

PERSPECTIVE

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

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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.

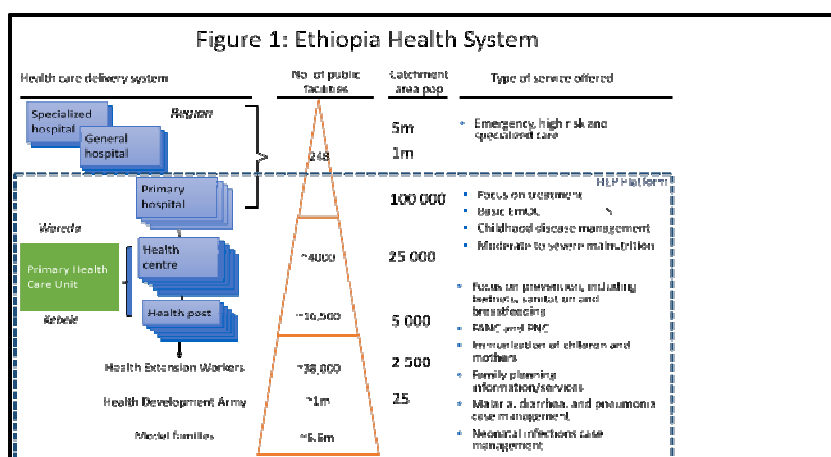
In this health system context, Ethiopia's health leadership and experts set out to design the Community Based Newborn Care program to make management of PSBI in newborns more accessible by embedding it in the HEP.

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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