supervision was deployed during this initial implementation period. All health posts in a study area received at least one visit, 20% received two, and 5% received more than two visits. (The number of later visits partially reflect the limited observation time available for this data collection.) There were strong effects of supervision on the consistency of PSBI management and they improved significantly with the number of visits, with performance going from 71% correct management of PSBI with first visits to 84% with third visits.

Referral: Data for performance of the referral system in the program area were limited by poor record keeping, especially at health centers, and major gaps in formal communications between health posts and health centers (linkage within the PHCUs). Health post data showed that only one third of cases of sick young infants were referred up the system; and while close to 90% of caretakers reported adherence, little confirmatory facility data in registers or through referral slips were available.

***Quality, Additions, and Adaptation*:** Some aspects of the CBNC package were not well implemented in certain geographic areas. For example, HEW identification of births followed by early postnatal care home visits did not happen, possibly reducing effective care of newborn PSBI cases. Other quality issues related to HEW care have been reported elsewhere and deserve more attention as the program matures (1). The addition of newborn care corners and chlorhexidine for cord care, although at different points in time, illustrate the requirements for detailed guidelines, planning and adequate lead-time, and the persistent follow-through needed to introduce them throughout the health system. Last, Ethiopia is a vast country whose health system must serve culturally and linguistically diverse populations. The CBNC program was first designed for the HEP in agrarian areas where 80% of the population lives. The example of how it was adapted to meet the needs of the pastoralist and semi-pastoralist people of Afar demonstrates one approach to addressing equity.

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Utilization and Community Demand: Many of the supplement papers document the availability of the supply side of CBNC. In one geographic area, health posts experienced a 21-fold increase in cases of sick young infants and a 6-fold increase in cases of PSBI, after program initiation. Despite these increases, the number of cases seen was very low compared with those expected. In the referral study, HEWs saw only one third of expected cases of PSBI. Desired reductions in neonatal mortality will require a much higher level of utilization and a correspondingly increased level of demand for services. While the FMOH and partners implemented demand generation interventions, they started later than the service provision and didn't have enough time to mature. Engagement of the Health Development Army was highly variable.

The challenge of changing social norms and beliefs for newborn care and home practices, even as compared with iCCM demand, is well recognized. Multiple studies of barriers to demand for newborn care in Ethiopia have been carried out and recommendations offered (2-4). However, concerted efforts to mobilize communities and change behavior are evolving slowly and it is not clear what interventions will be most effective or in what time frame.

What will CBNC look like going forward?

Sustainability: The FMOH has maintained leadership and political commitment to newborn health and community -based care, and they remain a priority of the Health Sector Transformation Plan (HSTP) (5). However, there are challenges sustaining the performance of key system components, especially essential supplies, robust supervision, clinical mentoring, and use of data for decision making. As donor and partner resources for CBNC ebb, and the FMOH is faced with the increasing complexity of meeting Sustainable Development Goals (SDGs), it will be important to continue to emphasize evidence for progress and accountability for newborn and child health.

Saving Lives: There is good news from modelling the possible effects of CBNC. The introduction of CBNC in the agrarian areas, including management of neonatal sepsis at the community level, has contributed to more than *46,000* additional neonatal lives saved between 2013 and 2016. However, the gains could be even higher - an additional 187,500 neonatal lives saved - if Ethiopia meets its MNCH-related HSTP targets between 2017 and 2020.

Limitations

The papers in this supplement used the best data available; however, they did not cover all geographic areas equally nor was data always complete. There was variation in documentation between areas supported by different partners and/or by variation in regional and woreda public health offices. The length of observation time after introduction was fairly short for a program attempting to add a more complex intervention and to change social norms. With more observation time there might be more evidence of sustained performance and impact.

Some topics important to program and outcome assessment are missing from this documentation. These include information on program and opportunity costs, newborn service utilization data for health centers and hospitals, effectiveness data for demand interventions, and more detailed equity of performance and coverage data (by geographic or economic quintile). We are also missing the voices of HEWs, community leaders, and more caretakers that might have provided different and important perspectives on the experience of care or health behavior, and who may have had innovative ideas for improvement.

Conclusion

The papers in this supplement show the considerable potential of a holistic community-based newborn care approach when the component elements – primary health services, supplies, training, supervision, information and leadership are seriously implemented. The limited change in utilization of these efforts also highlights the critical importance of a thoughtful integration of these activities across service delivery levels and of active community engagement. As Ethiopia's ambitious CBNC efforts expand, these areas would be well worth the attention of senior program managers.

Ethiopia has demonstrated its ability to dramatically change the realities of healthcare and access among its diverse and far-flung population. Few countries can match the progress made here over the past quarter century. Today's newborns will be the productive adults driving Ethiopia's society and economy in 2050 and beyond. It is the hope

of the authors of this supplement that the experiences and lessons learned described here, will enhance the likelihood that today's newborns will be the healthy and productive contributors needed for Ethiopia's future.

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GUIDELINES FOR AUTHORS

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- Original Articles (*vide infra*) on experimental and observational studies with clinical relevance
- Brief Communications
- Case Series
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- Teaching Articles
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- Correspondences/Letters to the Editor
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- **Abstract:** The abstract of an article is prepared on a separate page and contain 250 words; it should be structured under the titles: a) Background; b) Methods; c) Results; d) Conclusions. Briefly summarize the essential features of the article under above headings, respectively. Mention the problem being addressed in the study; how the study was conducted; the results and what the author(s) concluded from the results. Statistical methods used may appear under the Methods paragraph of the Abstract, but do not insert abbreviations or references in the Abstract section.
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The following examples demonstrate the acceptable reference styles.

Articles:

- Gilbert C, Foster A. Childhood blindness in the context of Vision 2020: the right to sight. Bull World Health Org. 2001; 79:227-32
- Teklu B. Disease patterns amongst civil servants in Addis Ababa: an analysis of outpatient visits to a Bank employee's clinic. Ethiop Med J 1980; 18:1-6
- Tsega E, Mengesha B, Nordenfelt E, Hansen B-G; lindberg J. Serological survey of human immunodeficiency virus infection in Ethiopia. Ethiop Med J 1988; 26(4):179-84
- Laird M, Deen M, Brooks S, et al. Telemedicine diagnosis of diabetic retinopathy and glaucoma by direct ophthalmoscopy (Abstract). Invest Ophthalmol Vis Sci. 1996; 37:104-5

Books and chapters from books:

- Henderson JW. Orbital Tumors, 3rd ed. Raven Press New York, 1994.
- Clipard JP. Dry Eye disorders. In Albert DM, Jakobiec FA (Eds). Principles and Practice of Ophthalmology. Philadelphia: W.B Saunders; 1994. pp. 257-76.

Website:

David K Lynch; laser History: Masers and lasers.
http://home.achilles.net/jtalbot/history/massers.htmAccessed19/04/2001

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