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Closer to Home:

Community-Based Management of Newborn Infections

Every year more than 4 million newborns die, accounting for more than 40 percent of all child deaths. More than four fifths (86 percent) of these newborn deaths are caused by three factors: infections, asphyxia, and complications of preterm birth. Infections alone—namely sepsis, pneumonia, diarrhea, and tetanus—account for 36 percent of all neonatal fatalities, or 1.4 million newborn deaths each year, and in countries with the highest neonatal mortality rates, infections cause closer to 50 percent of all deaths.

Nearly all of these newborn deaths, 96 percent, take place in developing countries, more than half occurring at home with no contact with the formal health system. Only one-third of childbirths in the least developed countries deliver with a skilled birth attendant and even fewer receive early postnatal care. In sub-Saharan Africa, for example, where slightly less than half of childbirths are at home, only 10 percent receive any kind of post-natal care within two days of delivery, the most critical period for a newborn.

Experts agree that almost all cases of infection in newborns can either be prevented or treated. Prevention is the first step, of course, although it is not the focus of this article. But even among newborns who do become infected, it has been estimated that nearly three-fourths (72 percent) of the resulting deaths could be avoided with 90 percent treatment coverage.

This newsletter will identify the main obstacles to standard, facility-based treatment in the worst-affected countries, examine the evidence for the most promising alternative—community-based management of infection (CBM)—and propose models of CBM that can be implemented in different settings and health system scenarios. We will focus here only on three common newborn infections that are caused by bacteria and can therefore be treated with antibiotics: sepsis, meningitis, and pneumonia. Tetanus will not be addressed.

THE GOLD STANDARD—AND ITS OBSTACLES

Successful treatment of newborn infections is commonplace in many countries. World Health Organization (WHO) defines the gold standard as “parenteral antibiotics in hospital for 10-14 days” and specifies the following regimen for infants under two months: parenteral benzylpenicillin or ampicillin, along with an aminoglycoside (gentamicin). Considerable field experience with newborns in developing countries has shown that the degree of postnatal care implied in these WHO guidelines is either not widely available or, even where it is available, is not routinely sought.

“Effective management of newborn sepsis and pneumonia requires timely identification of illness and treatment with appropriate antibiotics. There is an urgent need for alternative strategies for community health workers to identify signs of sepsis and for treatment with simple, effective antibiotic regimens. ‘Gold standard’ therapy for newborn sepsis—injectable aminoglycoside and penicillin—is not an option in community settings.”

Saving Newborn Lives
“Addressing key knowledge gaps for going to scale”

The obstacles to diagnosing and treating newborn infections in developing countries may vary from place to place, but in almost all developing countries there are three common underlying factors:

- More than half of all births take place in the home;
- Two-thirds of all newborns are delivered without a skilled attendant; and
- A small percentage of newborns receive postnatal care within the first few days of delivery

In each instance, if the mother or some other family member does not know the signs of infection in a newborn, then the family is not likely to seek treatment. And even in those cases where family members do perceive the threat, they often do not seek and receive help, for a variety of reasons:

- Due to weaknesses in the health system—lack of facilities, lack of drugs, lack of qualified staff, limited hours of operation—treatment may not be available
- The family cannot afford the treatment (or perceives it cannot)
- The mother (or other family members) do not have time to seek treatment and/or follow-up. In one study in Uganda, only 28 percent of families with sick children acted after being referred to a hospital, due largely to transportation or economic barriers.
- The nearest treatment facility is too far away
- Transport is not available or affordable
- Household or other family responsibilities may prevent the mother from seeking care.
- For cultural reasons the family may seek a traditional healer who may not be able to recognize or properly treat newborn infections

In some settings people have a low opinion of the quality of facility-based care. Given these circumstances, a consensus has emerged that the best hope for reducing newborn fatality from infections in low-resource settings lies with bringing treatment options closer to the home, into the community or village. There is recent evidence from a number of programs that this solution is both feasible and effective.

EMERGING EVIDENCE

The following section of this newsletter summarizes recent published and unpublished evidence showing that community-based management for newborn infections is both effective and feasible.

Some of the first evidence for community-based management (CBM) of newborn infection came from a meta-analysis of studies of community-based management of childhood pneumonia in which newborns were also treated. When data were pooled from the seven studies that treated and reported newborn outcomes, the results showed that CBM of pneumonia resulted in a significant 27 percent reduction in neonatal mortality from all causes, and an even higher 42 percent reduction in neonatal mortality due to pneumonia. The community-based treatment regimens were mostly oral antibiotics: oral cotrimoxazole (in four studies), followed by injectable penicillin (one study), and injectable penicillin along with oral amoxicillin (one study) (Sazawal and Black 2003). Based on these

findings, The Lancet Neonatal Survival Series identified community-based management of pneumonia to be an evidence-based intervention to save newborn lives (Darmstadt et al. 2005).

Other recent evidence now shows that most of the serious newborn infections, including sepsis in addition to pneumonia, can also be feasibly treated in community settings and that such treatment can save newborn lives. This evidence comes from four research projects which implemented community-based treatment of newborn infections in low-resource settings: the SEARCH program in Gadchiroli, India; the Ankur project in seven NGO areas in India; Projahnmo in the Sylhet District of Bangladesh; and the Morang Innovative Neonatal Intervention Program (MINI) in Nepal. The approaches and results of these programs are summarized below.

India: The SEARCH Program

This SEARCH program was carried out in 53 rural villages in the Gadchiroli district of Maharashtra, “an extremely underdeveloped district [where]...roads, communications, education, and health services are very poor” (Bang et al. 1999). In this district there was one male and one female paramedic for every 3,000 people, and a primary health center with two doctors for every 20,000 people. Care seeking for newborn illness outside the home was by far the exception, not the rule. Neonatal mortality was very high at the start of the program, in excess of 60 newborn deaths per 1,000 live births.

The intervention consisted of a package of home-based newborn care (HBNC) activities carried out by project-paid community health workers (CHW) who were selected for this role by village leaders. The CHW—approximately 1 for every 1,000 population—identified pregnant women in her village; made antenatal visits to counsel on healthy behaviors during pregnancy and birth preparedness; provided newborn care at delivery in conjunction with the traditional birth attendant (TBA); made postnatal visits on days 1, 2, 3, 5, 7, 14, 21, and 28 to check on the newborn and mother; and provided home treatment of suspected newborn infection with oral cotrimoxazole plus injectable gentamicin twice daily. While families were taught to recognize and seek care for newborn danger signs, treatment of newborn infection largely depended on active surveillance by the community health workers during routine postnatal home visits.

“Neonatal care for most neonates in developing countries is practically non-existent. [But] even in populations with poor economic and nutritional status and low female literacy, the infant mortality rate can be reduced by nearly half through health education and home-based neonatal care. This [SEARCH] model can be replicated in other developing countries, in which it should become part of primary health care and of the integrated management of sick children approach proposed by WHO.”

Bang et al. 1999

In the intervention villages, there was a highly significant overall reduction in neonatal mortality of 62 percent by the third year (as compared to the first), with a 58 percent decline in deaths due to sepsis. While the incidence of newborn infection declined with improved hygiene due to the preventive components, there was nonetheless a notable reduction in the case fatality for newborns with sepsis, presumably due to CBM with antibiotics. The case fatality from sepsis fell from 16.6 percent during the baseline period to 2.8 percent after CBM of newborn infection by CHWs. The investigators concluded that “home-based neonatal care, including management of sepsis, is acceptable [and] feasible and reduced neonatal and infant mortality by nearly 50 percent among our malnourished, illiterate, rural population. Our approach could reduce neonatal mortality substantially in developing countries” (Bang et al. 1999).

India: Ankur

The SEARCH model of home-based newborn care, including home-based treatment of suspected infections, was recently tested in different NGO-served areas in India. The name of this project, “Ankur,” means “sprout” in the local language, indicating the project’s purpose to demonstrate that HBNC could be replicated and expanded beyond SEARCH. Seven different NGOs participated in this effort. In some cases the NGOs provided health services for the first time, and in other cases NGOs with existing health activities expanded to add newborn health interventions. The participating NGO settings were varied—rural, tribal, and urban slums—but all were typical of low-resource areas in India and South Asia.

The HBNC intervention package was essentially the same as that in the SEARCH areas, except that there were two fewer postnatal visits. Community health workers were local women, selected by village leaders, trained by SEARCH to provide the HBNC, and supervised by health professionals attached to each NGO. CHWs identified pregnant women in their villages, conducted home visits to provide prenatal counseling, attended home childbirths with TBAs to provide immediate newborn care, and conducted routine postnatal visits to check on the health of the mother and newborn. Under this program's active surveillance and case detection, CHWs treated suspected newborn infections in the home—when referral was not possible—using the same antibiotic regimen as the SEARCH program: oral cotrimoxazole and injectable gentamicin.

Recent evaluation of Ankur found that the overall neonatal mortality rate in the project areas declined by 51 percent from baseline after only two years of HBNC intervention. Moreover, the evaluation noted that HBNC, including home-based identification and management of newborn infection, was a feasible intervention for NGOs to offer.

Bangladesh: Projahnmo

The Project for Advancing the Health of Newborns and Mothers (Projahnmo) was carried out in three sub-districts of rural Sylhet district, where the neonatal mortality rate was greater than 45 per 1,000 live births at the beginning of the project. Sylhet district, known for its strong conservative and traditional cultural norms, has health indicators that are among the poorest in Bangladesh. Approximately 90 percent of deliveries are at home, usually attended by a family member or friend or a TBA. There are limited options for treatment of newborn infections other than at one of the few referral hospitals, which are quite distant from most families. The study was designed to examine models of community-based newborn care. A home care model was carried out, using trained, paid CHWs to provide a package of antenatal counseling, postnatal home visits, home-based identification of serious newborn infections, and antibiotics for ill newborns whose families refused referral to a clinic. This home care package led to a 34 percent reduction in neonatal mortality (Baqui et al. 2008).

The Projahnmo home care model, like the SEARCH and Ankur models, involved active case detection through routine postnatal home visits to check on the mother and baby. The community health workers were trained to assess newborns and to conduct routine postnatal home visits on days 1, 3, and 7 and to identify signs and symptoms of newborn illness. All sick newborns were referred to qualified providers at a health facility. But if the family refused referral and consented to treatment in the home, then the CHW administered injectable antibiotics daily for ten consecutive days. The treatment regimen was intramuscular procaine penicillin along with intramuscular gentamicin once daily.

Despite recommendations for referral because of possible life-threatening infection, most families refused to seek care at the referral sites. For newborns with signs of possible very severe disease, only about one third of parents complied with the referral. Most of those refusing referral accepted home treatment from the CHW: two antibiotic injections daily for ten days. The case fatality rate for newborns treated with antibiotics by CHWs was 4.4 percent, which was found to be no different than that for those successfully referred to a facility for treatment (Baqui et al. 2007). These results provide important evidence that home-based identification and treatment of newborn infection is feasible and can reduce deaths by reaching newborns who do not otherwise have access to treatment.

“Given that recognition of [serious infection] largely remained dependent on CHW visits, and attendance at delivery remained low, support for CHWs in conducting postnatal visits and implementation of a successful communication system for families to notify CHW of deliveries are essential to any home-based model for neonatal care.”

Projahnmo-I
Final Report

Nepal: MINI

With evidence from SEARCH that home management of newborn infections was feasible and effective, a project in Nepal was undertaken to determine whether existing cadres of health workers in the government system could provide this life-saving intervention.

The objective of the Morang Innovative Neonatal Intervention (MINI) was to determine whether community-based female community health volunteers (FCHVs) and the most peripheral paid government health workers could identify and appropriately manage neonatal infections—whether it was feasible, in short, to deliver appropriate treatment for newborns in community settings via the existing government health infrastructure. (It was not designed to measure the impact of these activities on neonatal mortality.)

“Community-based management of neonatal infections, through the current government infrastructure, is feasible and necessary in Nepal. With the majority of babies still being born at home and, when they become ill, dying at home, services that reach out to them and their families are essential.”

Jaganath Sharma
MINI
Final Report

FCHVs already identified and managed childhood pneumonia in Morang district, as they do in most districts in Nepal. MINI added newborn infection management at the community level, largely by expanding FCHV activities to include newborns. FCHVs were trained to visit newborns in their home as soon after birth as possible. They weighed the newborn, conducted an assessment, and counseled the family on essential newborn care and newborn danger signs. If the newborn developed signs of infection at any time during the first two months of life, the caretakers were instructed to call the FCHV to assess the baby. If the FCHV detected any danger signs, she obtained consent from the family and initiated treatment with oral cotrimoxazole. She then gave the family a “call form” used to notify and request a trained government health worker to come to their home to give gentamicin injection once a day for seven days. (Oral cotrimoxazole was given for five days.) Thus, the FCHV served to link the family to the government health worker to provide treatment for newborn infections.

MINI was initially implemented in 21 intervention villages and later expanded to all 65 villages in the district, reaching a population of over 700,000. Program evaluation results showed that 80 percent of expected episodes of possible severe bacterial infection in newborns were being treated, compared to 5 percent at the beginning of MINI. The gentamicin completion rate for treated newborns was 93 percent. The evaluation at the end of MINI concluded that community-based health workers are willing and able to manage neonatal infections, are motivated to perform additional tasks in order to save newborn lives, and are thus able to provide high rates of appropriate antibiotic coverage.

The evidence from these four studies demonstrates and/or reinforces several important truths about treating newborn infections in low-resource settings:

- Active surveillance through early postnatal home visits helps identify newborns who need antibiotics for suspected infections
- Families often do not act on referrals to health facilities
- Community or village level health workers can be successfully trained to identify the signs of newborn infection and to administer antibiotics in the home
- Families will accept antibiotic treatment in the home
- Community- and/or home-based treatment works; it saves lives
- Community-based management of newborn infection can be carried out using the existing health infrastructure (at least on the scale represented in these four programs)

The results of the four programs described above are encouraging. The findings showed that community-based interventions against neonatal infections are both feasible and effective. However, as all the studies are based in Asian countries, they do not necessarily predict outcomes in other developing countries, especially in sub-Saharan Africa. Though studies also do not tell us what will happen if such interventions are carried out on a larger scale, the experts from all over the world reached a consensus about scaling-up community-based interventions for neonatal sepsis (see below).

NEXT STEPS: RECOMMENDATIONS FROM GLOBAL CONSULTATION

In 2007, a global consultation on community approaches to newborn infection was convened by the World Health Organization (WHO), the United State Agency for International Development (USAID), and Save the Children/Saving Newborn Lives (SC/CNL). The consultation reviewed the evidence from recent studies and made recommendations to guide future research as well as program implementation.

Based on the review of studies conducted in Bangladesh, India, Nepal and Pakistan, the consultation opined that there is still insufficient evidence about the most effective and feasible antibiotic treatment regimen at the community level to make global policy recommendations about the optimal drug regimen for the community level. The consultation also concluded that, in areas with limited or no access to facility-based care, home and community-based interventions involving health extension or community health workers have a substantial impact on neonatal mortality. Improved access to treatment of probable sepsis, either at home or at first level health facilities close to home, improves newborn care practices in general and increases identification of illnesses at home. The consultation thus charged future research to further test optimal combination oral and intramuscular (IM) antibiotic regimens that would be feasible in weak health systems (for first-level facility and community treatment), acceptable to families, and marked with a treatment success rate as close as possible to the current standard regimen of injectable gentamicin and penicillin for 7-10 days.

For current programs, the consultation recommended that, where possible, the standard regimen be provided in community settings. But where the standard regimen is not feasible, the meeting recommended that alternatives be used: combination of injectable gentamicin and an oral antibiotic (amoxicillin or cotrimoxazole), or oral antibiotic alone if an injectable antibiotic is not feasible. The choice of oral agent—amoxicillin or cotrimoxazole—should be determined based on local program experience, antibiotic sensitivity patterns, and local rates of treatment success/failure with either oral antibiotic.

Points of consensus about effectiveness of different intervention options in the global consultation:

- In areas with limited or no access to facility-based care, home and community-based interventions involving health extension or community health workers have a substantial impact on neonatal mortality, including mortality in the first week of life. This conclusion is based on review of 6 studies conducted in south Asia- Bangladesh, India, Nepal and Pakistan.

- A positive impact on reducing neonatal mortality has been seen with three types of home and community intervention packages:

- Community mobilization as a preventive strategy (*Makwanpur/Nepal*)
- Community mobilization and home visits during pregnancy and neonatal period to promote optimal newborn care prevention practices including care seeking for illness (*Shivgarh/India, Hala/Pakistan, Sylhet/Bangladesh*)
- Home visits during pregnancy and neonatal period to promote optimal essential newborn care, and management of sepsis by community health workers (*SEARCH/India, ANKUR/India, Sylhet/Bangladesh*)

- The studies presented at the consultation documented that neonatal mortality could be reduced by improving newborn care practices and identification of illnesses at home. Home visits in the first two days of life are particularly important, and there was a suggestion that visits on the first day of life may be crucial.

- Improved access to treatment of probable sepsis, either at home or at first level health facilities close to home, improves newborn care practices in general and increases identification of illnesses at home.

<http://www.savethechildren.org/publications/technical-resources/saving-newborn-lives/publications/Sepsis-Report-2007.pdf>

GOING FORWARD: SUGGESTED PROGRAM APPROACHES

Different country settings require different program approaches to provide effective community-based treatment for newborn infections. To design the most effective program for management of newborn infections, the following factors must be taken into consideration:

- The available health services, ranging from communities to referral hospitals
- Common care-seeking behaviors and family compliance with recommended treatment for newborn illness
- Current programs to treat illnesses in children under five, especially those under two months of age (e.g., integrated management of newborn and childhood illness, IMNCI; community case management)
- Program opportunities to reach newborns and families in the early postnatal period, and
- Country policies that determine the availability of drugs for newborn illness, as well as drug administration by health providers in community and first-level facilities.

Based on an assessment of these five factors, a broad range of program approaches may be adopted—all aimed to provide diagnosis and effective management of newborn infections as close to home as possible.

The first thing to consider is whether first-level facility treatment for newborns could be made available and whether families would seek and utilize this care. In many low-income countries, first-level facilities are poorly staffed and under-equipped, presenting fundamental challenges to delivering effective management of newborn infection at facilities. Where first-level facilities are functioning to provide care (such as IMCI) to children, there are important opportunities to add newborn infection management to current care. In this situation, other factors then need to be considered. Will families seek care for their newborns at facilities, especially timely care such that antibiotics can successfully treat newborn infection? Do current policies exist, or do current policies need to be modified, to allow first-level facility staff to treat newborns with injectable and/or oral antibiotics? In some countries, reaching sick newborns in the near-term future requires efforts undertaken now to strengthen first-level facility care and ensure that policies include newborn infection management at these facilities. However, in many countries, first-level facility treatment of most newborn infections is a distant goal but not a reliable solution to save newborn lives now and in the near-term future.

Alternative strategies, such as community case management, must largely utilize community health workers to bring treatment options closer to the newborn at home. Most often, community health workers are linked to existing health systems, although the strength of this linkage varies considerably across countries. Designing the most appropriate alternative approach to manage newborn infection likely means redefining community health worker roles. In some countries, these roles are mostly preventive, helping to ensure that families know newborn danger signs and have plans to seek timely care from qualified providers. Where delays in care for sick newborns are common, community health workers may be trained to identify signs of newborn illness and to treat with the first dose of antibiotics (oral or injectable) at the time they refer. In selecting this approach programmers should consider factors such as the current community health worker role in prevention and treatment of childhood illness, country policies regarding curative care by community health workers, existing supervision systems, and drug and equipment supply logistics.

To improve referrals and provide effective management of newborn infections, community health workers must make early contact with the family and newborn after childbirth, and they must be trained to recognize signs of newborn infection. The recent evidence, presented above, demonstrates that both are feasible. Postnatal home visits by the community health worker, conducted early during the first week after childbirth, reinforce important preventive practices and enable the ill newborn to be identified for referral or management. Postnatal home visits enable community health workers to counsel families to know newborn danger signs, and to seek care from a qualified health provider. Postnatal visits also provide that the newborn is examined for signs of infection, a critical need in settings where cultural or financial barriers prevent families from seeking newborn care outside the home.

Recommended Postnatal Care for Newborns

Suggested **timing** of visits: A total of three postnatal care home visits is recommended for newborns:

1. As soon as possible after delivery (within the first 24 hours)
2. On day 3
3. On day 7 (after the first week of life)

Essential **postnatal care** for all newborns:

- Promote and support early and exclusive breastfeeding (within the 1st hour after birth).
- Help keep the newborn warm; promote skin-to-skin care.
- Promote hygienic cord care and skin care.
- Counsel on prompt recognition of danger signs and care seeking by the family (not feeding well, reduced activity, difficult breathing, fever or feels cold, fits or convulsions).
- Promote birth registration and timely vaccination.
- Identify and support newborns who need additional care (e.g., low birth weight infants, those with signs of newborn infections, those with mothers who are HIV-infected). If feasible, treat local infections at home.
- Provide referral for treatment of serious newborn infections, or provide home- or community-based treatment where referral for newborns is not possible

How can community health workers recognize sick newborns needing antibiotic treatment? A simple algorithm to identify newborn infections now exists. A recently published study has established a set of seven easily identifiable clinical signs that reliably indicate newborns who need antibiotics. (See box.) While this study largely involved non-physician health providers in clinics, the signs are simple enough to be recognized and used by community health workers to make referral and treatment decisions. While further research will be needed to validate the use of this algorithm by community health workers, programs should nevertheless use the algorithm, or an adapted version, to identify newborn infections in community-based settings.

Signs of Serious Newborn Infection

1. History of difficulty feeding
2. Movement only when stimulated
3. Temperature below 35.5 °C
4. Temperature above 37.5 °C
5. Respiratory rate > 60
6. Severe chest indrawing
7. History of convulsions

Simini 2008

ACTION STEPS LEADING TO IMPROVED MANAGEMENT OF NEWBORN INFECTION

The following actions can be undertaken now by programs to improve community-based access to treatment of serious infections in newborns:

- Conduct situation analysis to identify treatment options and current policies for newborn infection in first-level facilities and community settings.
- Conduct formative research to understand current patterns of care-seeking for newborn illness and to identify whether current treatment options or alternative approaches are acceptable to families.
- Design and test programs for community health workers to improve care seeking; and to identify, refer, and/or manage newborn infection using program platforms such as IMNCI, community case management, and community-based postnatal care.
- Advocate for policy change as needed to ensure improved skills and availability and use of oral/injectable antibiotics for newborns at first-level facility or in community-based settings.
- Advocate for policy change as needed to ensure postnatal visits within the first 24 hours, and by the third and seventh day of life.

CONCLUSION

While we may still be in the discovery phase of managing newborn infections in the community—learning more about what works and what does not, teasing out best practices—the evidence that such programs save lives is unequivocal. The challenge now is to further refine the design and implementation of these efforts and find ways to take them to scale.

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